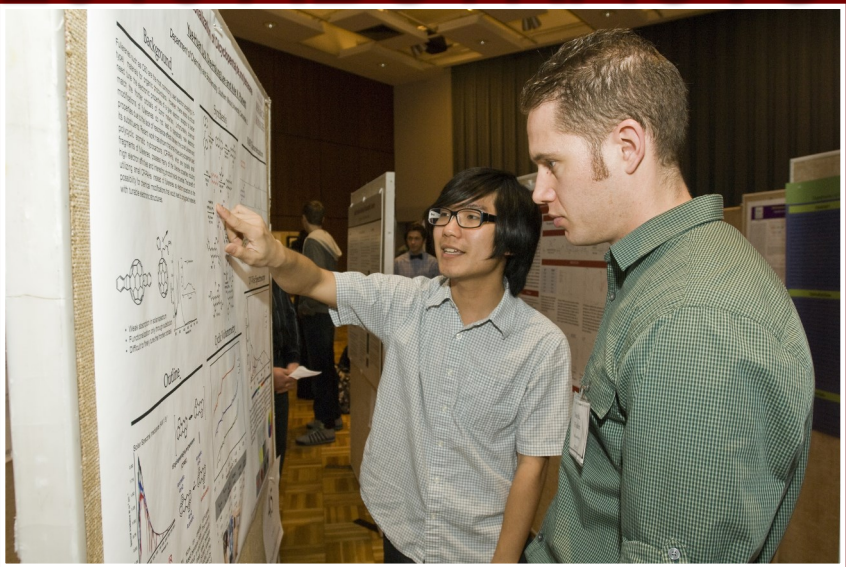
4-2015

2015 Abstract Book

Undergraduate Creative Activities and Research Forum

UNDERGRADUATE CREATIVE ACTIVITIES AND RESEARCH FORUM

2015 ABSTRACTS



PARTICIPATE

LEARN

LEAD

SIU Southern Illinois University
CARBONDALE

Student Center
Ballrooms A, B, C, & D
April 6th, 2015

“**We value undergraduate participation** in research and creative endeavors because it enhances our students’ critical thinking and communication skills, which better prepares them to compete in the global society. Research also stimulates curiosity, which leads of course to answers. I know from my own research when I was a faculty member the excitement of discovering new information, and the satisfaction that comes from sharing those discoveries with others. The commitment of our students and their faculty mentors is an inspiration to all of us.”

—Randy J. Dunn, SIU System President

“Our undergraduates engaged in research are among our best and most successful students. Research is problem-solving—learning to ask questions and finding out how to answer them. From freshmen to seniors, these students are gaining knowledge and skills, and building collaborative relationships, that will propel their lives and careers in every field and provide real advantages in their professional careers. We are very proud of their accomplishments.”

—Susan M. Ford, Acting Provost and Vice Chancellor for Academic Affairs

“**Creating new knowledge** is the pulse of SIU. Our students have direct access to renowned faculty and facilities typically found at universities several times our size, leading to accomplishments in diverse places such as the laboratory, studio, and stage. Not only do our students leave SIU with a degree in hand, but also a creative mind. And with hard work and some serendipity, our graduates may also find themselves with a published article, a novel musical score, an unique piece of art, or most importantly, a fresh view of the world. At SIU, all things are within your reach.”

—James Garvey, Interim Vice Chancellor for Research and Graduate Dean

“‘Know No Bounds’ represents Southern Illinois University Carbondale without a doubt. Participating in undergraduate creative activities and research is a way for students to Experience the endlessly expanding boundaries available at SIU Carbondale. This Forum is a valuable showcase for the world to see students walking in the path ‘Know No Bounds’.”

—Rodrigo Carramiñana, Director of the Center for Undergraduate Research and Creative Activities

Undergraduate Creative Activities and Research Forum
April 6, 2015
Southern Illinois University Carbondale

Program

Poster judging sessions: 8:30 a.m. - 12:30 p.m.
Public viewing session: 1:00 p.m. - 3:00 p.m.
Award presentations: 3:00 p.m.
- Creative and Scholarly Saluki Rookies' poster awards
- Forum poster awards by category
- Saluki App competition awards
- SIU Carbondale Literary & Art Award awards
- CURCA Faculty Mentor Award of Excellence
- REACH awards for 2015-2016 academic year

CURCA Director
Rodrigo Carramiñana

Event Manager
Lori Foster, CURCA

Organizers
Eddie Davenport, CURCA
Magdalena Gorczynska, CURCA
Ouadie Akaaboune, CURCA

Sponsors
Office of the Vice Chancellor for Research
Office of the Provost
The Sustainability Council
Saluki Ventures
Center for Undergraduate Research & Creative Activities (CURCA)

Saluki App competition
Coordinator
Amy McMorrow Hunter, Advanced Coal and Energy Research Center

The Saluki App Competition encourages SIU Carbondale student involvement and the creation of useful and valuable application software ("apps") for mobile devices. Individual students or teams will compete for prizes by submitting their apps that make the SIU campus and/or the Southern Illinois region better.

For more information on Saluki Ventures, one of the Saluki App competition sponsors, visit http://researchpark.siu.edu/saluki-ventures/index.html

SIU Carbondale Literary & Art Award

Coordinators
Allison Joseph, Department of English
Pinckney Benedict, Department of English
Jon Charles Tribble, Department of English

The SIU Carbondale Literary & Art Award recognizes creative excellence in the categories of poetry, fiction, and visual art as published in *Grassroots,* SIU Carbondale's undergraduate arts magazine. Award winners are chosen, through an identity-blind process, based on the scope and ambition of the project undertaken, the energy and intensity of the project's execution, and the effectiveness of the project's final form in achieving its high artistic aims. From 205 submissions, the *Grassroots* editors chose for inclusion in the magazine 16 pieces of fiction, 26 pieces of poetry, and 22 pieces of visual art. Of those, one will be named the SIU Carbondale Literary & Art Award winner in each category, with two runners-up in each category.

CURCA Faculty Mentor Award of Excellence

The Center for Undergraduate Research and Creative Activities (CURCA) is awarding faculty from each college who have mentored undergraduate students in research and/or creative activities outside of the classroom. This award is created to recognize faculty mentors within each college who dedicate time and effort to help undergraduate students expand their knowledge through research and/or creative activities. Each faculty mentor is selected by their college. The awarded mentor will receive a commemorative plaque which is presented at the Undergraduate Creative Activities and Research Forum and will also receive a $500 award.

Thank you to all faculty, staff, and graduate students who are sharing time and expertise to serve as judges at the 2015 Undergraduate Creative Activities and Research Forum. The following list is of individuals confirmed at the time of printing this publication.

Poster judges

Najjar Abdul-Musawwir, Art and Design
Mohamed Abdullah A Alammari, Health Education and Recreation
Mansour Alharaib, Economics
Beth Alongi, Student Center
Assyad Al-wreikat, Economics
Sara Baer, Plant Biology
Mauchharla Baleeswaraiah, Physics
Brent Bany, Physiology
John Barnard, History
Kelly Bender, Microbiology
Christina Bleyer, Library Affairs
Marie Bukowski, Art and Design
Royce Burnett, Accountancy
George Burruss, Criminology and Criminal Justice
Mariela Castro, Behavior Analysis and Therapy
Alessandro Catenazzi, Zoology
Lizette Chevalier, College of Engineering
Yoginder Chugh, Mining and Mineral Resources Engineering
Sam Chung, Information Systems and Applied Technologies
Garth Crosby, Technology
Saran Donahoo, Educational Administration and Higher Education
Chad Drake, Psychology
Jennifer Elder, Social Work
Buffy Ellsworth, Physiology
Derek Fisher, Microbiology
Carl Flowers, Rehabilitation Institute
Michael Fralaide, Physics
Rachel Frazier, Transfer Student Services
Matthew Giblin, Criminology and Criminal Justice
David Gibson, Plant Biology
Jessica Goodman, Health Education and Recreation
Kiriti Gowda, Electrical and Computer Engineering
Pamela Gwaltney, University Honors
Reza Habib, Psychology
Harvey Henson, College of Science
Savannah Howe, Microbiology
Thomas Imboden, Information Systems Technologies
Scott Ishman, Geology
Timothy Janello, Automotive Technology
F. Agustin Jimenez-Ruiz, Technology
Jun Kim, Health Education and Recreation
Tammy Kochel, Criminology and Criminal Justice
Punit Kohli, Chemistry and Biochemistry
Prabir Kolay, Civil and Environmental Engineering
Vicki Lang-Mendenhall, Touch of Nature
Seung-Hee Lee, Fashion Design and Merchandising
Liliana Lefticariu, Geology
Dafna Lemish, College of Mass Communication and Media Arts
Duane Lickteig, Curriculum and Instruction Secondary Education

Poster judges

James Maclean, Physiology
Pat Manfredi, University Core Curriculum
Dipanjan Mazumdar, Physics
Walter Metz, Cinema and Photography
Anne Moore, Library Affairs
Maia Moore, Educational Psychology
Karen Ocon, Curriculum and Instruction
Laura O'Connell, Cooperative Wildlife Research Lab
Michael Page, Fisheries and Illinois Aquatic Center
Sudip Pandey, Physics
Logan Park, Forestry
Kyle Plunkett, Chemistry and Biochemistry
Rene Poitevin, Center for Inclusive Excellence
Jared Porter, Kinesiology
Sheree Randle, Registrar's Office
April Reiman, Graduate School
Rachel Richey, Admissions Office
Kyle Rowsey, Rehabilitation Institute
Seyed Samadi, Mathematics
Hassana Samassekou, Physics
Kuloth V. Shajesh, Physics
Andrew Sharp, Anatomy
Pamela Smoot, Africana Studies
Andrey Soares, Information Systems and Applied Technologies
Alaina Steele, Criminology and Criminal Justice
Michelle Suarez, Alumni Services
Saikat Talapatra, Physics
Marilyn Thakur, Business
Troy Vaughn, Recreational Sports and Services
Sharon Walters, Office of Assessment and Program Review
Robin Warne, Zoology
Matthew Whiles, Zoology
Matthew Williams, Philosophy
Zhengui Patrick Zheng, Physiology
Kay Zivkovich, Art and Design

Saluki App competition judges

John Ahrens , SIU director of enterprise applications
Lauren Siegert, online director, The Southern Illinoisan
Tom Harness - owner, Harness

SIU Carbondale Literary and Art Award judges

Kristiana Kahakauwila, novelist
Melodie Past, painter and photographer
Katherine Riegle, author of poetry

Student participants	Mentors
1. Shant Alexanian	Tsuchin Chu
2. B. Ra-El Ali	Sally Gradle
3. Josh Alstat & Carrie Crawford	Prabir Kolay
4. Marissa Amposta	Sally Gradle
5. Drake Anthony	Boyd Goodson
6. Lauren Austin & Rosemary Bolin	Mark Wagner
7. Michael Bailey	Alison Erazmus
8. Lateesha Baquet	Kathleen Chwalisz
9. Annamarie Beckmeyer	Dale B. Hales
10. Samuel Berger	Eric Chitambar
11. Tyler Berndt	Matt Whiles
12. Melanie Bilbrey	Natasha Zaretsky
13. Rosemary Bolin	Heather Lapham
14. Benjamin Bollero	Jacob Tews
15. Laura Botello	Ramesh Gupta
16. Kevin Bradley	Amber Pond
17. Rachel Brady	George Brozak
18. Cierra Branch-Harris & Amber Cox	Stephanie Clancy Dollinger & Paul Etcheverry
19. Gabriela Brito	Liliana Lefticariu
20. Sidney Brothers	Valerie Boyer
21. Curtis Brown	Regina Trevino
22. Megan Brown, Kaitlyn Holtsclaw & Michael Soltis	Marjorie Brooks
23. Steven Burris, Alan Hogan, Kimia Memar, Gilbert Ofori, Samuel Oltman & Kelby Rogers	Kathleen Pericak-Spector
24. Eduardo Caminha	Matthew Schlesinger
25. Shaylin Carlton, Rebekah Durig, Chloe Helser, & Sarah Jilek	Allison Joseph
26. Krystal Chung	Zhihua Du
27. Tanisha Clark	Sharon Granderson
28. Brooke Cleary & Aimee Lepla	Seung-Hee Lee
29. Tonya Clements	Scott Ishman
30. Megan Colburn	Alessandro Catenazzi
31. Nathan Colley	Lichang Wang
32. Gina Collori	Daryl Kroner
33. Katherine Cooper	Chad Drake
34. Allana Cronk	Julie Partridge
35. Chris Crow	Logan Park
36. Derrick Davis	Brent Bany

[cont.]

Student participants	Mentors
37. Timothy DeKoster	Jesse Trushenski
38. Kesia Denney	Lisabeth DiLalla
39. Andrew Derby	Michael Lydy
40. Nicole Dethrow	Amber Pond
41. Austin Diericx	Yoginder Chugh
42. Europe Doan	Judy Davie
43. Julie Driebergen	Alessandro Catenazzi
44. Logan Druessel	Brent Bany
45. Baylen Earls	Aldwin Anterola
46. Miller Eaton	Thurshari Jayasekera
47. Brenda Escutia	Sosanya Jones
48. Rachel Fishel	Kanako Hayashi
49. Talitha Fisher	Lisabeth DiLalla
50. Martin Flores	Andrew Sharp
51. Nicholas Flowers	David Gibson
52. Wilson Fogler	Clayton Nielsen
53. Alan Franklin	Stephanie Clancy Dollinger & David Gilbert
54 Shantel Franklin	James Allen
55. Margaret French	Jared Porter
56. Madeleine Gagesch	Sarah Kertz
57. Jovan Gathings	Sandy Pensoneau-Conway
58. Elizabeth Geerling	Prema Narayan
59. Miranda Gibson	Stephanie Clancy Dollinger
60. Alex Glasnovich	Andrey Soares
61. Alex Glanovich, Geovane Piccinin, & Marcelo Bandiera da Silva	Andrey Soares
62. Alex Gonzalez	James Allen & Sandy Walters
63. Ryan Gougis	George Burruss
64. Cassandra Goyer	Erin Venable
65. Matthew Grammer	Kanako Hayashi
66. Kenyahtta Gray	Sandie Bass-Ringdahl
67. Sohaib Hameed	Amber Pond
68. Ashani Hamilton	Karen Jones
69. Abdullah Hariri	Sam Chung
70. Luke Harl	Philip Anton
71. Savhannah Haslett	Robin Warne
72. Elizabeth Haubert	Stacy Thompson
73. Matt Hautzinger	Punit Kohli
74. Matthew Heberlie	Steven Goetz
75. Brian Heine	Boyd Goodson [cont.]

Student participants	Mentors
76. Luke Henley	Saikat Talapatra
77. Bradley Henning	Jared Porter
78. Michael Holm	John Reeve
79. Mallory Holzhauer	Mary Stoffel
80. Anna Hooppaw	Derek Fisher
81. Heather Huffman	Joseph Cheatwood
82. Brandi Husch	Karen Renzaglia
83. Todd Ihle	Kishore Thakur
84. Sabrina Imundo	Kris Schachel
85. Bryan Jenks	Pamela Smoot
86. Holly Johnson	Philip Anton
87. Hong Gyoon Jung	Sam Chung
88. Jason Kaatz	James Mathias
89. Paige Kannall	Buffy Ellsworth
90. Jesse Kays	Jane Geisler-Lee & Qiang Cheng
91. Shelby Kemp	Michael Olson
92. Samantha Kevin	Brian Small
93. Nathan Knight	Eric Jones
94. Emily Koberstein	Stephanie Clancy Dollinger & Sherrie Parks
95. Henry Krol	Reza Habib
96. Melanie Kurinec	Matthew Purdy
97. Donald Larsen	Qingfeng Ge
98. Brian Laurore	Rasit Koc & Tsuchin Chu
99. Asia Lee	Cheryl Burke-Jarvis
100. Kristopher Lewis	Beth Spezia
101. Chen Li & Nichol Staples	Gregory Budzban
102. Annie Linhart	Erik Oberg
103. Sasha Litt & Destini Dawson	Janet Fuller
104. Alicia Luebbers & Patricia Walker	Sara Baer
105. John Marchetta	Kuloth V. Shajesh
106. Jacob Marler	Dale B. Hales
107. Timothy Marshall	Lizette Chevalier
108. Sean Martin	Garth Crosby
109. Alyssa Martinez	Deborah Bruns
110. Claudia Martinez	Stacey Sloboda
111. Lea Matschke	David Gibson
112. Jacquelyn McCune	Chad Briggs

[cont.]

Student participants	Mentors
113. Siedah McNeil	Christina Campbell
114. Siedah McNeil	Elisabeth Reichert
115. Shannon McQueen	Alessandro Catenazzi
116. Jonathan Meats	Clayton Nielsen
117. David Mersman	Matthew Schlesinger
118. Matthew Meyer	John Legier
119. Elijah Mihalik	Qingfeng Ge
120. Alyssa Miller	Vjollca Konjufca
121. Shelby Moore	Mary Kinsel & Gary Kinsel
122. Leslie Murray	Robert Hahn
123. Aaron Neal & Robert Konzelmann	Chad Schwartz
124. Darmez Nelson	Chad Drake
125. Amanda Novak	Zhengui Zheng
126. Saheed Obitayo	Harvey Henson
127. Olivia O'Donnell	Valerie Boyer
128. Jordan O'Malley	Nathan Bonner
129. Konstandinos Papazoglou	Stephanie Clancy Dollinger & Benjamin Rodriguez
130. Gene Park	Dona Bachman
131. Jaclyn Parks	Vjollca Konjufca
132. Kaitlyn Pasel	Mary Louise Cashel
133. Jacob Patsch	Harvey Henson
134. Brooke Patton	Scott Ishman
135. Madeleine Pfaff	Eric Schauber
136. Geovane Ferreira Piccinin	Andrey Soares
137. Daniel Pineau	Stephanie Clancy Dollinger
138. Tanner Rehnberg	Gary Kinsel
139. Julianna Richie	Saikat Talapatra
140. Carol Rivas	Matt Whiles
141. Caroline Robertson	David Sutton
142. Kayla Rodenberg	Carol Westerman-Jones
143. Travis Rogers	Sarah Kertz
144. Jocelyn Rothschild-Frey	Juliane Wallace
145. Leticia Russell	Matthew Schlesinger
146. Anthony Sabella	Andrew Wood
147. Francesca Sanchez	Vjollca Konjufca
148. Waheed Sawar	Leo Silbert
149. Kelly Schmidt	Buffy Ellsworth
150. Kevin Schrader	Dale B. Hales
151. Daniel Sears	Alessandro Catenazzi [cont.]

Student participants	Mentors
152. Hailey Sellek	Lydia Arbogast
153. Suddarsun Shivakumar	Kuloth V. Shajesh
154. Rachel Slick	Alejandro Caceres
155. Marcella Smith	Seung-Hee Lee
156. Samantha Sparks	Erin Venable
157. Ryan Spencer	Tsuchin Chu
158. Victoria Steinberg	Pamela Smoot
159. Kira Stork	Vicki Lang-Mendenhall
160. Kira Stork & Mackenzie Housman	Maria Franca
161. Ruth Suddarth	Harvey Henson
162. Byron Suits	Paul Edwards
163. Anna Sullivan	Rachel Cook
164. Oneal Summers & Rebekah Durig	Gregory Budzban
165. Brent Sunderlage	Karen Jones
166. Jamie Sykes	Jeremiah Scott
167. Melissa Ttanaka	Jared Porter
168. Alex Taylor	George Brozak
169. Courtney Taylor	Phillip Anton
170. Ramona Tucci	Jyotsna Kapur
171. Ivan Vargas	Kevin Sylwester
172. Stephanie Venis	Tsuchin Chu
173. William Vignovich & Gavin Stonehouse	Nancy Garwood & Kurt Neubig
174. Kent Wagenschutz	Susannah Munson
175. Mason Wagner, Oscar Ortega, Sterling Jackson, Shaun Wolfe, & Wendy Sagesse	Kathleen Pericak-Spector
176. Charles Walker	Stephanie Clancy Dollinger
177. Jacob Walker	Jun Qin
178. Kevin Walsh & April Haskett	Shannon Wilson
179. Cody Ward	Dale B. Hales
180. Ashlee Weaver	Karla Fehr
181. Austin Weigle	Kevin Smith
182. Tyler Wells	Michael Eichholz
183. Morgan Wendling	Rebecca Atkinson
184. Hannah West	Gary Apgar
185. Kyle Whittington	Buffy Ellsworth
186. Kayla Wiedau	Karen Jones
187. Alexandra Willis	Lisabeth DiLalla

[cont.]

Student participants	Mentors
188. Ashton Wilson	Erin Venable
189. Lyneesya Wilson	Reza Habib
190. Shaun Wolfe	Kevin Sylwester
191. Allison Wright	Prema Narayan
192. Bradley Wurl	Yanna Liang
193. William Yarnell	Juliane Wallace
194. Gregory Zimay	Boyd Goodson
195. Stephania Zneimer	Liliana Lefticariu

Shant B. Alexanian and Tsuchin Chu, Ph.D.

Department of Mechanical Engineering and Energy Processes

NDE of Weak Bonds in Adhesively Bonded Joints

The focus of this research is to examine the use of through-transmission ultrasonic (TTU) Acoustography NDE to detect and quantify the bondline defects in adhesively bonded carbon fiber reinforced plastics-Aluminum (CFRP-Al) lap joints. The bondline defects in the CFRP-Al lap joints were simulated by introducing a xylene based degreaser on the bonding surface of the 2024-T3 Aluminum by percentage surface area. The percentage surface area ranged from 25% to 75%. The TTU Acoustography method, operating at 5 MHz, was able to detect the surface contaminant in the bondline. The correlation of lap shear test data with Acoustography ultrasonic attenuation was also carried out for the quantitative evaluation of bond shear strength in composite joints.

B. Ra-El Ali

School of Art and Design, Painting and Drawing

UnI-Verse-City Mural

"UnI-Verse-City, Where U and I will always stay versatile fighting for what is right and true in this city we call SIU." "UnI-Verse-City Mural" is a project that will provide a visual representation of what it means to be a leader. The murals purpose is to inspire leadership within my peers as well as Unity between them. The research base for the project is through via survey. I have surveyed the diverse student body to discover their opinions on leadership. What is a leader? Who are our leaders currently? How do you become a leader? From My responses I have produced three artworks that will reflect and convey the student bodies ideas through the figure in motion and symbolism. The Artworks are crafted from a mix of media ranging from Charcoal, watercolor, acrylic and chalk, pastel…The artworks will be donated to the school so that idea of leadership and unity will always stay present on the campus of SIUC.

Josh Alstat, Carrie Crawford, and
Prabir Kolay, Ph.D., P.E., M.ASCE

Department of Civil and Environmental Engineering

The implementation of recycled aggregates in everyday construction practices

Concrete is one of the oldest and most widely used materials for construction due to the number of benefits that it possesses. The Worldwide consumption of concrete aggregates is approximately 11.5 billion tons per year for the construction of any infrastructures (Mehta and Monteiro, 2013). It has been predicted that more than 2.5 billion tons per year of coarse aggregates are expected to be consumed by the year 2020 for construction purposes (USGS, 2009). The raw material (i.e., coarse aggregate) used for concrete is becoming costly, depleting day by day, and its production uses a substantial amount of energy. Hence, the recycled aggregate (RA) provides the perfect solution for this growing problem. The use of RA can be cheaper than the natural or virgin aggregates (VA) that are commonly used now. It can replace the VA to some percentage on road pavement or partial replacement in concrete, which can reduce the depletion of VA resources. RA implementation would also help in reducing landfill costs. The energy consumed while preparing the RA is significantly less compared to energy consumption during VA preparation. Therefore, using these recycled aggregates presents a sustainable solution to the environmental impact at hand. However, the main drawback for bulk utilization of RA is its characterization and proper quality control. The physical and chemical characteristics of the RA differ from natural aggregate. Hence, the current research focuses on characterization and utilization of the recycled aggregates from old concrete structures or pavement, which would have been landfilled, to form new concrete for construction purposes or using them as base or sub-base material in road pavement.

Marissa Amposta

School of Art and Design

The connection between community and art

While many Americans know about art education as a school experience, the chance to pursue artistic opportunities in communities is not as widely known. The goal of this research was to explore what the possible venues could be for establishing greater outreach between the SIU Art Education program and the surrounding southern Illinois area. Over the past ten years, the Art Education Program has worked with the community and students, who are in preparation of becoming teachers, have assisted at Carbondale Boys and Girls Club, Brehm Preparatory, Touch of Nature, and many more. There are many additional venues that have called and requested assistance to shape an art program, however, there has never been an on-going catalog to effectively document the needs of the wide variety of potential community groups.

This research identifies who the community groups are, what their needs are in terms of an art program, and what kind of collaboration they would be willing to begin in partnership with SIU's Art Education Program. To accomplish this research, an interview questionnaire was developed by the author and the SIU Art Education Program Coordinator. Each survey was completed with an on-site interview by the author in order to obtain the most information possible regarding the setting, the specific people who would be involved, and the potential resources available.

Meeting with different members of the community, art associated or not, there is a similar need/want and assumption of art that is leaning towards "arts & crafts." Training students to specifically develop community arts can help guide more of an art-orientated program versus the currently established "art & craft" programs. There is a gap of communication between the town and SIU and with the findings, a coordinator to help be that voice could strengthen the connection between the community, art and SIU.

Drake Anthony, Kaili Ranta, Brogan Gust, Brian Heine, and Boyd Goodson, Ph.D.

Department of Chemistry and Biochemistry

Can energy-pooling be exploited to create a Rb diode-pumped alkali metal vapor laser with violet-light output at 421 nm?

Diode-pumped alkali vapor lasers (DPALs) are of interest because of unique optical properties, including narrow spectral dispersion, high quantum efficiencies, and unusually long coherence lengths. Usually such lasers operate in the near-infrared, particularly for Rb vapor, since the output wavelength is typically at the D1 or D2 transition (~795 or ~780 nm, respectively). Previous experiments studying the optimization of xenon polarization by means of alkali metal spin exchange optical pumping (SEOP) have shown that Rb vapor, particularly in the presence of Xe gas, will undergo strikingly bright violet emission of 421 nm light when pumped with a 30 W 795 nm laser diode array (Goodson, 2006); this light was assigned primarily to emission from the 6P excited state populated by a so-called energy-pooling mechanism wherein two Rb atoms excited into the 5P state by the laser non-radiatively "share" their energy during near-collisions to yield a ground-state Rb atom and a "doubly-excited" Rb atom in the 6P state that can emit at 421 nm. The goal of this experiment is to set up a lasing cavity around the optical pumping cell of the Rb vapor, with the goal of achieving continuous wave operation of high powered 421 nm laser light. This cell is to be pumped with a circularly polarized 40 W laser diode array with a narrow emission band matching the Rb D1 absorption band of 794.76 nm. Lasing is to be achieved via dichroic mirrors that allow the input of 794.76 nm pumping light into the cell, while resonating the emitted 421 nm light. The significance of this study is that if successful, it will provide a useful method of generating high powered laser light in a wavelength of light not commonly available from InGaN semiconductor laser diodes. This experiment is currently in progress, with results pending.

Lauren Austin[1], Rosemary Bolin[1], and Mark Wagner, Ph.D.[2]

[1]Department of Anthropology and [2]The Center for Archaeological Investigations

Crawford Farm: Cultural continuity and variation among the Sauk of Illinois during the Colonial Period

In the years leading up to the War of 1812 the Native American peoples of Illinois were split into two factions: the pragmatists and the nativists. Pragmatists adopted American culture and ideology in varying degrees as a way of ensured survival while nativists believed that Native people needed to return to a way of life, which existed before encounters with Europeans. Nativist prophets interpreted the problems faced by Native Americans to be a result of a loss of spiritual power caused by European materials and interactions. The focus of this project is to explore the possible ways European colonial trade influenced the culture of the Sauk people through the analysis of an artifact assemblage collected from a historic Sauk site near Rock Island, Illinois, known as Crawford Farm. Crawford Farm is believed to have been the site of "Saukenauk," a major 1790-1820 Sauk Indian village. This artifact collection, which was recently donated to the Illinois State Museum, was collected by a private individual in the 1950s. In analyzing the types of material culture that was important to the Sauk, we can also see what was *not* important to them. The absence of these Euro-American items suggest that the Sauk continued to maintain a cultural identity that was distinctly separate from Euro-American lifeways, viewing them as a means to acculturation in which they were resistant to. However, items such as copper kettles, introduced by Europeans, were still used by the Sauk. We can see that certain items, although of European origin, had become a part of Sauk material culture and was congruent with nativist thought at the time. This artifact assemblage demonstrates the element of choice and native identity among the Sauk, and the fluidity of cultural expression during a time of upheaval and colonial expansion.

Michael Bailey

University Museum, Museum Studies

Explorations of curating and exhibit design at the University Museum

Designing an exhibit for a museum collection takes a lot of thought as well as physical labor. An art in itself, the design should ideally be suited to the works being displayed, but not steal all of the attention. The first focus is the objects. Do they present a theme? Are they 3D objects that can fill up the room quick, or 2D wall hangings that need enough distance between each other? Any room can be packed full of art and artifacts, but the point is to leave a comfortable amount of space for patrons to walk through and view works on display. So having a plan is key. Know the objects, the space, how each work should be displayed, and then make it happen. Materials such as spackle and paint may be needed to touch up or change wall and/or pedestal colors. Sometimes wall and/or displays need to be built from scratch or reused from past shows which could require any number of tools in the museum workshop. When the room starts coming to fruition, it still needs its objects to be placed in their designated display areas. Care and consideration must be taken with each object individually, resting objects directly on painted surfaces can be contaminate in multiple ways. So objects can be places on mylar sheet cut outs or plexi-glass. Fabrics cannot touch paint or other dirty fabrics so they are hung away from the wall or mounted on plastic or clean felt surfaces. Some objects require further protection so glass or plexi cases are places over them to ensure safety. After labeling and cleaning the cases and floors the exhibit can be opened and it is on to the next.

Lateesha Baquet and Kathy Chwalisz, Ph.D.

Department of Psychology

Factors that influence minority students' decision to attend college

This study explored factors such as personal experiences, community, educational backgrounds, and family that influence African-American students' decision to attend college. According to Blum (2005) and Klem & Connell (2004), a child's intellect is a predictor of academic success and should be reflected on by educators when seeking to improve academic achievement in students. However, beyond intellect, there are numerous factors that contribute to academic achievement and greater achievement in career and life. African- American students, currently enrolled in college, were asked to complete a survey in which they rated how much personal, educational background, community and family factors led to their enrolling in college. The factors were also considered for first- generation students and some small differences were found compared to students from families with higher education experience.

Annamarie Beckmeyer and Dale B. Hales, Ph.D.

Department of Physiology, School of Medicine

Investigation of a flax diet intervention in ovarian cancer incidences in chickens using COMET analysis of oxidative damage

The COMET assay (single-cell electrophoresis) is used to measure DNA damage in eukaryotic cells. Cells are fixed onto an agarose coated slide impregnated with ethidium bromide, a dye that binds to DNA, and subjected to electrophoresis. When observed under a fluorescent microscope, DNA damage appears as a comet tail or halo coming from the cell. This experiment, using human ovarian cancer cells from the HEY line, was conducted to examine the usefulness of determining DNA damage in chickens as a way to detect ovarian cancer. Chickens with high levels of oxidative damage to the DNA of their blood cells are more susceptible to cancer. By employing this method, the effects of dietary intervention in ovarian cancer can be measured. It will check to see if chickens have systemic oxidative stress as a result of their diets. Future studies may investigate the effect of a flax diet, which is high in omega-3 fatty acids, on reducing the inflammation and oxidative stress that may lead to ovarian cancer. This research may later be applied to humans as a method to detect ovarian cancer.

Samuel Berger and Eric Chitambar, Ph.D.

Department of Physics

Bell inequalities with relaxed measurement independence

A tenant of classical physics is a principle known as locality. This says that within a small time frame, a physical system can only be affected by what is near it. The well-known Bell-CHSH Inequality often allows one to test whether a certain theory is local based on the measurement statistics described by that theory. Quantum mechanics, for instance, violates the Bell-CHSH Inequality, and it is therefore often concluded that quantum mechanics does not satisfy the principle of locality. However, there is an extra assumption employed in the derivation of the Bell-CHSH Inequality known as measurement independence. Under measurement independence it is always possible to perform uncorrelated measurements on two spatially separate systems.

Tyler P. Berndt, Kelley A. Fritz, Matt R. Whiles, Ph.D., and Jesse T. Trushenski, Ph.D.

Department of Zoology

Fatty acid export from temporary wetlands via amphibian metamorph emergence

Certain essential fatty acids, such as long-chain polyunsaturated fatty acids (LC-PUFA), are required by animals for optimal health. LC-PUFA include, docosahexaenoic acid (DHA, 22:6n-3), eicosapentaenoic acid (EPA, 20:5n-3), and arachidonic acid (ARA, 20:4n-6). Many animals can synthesize these LC-PUFA from their biochemical precursors, however this is an energetically expensive process, making dietary sources of these LC-PUFA quite valuable. Terrestrial plants cannot synthesize these LC-PUFA but many algae can, and do, in large quantities. In aquatic habitats the LC-PUFA synthesized by algae can be transferred to, and accumulate in, higher trophic levels. Organisms with complex life cycles, in which they are aquatic as larvae and terrestrial as adults, such as amphibians, may serve as vectors for LC-PUFA transport across aquatic-terrestrial boundaries. Few studies have examined this potential pathway for LC-PUFA transport. We collected emerging metamorphs of one predaceous species, *Ambystoma maculatum,* and one omnivorous species complex, *Pseudacris feriarum/triseriata,* from temporary ponds in Southern Illinois. We then analyzed and compared LC-PUFA content and estimated LC-PUFA export into the surrounding forest. This is the first study to examine amphibian emergence as a pathway for LC-PUFA export across aquatic-terrestrial boundaries.

Melanie Bilbrey

Department of History

Transgender identity and media in historical perspective

Despite recent advances in the public sphere, the transgender community remains vulnerable and underrepresented in daily life. While the media has been fascinated with transgender stories since the 1950s, these stories have been skewed in ways that undermine what it truly means to be a transgender person living in the contemporary United States. The disconnect between dominant media narratives and the daily lives of transgendered people is harmful, because it shields the mainstream from the harsh realities of every day life for these individuals and allows violence, discrimination, and transphobia to continue. This study analyzes the growing visibility of the transgender movement, the way the movement is portrayed in the media, and how the gap between media narratives and lived experience affects the transgender community. This research will open discussion about the discrimination confronting the trans community in both the public and private spheres.

Rosemary Bolin[1] and Heather Lapham, Ph.D.[2]

[1]Department of Anthropology and [2]Center for Archaeological Investigations

A preliminary stable isotope analysis of dog remains from burial and midden contexts in Woodland components at the Black Earth site

Dogs play a variety of roles in everyday human life today, as they did in the ancient past. The archaeological record provides ample evidence of the importance of dogs to humans around the world for many, many thousands of years. The aim of this preliminary study is to better define the relationship between humans and dogs at a prehistoric Woodland-period archaeological site, known as the Black Earth site (11SA87), where the skeletal remains of domestic dogs (*Canis familiaris*) were found in both burial and midden contexts. In order to better understand why some dogs were being buried upon death, while the remains of other dogs ended up in midden or refuse-related contexts (i.e, possibly the remains of past meals of the human occupants of the site), a stable isotope dietary analysis will be conducted on dog remains found in these two different contexts. Samples from foxes, raccoons, and deer will also undergo isotopic analysis to serve as a wild carnivore and herbivore baseline for comparison to the canine samples. A skeletal analysis will be performed on two newly identified dog burials, while four previously studied dog burials will be used for comparison. This skeletal analysis will help to determine sex, age, and general bone condition, which will allow us to more fully understand the role of these dogs at the Black Earth site. It is hypothesized, based on the different context of the dog remains, that dogs from burials will have different stable isotope values than dogs from midden (i.e., refuse) contexts, because, as seen in other parts of the world, dogs intended for burial or ritual purposes were fed different diets than your "everyday" dog.

Benjamin Bollero

School of Music

Southern Illinois Junior Orchestra: Nurturing children to become more than musicians

In a world of ever changing ideals and lifestyles, music education has been a constant, especially for children and young people. Studies show that children who learn music are more likely to excel in multiple areas, academically and intellectually. Music stimulates the brain in ways few other activities can. It increases hand-eye control through the act of physically playing an instrument; it challenges the brain mathematically when interpreting rhythms and intervallic distances between notes on a page; it teaches different languages, as many musical pieces often have tempo and dynamic markings in foreign languages, not to mention many choral pieces being written in Italian, German, and French; it increases awareness of the science behind how sound is actually produced from the instrument they are playing; it gives a background of history when talking about composers and their influences for writing the music they did. Music is truly a "weapon of mass instruction".

At rehearsals for the Southern Illinois Junior Orchestra (SIJO), the goal is to nurture young children between grades 2 and 8, not only into better musicians who eventually will move on to play with the Southern Illinois Civic Orchestra (SICO), but into intellectually healthy individuals. SIJO gives child string players an outlet to think creatively and learn about the complexities of music in a fun, safe environment. Children learn the importance of maintaining physical health in regards to playing an instrument, the social behaviors needed to work with a large group, and the academic factors listed above. By the time the end-of-semester concerts come, they are more than likely stimulated and eager to come back and learn more.

Laura Botello

Department of Biochemistry and Molecular Biology

Determining the role of Gar1 protein in the H/ACA ribonucleoprotein complex of Haloferax volcanii

Pseudouridine is the most common posttranscriptional modification found in RNAs. This is brought about either by stand-alone protein enzymes called pseudouridine synthases or by ribonucleoprotein complexes. The ribonucleoprotein complexes consist of cbf5, the catalytic protein and three accessory proteins Gar1, Nop10 and L7Ae. Studies on crystal structure of this complex predict that Gar1 might be involved in the release of the product after modification thus playing a role in turnover. 23S rRNA in *Haloferax volcanii* has three pseudouridine modification at positions 1940, 1942, and 2605. We could not delete Gar1 gene from *Haloferax volcanii* genome. However, it could be deleted in a strain where Cbf5 gene has been deleted. We predicted that absence of Gar1 inhibits product release after modification resulting in non-viable cells. We found that the double deleted strain for Cbf5 and Gar1 cannot be transformed with plasmid borne copy of cbf5. However, the catalytic mutant of cbf5 can be transformed in this strain suggesting that if an active complex is formed, Gar1 is essential for product release. Now we would be checking whether this catalytic mutant protein is produced within the cells. We predict that double- deleted strain can be transformed with two plasmids, one containing Gar1 and the other containing Cbf5. We will check this.

Kevin S. Bradley, Sohaib Hameed, and Amber L. Pond, Ph.D.

Department of Anatomy, School of Medicine

The MERG1a K^+ channel modulates NFkB activity through its cytoplasmic N-terminal sequence

Skeletal muscle atrophy is defined as a loss of muscle strength and size that often occurs with injury, disease states and normal aging. The loss of protein that contributes to skeletal muscle atrophy results primarily from the activity of three proteolytic systems: calpains, cathepsins, and the ubiquitin proteasome pathway (UPP). We have shown that ERG1a, a K^+ channel partially responsible for cardiac action potential repolarization in humans and mice, contributes to skeletal muscle atrophy by up-regulating ubiquitin proteasome proteolysis (UPP). We have further shown that electroporation of a *Merg1a* expression plasmid (ectopic expression) into mouse gastrocnemius muscle decreases activity of the NFkB transcription factor family, proteins known to modulate genes related to atrophy. Because the *Merg1a* was ectopically expressed in non-atrophic muscle, we asked if *Merg1a* expression would also increase NFkB activity in a physiological atrophy model in which atrophic co-factors would be present. Thus, we ectopically co-expressed *Merg1a* and an NFkB luciferase reporter in denervated gastrocnemius muscles, which we show do not express Merg1a for up to 14 days after sciatic nerve transection. We discovered that, although denervation causes an increase in NFkB activity over time, *Merg1a* expression inhibits this increase. Surprisingly, we also found that expression of a dominant negative *Merg1a* (*DN-Merg1a*) plasmid also decreases NFkB activity in denervated muscle. The *DN-Merg1a* plasmid is a single residue pore mutant that does not conduct current. This latter finding strongly suggests that NFkB activity modulation by MERG1a does not require current conductance. Thus, another aspect of the channel must be responsible for NFkB modulation. The ERG1a protein does, indeed, have numerous signaling sites on its intracellular N-terminus.

Rachel Brady

School of Music

Music festivals: Community outreach furthering music education

Study after study has found that music education has a positive impact on a child's social and cognitive development. Despite this, schools are cutting funding to music programs nation-wide. The School of Music at Southern Illinois University Carbondale (SIUC) has multiple events on campus that promote music education. Working with area band directors and the Illinois Music Education Association (ILMEA), SIUC host multiple festivals from clinics to competitions to honor programs. Through these festivals, students are pushed above and beyond the standard band or chorus classroom and rekindle a love of music and a love of learning that can be brought back to their individual schools. This project shows how these festivals are put together, ran, and their impact on the community around us.

Cierra Branch-Harris and Amber Cox

Department of Psychology

The effects of divorce on college students' attitudes

Participants will be students taking an Introduction Psychology course at a large Midwestern University ages 18-25 years. Participants will be evaluated on their attitudes towards marriage based on their parents' marital status. The measures being used in this study are the Attitudes toward Marriage Scale (Kinnard & Gerrard, 1986), Attitudes towards Divorce Scale (Kinnard & Gerrard 1986), Children's Perception of Interparental Conflict Scale (Seid & Fincham 1992), Couples Satisfaction Index (Funk & Rogge 2007), Commitment Scale (Rusbult, Kusashiro, Kubabcka & Finkel 2009), and Adult Romantic Attachment Questionnaire (Frayler, Waller & Brenan 2000). We hypothesize that parental divorce will have a negative effect on young adults' attitudes towards marriage, parents who remain married will have positive effects on young adults' attitudes towards marriage, parents who have high levels of conflict produce negative attitudes among young adults and parents who have low levels of conflict will exhibit positive attitudes. We also hypothesize that women will have more favorable attitudes towards marriage but more favorable attitudes toward divorce then men and that divorce will have a negative effect on adult romantic attachment.

Gabriela Brito and Liliana Lefticariu, Ph.D.

Department of Geology

Stable isotope composition of water in Southern Illinois and Missouri

The hydrologic cycle is the continuous movement of water among different reservoirs of the hydrosphere, atmosphere, and lithosphere. On Earth, water is in constant motion starting with evaporation from the ocean, transportation through the atmosphere, condensation during rain events, and precipitation into the, lakes, rivers and streams. Water is also a major constituent of the biosphere and plays an important role in all physiological processes. The movement of water among different reservoirs can be traced by using the stable isotopic composition of water. Both oxygen and hydrogen are part of the water molecule and thus the hydrogen and oxygen isotopes can be used to fingerprint water movement both in geological and biological systems. Variations in the isotope composition of precipitation can be used to figure out paleo-climate and paleo-hydrologic information, since isotopic compositions of sea water, ice, atmospheric water vapor, and meteoric water are distinct. To better understand the hydrological cycle in Southern Illinois, data will be presented on hydrogen and oxygen isotope values of river water from Southern Illinois and Missouri. These isotopic values will be correlated with isotopic values of precipitation. Temporal trends in isotopic composition of river waters can help us better understand the effects of climate change on local hydrological processes.

Sidney Brothers

Rehabilitation Institute, Communication Disorders and Sciences

Dynamic assessment with English Language Learners

Currently, the clinical assessment of English Language Learners (ELL) is often a challenge for speech language pathologists (SLPs). Providing an efficient and accurate assessment of ELL individuals' language needs is often a daunting task due to the current methods and tools that are available for use in formal language assessment and the complexity of second-language acquisition. Dynamic assessment techniques offer the opportunity to assess how children learn language as opposed to what language the child already knows. An example of a dynamic assessment tool is the invented rule procedure which targets the ability to process novel, nonsense, language rules. This investigation will utilize the invented rule learning procedure with a modeling protocol to compare performance on the invented rule task between children who are ELL and children who are monolingual. Task performance was also compared with individual participant's scores on the Peabody Picture Vocabulary Test-4 (PPVT-4)and the Comprehensive Test of Phonological Processes-2 (CTOPP-2).This project's objectives were to discover whether or not history of exposure to multiple languages impacts a child's ability to pass the invented rule, the age at which administration this assessment is most appropriate, and whether performance on an invented rule task correlates to performance on the PPVT-4 and CTOPP-2.The results from the 2014-2015 academic year will be compared with results from invented rule procedures that have been collected over the past 3 years. We predict that these findings will indicate if the assessments are assessing different areas of language, as well as what age is administration for this assessment appropriate. These findings can potentially help determine whether flaws in language use or production are a consequence of a language difference or language disorder.

Curtis Brown and Regina Trevino, Ph.D.

Department of Business Economics

Non-traditional students: An analysis of the challenges of graduating from college

Student loan debt is a serious problem in the United States for both community colleges and private and public 4-year institutions. This intrigued me enough to explore how non-traditional students, more specifically single parents, are affected. In this study, I investigated if non-traditional students were more likely than traditional students to allocate student loan funds on expenses not related to school. In addition I analyzed if non-traditional students have a lower graduation rate than traditional students. I used data from 30 universities from the year 2010. The regression analysis indicates that non-traditional students have larger student debt loans and a statistically significant lower probability of graduation. My goal in this research project is to advocate for the government to create more specific policies to assist non-traditional students.

Megan Brown, Kaitlyn Holtsclaw, and Michael Soltis

Department of Zoology

Resolving nutrient issues in Campus Lake

Campus Lake increasingly experiences toxic algal blooms due to excessive inputs of nitrate and phosphate nutrients (eutrophication). Our experimental objectives are to compare how well different water treatment methods remove nitrate from the lake water or bind phosphate to make it biologically unavailable for use by the algal species living in the lake. We will test the efficacy of bacterial breakdown of nitrates, which are released into the atmosphere in the form of nitrogen gas. To keep algae from using phosphate we will test two treatment methods: binding with iron and binding with aluminum sulfate. We predict that aluminum sulfate will bind approximately ten times more phosphate per unit mass, than iron. Based on our experimental findings, we will present the most cost-effective treatments for resolving nutrient issues in Campus Lake. Resolving nutrient issues can benefit not only students at Southern Illinois University, but also assist the world at large, for these methods can be applied to other aquatic systems suffering from eutrophication and algal blooms caused by human activity.

Steven Burris[1], Alan Hogan[2], Kimia Memar[3], Gilbert Ofori[1], Samuel Oltman[2], Kelby Rogers[2], and Kathleen Pericak-Spector, Ph.D.[4]

[1]Department of Civil and Environmental Engineering, [2]Department of Mechanical Engineering and Energy Processes, [3]Department of Electrical and Computer Engineering, and [4]Department of Mathematics

Supplemental instruction and it's impact in the classroom

This abstract outlines the objectives, approaches and results of the Supplemental Education Research Project funded by the Center for Undergraduate Research at SIU. This project involves six students who take different approaches to create the environment for a more practical and productive math education in the university. The general observation about the math classes is that students have constantly been in need for more help to comprehend the material deeply in order to make long term use of what they learn. Each of the six students are organized into assisting teachers in certain classes and explaining the concept to the students, eliminate confusion by solving multiple examples and doing one on one tutoring for particular students recommended by the faculty advisor of this project. In order to evaluate the results of this project statistical data has been taken into account. Also a survey has been developed and responses have been gathered by different groups of students. The results of the survey are currently being analyzed to be presented in the poster, next to observations recorded by each of the six TAs during the past year. But according to the statistical data, supplemental instruction courses improved the students' grades and lowered the drop-out rate. From the data collected between supplemental and non-supplemental courses, there was an 8% increase of students receiving an A when they received extra education. Also, it was shown that almost 20% of students in non-supplemental had dropped out of the class compared to a 12% drop-out rate in the supplemental courses. There are various ways to improve the supplemental instruction which include increasing the number of UGAs, imploring teachers to assign worksheets for supervision and assistance, increase the work hours of the UGAs, and exposure to UGAs at all levels in order to develop the necessary educational discipline required in math classes.

Eduardo Caminha

Department of Psychology

Examining the effects of multimodal feedback on skill acquisition

Research in the area of motor learning has demonstrated that providing frequent visual feedback does not typically aid in motor skill acquisition. These findings are partially explained by the guidance hypothesis, which posits that learners come to rely on visual feedback to guide their movements. However, recent findings suggest that providing feedback via different or multiple sensory modalities can circumvent the guidance effect. As such, the current experiment seeks to examine the effects of feedback modality on learning of a simple motor skill. Participants were asked to complete a computer-based steering task, which consists of navigating a cursor through a narrow, non-linear pathway, using their non-dominant hand. During practice, participants received visual, auditory, or audiovisual feedback indicating cursor position relative to the path. After a 24-hour delay, participants completed a retention test, in which feedback was removed and participants navigated the path to the best of their ability. Performance on the retention test was compared across the three feedback conditions to assess motor learning. We hypothesized that participants receiving auditory or multimodal feedback would score higher on measures of learning than would participants in the visual feedback condition.

Shaylin Carlton, Rebekah Durig, Chloe Helser, Sarah Jilek, and Allison Joseph

Department of English

Editing and publishing SIU's premier undergraduate literary and arts magazine, Grassroots

Grassroots Undergraduate Literary and Arts Magazine is an undertaking spanning more than 20 years, focused primarily on promoting the arts amongst Southern Illinois University undergraduate populations. The publication features works including photography, fine art, comics, poetry, screenplays, short fiction, and other artistic media from the diverse student body on SIU's campus. Throughout the 2014/2015 academic year, the four undergraduate editors have researched and developed event planning, magazine editing, and book publishing methods to release the annual edition of Grassroots, promote the work, and host nationally-acclaimed authors at the annual Devil's Kitchen literary festival. The editors also host and judge a literary contest, receiving and reviewing hundreds of professionally published fiction, nonfiction, and poetry books each year and choosing three winners to attend the festival.

This poster will demonstrate the process implemented by the four undergraduate editors to publish the magazine and host related events. Examples include navigating Adobe InDesign, working with a professional publishing company, designing layouts, advertising, professional networking, copyediting, and event planning.

Krystal Chung

Department of Chemistry and Biochemistry

Determining the structure of JEV core protein

In Dr. Du's lab, where I've been working in, there has been a lot of research on a human protein called Caprin1 (cytoplasmic activation/ proliferation-associated protein-1). Caprin1 plays a role in many different biological processes such as cell proliferation, antiviral immune response, maintenance of healthy nerve cells, and cellular response to environmental stress. By using a technique called X-ray crystallography, the lab determined a structure (i.e. the 3-dimensional shape) of a portion of Caprin1. Insights from the structure suggest that this portion of Caprin1 may interact with the core protein of Japanese Encephalitis Virus (JEV). JEV is a mosquito-borne human pathogen that may cause fatal infection. Because Caprin1 mediates antiviral stress response against JEV infection, JEV uses its core protein to interact with Caprin1 as a counter measure. My job has been to determine the structure of the JEV core protein, so as to eventually determine to the nature of the interaction between Caprin1 and JEV. I recently obtained a pure protein sample of the JEV core protein. With this progress, I expected that my research will lead to the identification of the Caprin1 region responsible for binding the JEV core protein and molecular details of the interaction. Combined with results made by other Du lab members, my study will contribute to achieving a better knowledge about Caprin1 functions.

Tanisha Clark

School of Art and Design, Communication Design

Graphic design: The new essential for libraries

The use of graphic design can be seen everywhere. The combination of text and image arranged in a way that draws a viewer or audience in has been used for years and even more today. We as people are constantly impacted with some use of graphic design even when we are unaware. Graphic design is implemented in billboards, commercials, schools, ads, magazines, websites, posters, malls, grocery stores, packaging, and other businesses or matters that require marketing or promotion. By this, the importance of visually and effectively communicating to an audience is clearly seen. Without this communication, it would be difficult for the intended audience to understand an intended message.

Libraries are no different from the stated examples above. They too have a specific message to get to a specific audience that needs to be done in a visually, effective way. Many overlook libraries and do not understand the use of graphic design as necessary or important. Most don't see the need for an in-house graphics department in a library setting.

For my research poster, the objective was to explore why the use of graphic design is essential for libraries. I explain and give reasons why libraries are in need of graphic design, why an in-house graphics department would be beneficial to a library, and the types of graphics that can be used in such an atmosphere.

For the conclusion, I explain what I, as an Undergraduate Assistant and an aspiring graphic designer, help with as far as design at SIU Morris Library. A majority of the results concluded in my research are based on my work experience there. During my time working, I myself have become greatly aware of why graphic design is essential in not only this library, but also essential and beneficial to *all* libraries or library settings.

Brooke Cleary, Aimee LePla, and Seung-Hee Lee, Ph.D.

School of Architecture, Fashion Design and Merchandising

College students' perception towards fashion sustainability

There are a vast amount of ethical issues when it comes to fashion sustainability; water being contaminated from dyes, unfair labor sourcing overseas, and a decrease of garment prices are all major components that contribute to this issue. The purpose of this study is to examine college student's perception on sustainable fashion and compile their ideas on how to help this issue.

We have surveyed 67 college students at Southern Illinois University to acquire more research data. As a result of doing this survey we found that 62.7% of students are concerned about social, environmental, and ethical issues in the fashion industry. Human rights were the most important concern, followed by cheap labor, and toxic dyes, while global warming was the least important of the issues. Our data analysis shows that when purchasing clothing price and quality appear to be vital factors in a consumer's decision. Surprisingly, color is the last thing consumer's worry about. Over 38% of students responded that they have purchased organic clothing, meanwhile the rest were unsure where to even buy it. H&M and Levi's companies are considered as the most popular brands that carry ethical fashion ranges. The survey found that 68.7% of students are discouraged from buying more sustainable clothing because of the high price tag that usually comes with it. Our results also indicate that 73.1% of the students would rather buy the ethical option of clothing if it had the same appearance and price as conventionally produced clothing. Ultimately, our research reveals that 65.7% of students believe fashion sustainability is important in our society and are interested in ways to solve this ethical issue. In conclusion, most students are familiar with the idea of sustainability, however few members in our society are actually aware that fashion plays a major role in making our environment more sustainable.

Based on these results, this study can help inform a greater amount of college student's on the issue of fashion sustainability. This research also will help provide consumers to guide on how to shop more ethically for a brighter, more sustainable, future, and marketers to promote their sustainability business strategies.

Tonya Clements and Scott Ishman, Ph.D.

Department of Geology

Using foraminifera to reconstruct Holocene oceanographic conditions: Western Antartica Peninsula margin

Foraminifera are single celled, shelled organisms that are used as proxies for changing oceanographic conditions. This project studied benthic (bottom-dwelling) and planktonic (floating) foraminifera collected from the western margin of the Antarctic Peninsula (WAP) to reconstruct Holocene (~12,000 yrs) paleoceanographic conditions (changes in ocean salinity and temperature). Neogloboquadrina pachyderma (planktonic) and Bulimina aculeata (benthic) are used to indicate primary productivity and the presence of warm Upper Circumpolar Deep Water (UCDW), respectively. Sediment core, LMG13-11 JGC-4, collected from the Hugo Island Trough, was 604 cm in length. An uncorrected Carbon 14 age of 11,200 years from 304 cm core depth suggests the entire Holocene is represented. From the base of the core to ~330 cm (deglacial) N. pachyderma is absent or very rare with B. aculeata absent. This coincides with sediments dominated by muddy sands with pebbles indicating ice proximal conditions. At ~330 cm N. pachyderma appears in moderate abundances with diatoms (planktonic algae) appearing at ~300 cm indicating thinning of the ice shelf, coinciding with the beginning of the Middle Holocene. From 279 cm to 262 cm the sediments are dominated by diatom ooze containing high abundances of calcareous foraminifera that include N. pachyderma, suggesting open water with high primary productivity and shortened sea ice seasonality. This is followed by clastic dominated sedimentation to 152 cm. The first occurrence of B. aculeata occurs at 152 cm, coincident with an increase in diatom abundance and remains the dominant benthic foraminifera to the top of the core marking the establishment of UCDW on the WAP. This record is consistent with other records from the WAP.

Megan Colburn and Alessandro Catenazzi, Ph.D.

Department of Zoology

The effect of seasonality on the prevalence and intensity of Batrachochytrium dendrobatidis in Peruvian amphibians

Batrachochytrim dendrobatidis (Bd) is a major cause of amphibian population declines and mass extinctions in many parts of the world. In many species of amphibians, this fungus can cause a fatal disease called chytridiomycosis. The goal of this study is to understand how the environment might affect the prevalence and intensity of Bd. We hypothesized that patterns of Bd can be explained by using Bd's growth performance as a function of temperature. Bd grows best at temperatures from 15 degrees C to 25 degrees C when cultured and is killed at temperatures at or above 30 degrees C. Consequently, we predicted that there would be a higher prevalence and intensity of Bd during the dry season when temperatures are lower than during the wet season. We also predicted that Bd prevalence and intensity would be highest in areas of moderate to high elevation where ambient temperatures fell within the temperature range for optimal growth of Bd. To test the hypothesis, we studied seasonal and elevational variations in prevalence and intensity of infection. We analyzed three years of wet season data and three of dry season data. Frogs were sampled using a swabbing protocol, and the skin swabs were analyzed for the level of Bd infection using real-time PCR. We found that prevalence of Bd varied with elevation and was highest at elevations from 1000 to 2000 meters. Bd prevalence also varied seasonally and was higher in the dry season (~65%) than in the wet season (~15%). Analyzing how temperature and other environmental factors promote this disease will help predict when and where future epidemics may occur.

Nate Colley, Pamela Ubaldo, and Lichang Wang, Ph.D.

Department of Chemistry

Illinois coal for solar energy harvesting and conversion

Dye sensitized solar cells (DSSC) are a new generation of solar cells that can compete with traditional silicon based solar cells. Although DSSCs are currently not as efficient as crystalline solar cells, they are cheaper to construct. DSSCs are composed of a dye stained metal oxide layer and an electrolyte redox couple that are sandwiched between two conductive glass plates. The dye absorbs a photon of light and becomes oxidized. Then, it injects an electron into the conduction band of the metal oxide layer. The electron is passed through an external circuit to the other conductive glass plate. The electron is then transferred to the electrolyte redox couple, which reduces the dye back to its original state.

The goal of this project is to develop new dyes for use in DSSCs while maintaining a relatively low production cost. Coal was used because it is abundant and inexpensive compared to ruthenium dyes that are widely used in DSSCs. Coal dyes were prepared using a variety of organic solvents to partially dissolve solid coal. The liquid solutions were then separated from the remaining solid coal samples. UV-vis and FT-IR spectroscopy were used to characterize the absorbance spectra and functional groups of the dye. Ten DSSCs were constructed using each coal dye. The open circuit voltage and short circuit current was tested for each solar cell using a digital millimeter. These points, along with the max power point, were plotted to generate an IV-curve. This preliminary research has shown that chemically unaltered coal can be used to create functioning DSSCs. However, future studies will explore methods to functionalize coal in order to change its chemical properties and improve DSSC efficiency.

Gina Collori and Daryl Kroner, Ph.D.

School of Social Work and Department of Criminology and Criminal Justice

Early acting out or criminal friends? Examining the contributions to adult crime

This study investigated the ability of youth risk factors to predict adult criminality. Using a retrospective design with 126 male offenders, this study evaluated the effects of the early onset (before age 18) of criminal associates and antisocial behavior on adult crime in male offenders. Results of the statistical analyses showed that the early onset of antisocial behavior was more influential than the early onset of criminal associates in the prediction of adult crime. These findings suggest that the early onset of antisocial behavior in offenders is a significant predictor of adult crime. Juvenile delinquency prevention and intervention efforts should focus on addressing the onset of antisocial behaviors, as they have shown to be a direct contributor to adult criminality.

Katherine L. Cooper, Anke Lehnert, and Chad Drake, Ph.D.

Department of Psychology

Assessing the stability of social cognition: An ideographic IRAP study

Measures of implicit cognition commonly assess social attitudes using a nomothetic approach to stimulus selection. While this approach has generated many empirical fruits, it typically is done in respect to group differences, with little focus on using the measure to assess an individual's behavior over time. Furthermore, the reliability psychometrics of implicit measures often suggest that using them for individual assessment may not be advisable. Perhaps an ideographic approach to assessing implicit cognition may provide a more psychometrically sound measure. The current study involved three college students who engage the Implicit Relational Assessment Procedure (IRAP; Barnes-Holmes, et al., 2006) on three separate occasions over a 2-week period. For each occasion, the participant completed an IRAP, engaged in unrelated tasks for approximately 15 minutes, and completed the same IRAP again. The IRAP contained the name of a positively-regarded person and the name of a negatively-regarded person, each personally known by the participant. The results show a mix of reliable and unreliable relational repertoires over the duration of the study. Some patterns correspond to within- and between-session intervals. The data overall provide a basis for additional studies with this ideographic approach to IRAP stimulus configuration.

Allana Cronk, Julie Partridge, Ph.D., and Jared M. Porter, Ph.D.

Department of Kinesiology

Standing long jump performance is improved by adopting an external focus of attention

Numerous studies have demonstrated that using verbal instructions to direct a performer's attention externally (i.e., towards the effect of the movement) significantly enhances motor skill performance. Limited research has also demonstrated that increasing the distance of an external focus relative to the body magnifies the effect of an external focus of attention. The purpose of this study was to investigate the effect of increasing the distance of an external focus of attention on standing long jump performance. Using a counterbalanced within-participant design, recreationally trained male subjects (n=35) performed two standing long jumps following three different sets of verbal instructions, for a total of 6 jumps. Each jump was separated by 1 minute of seated rest. One set of instructions was designed to focus attention externally near the body (EXN); another set of instructions directed attention externally to a target farther from the body (EXF); the last set of instructions served as a control condition (CON) and did not encourage a specific focus of attention. Results indicated that the EXN and EXF conditions produced jump distances that were significantly greater than the CON condition. In addition, subjects in the EXF condition jumped significantly farther than the EXN condition. These findings suggest that increasing the distance of an external focus of attention, relative to the body, immediately improves standing long jump performance.

Chris Crow

Department of Forestry

Differential efficacy of alternative bicycle safety lighting type and position on overtaking vehicular passing distance and behaviors

Bicycling is a sustainable means of transportation and encourages healthy, resilient communities. Commuting and recreational riding participation have increased due to interest in reducing emissions, fitness, and traffic congestion. However, accidents can occur at high rates, the most dangerous of which happen at night. The risk of fatal accidents at night increases by 110.9% Worse, riders commonly overestimate their nighttime conspicuity (visibility). This project tested which safety light source for bicycles best increased the safe passing distance between commuter bicycles and overtaking motor vehicles on the road. The goal was to test different prototype and market-available bicycle light sources gathered from industry partners. We collected data using combined, custom-built LiDAR (laser) and ultrasonic range-finding sensors paired with a data logger that was side-mounted to a bicycle. The presence of rear-facing bicycle lights versus the legal standard reflector were tested in situ using a partial factorial experimental procedure intended to separate effects of the treatment from environmental conditions and facilities examined by other more observational safety studies. Data were collected on defined streets of low-speed limits through the SIUC campus and Carbondale city limits while using a randomized ride schedule and light selection. Collected data described the effectiveness of each kind of light used in practical nighttime road cycling conditions. Preliminary results indicate lateral distances between the bicycle and motor vehicle may increase when lights are present and that the bicyclist's most dangerous time may be when the motor vehicle first encounters the bicycle.

Derrick Davis and Brent Bany, Ph.D.

Department of Physiology, School of Medicine

The role of NR4A2 in decidualization of human endometrial stromal cells

The hypothesis of our work is that the transcription factor NR4A2 plays a key role in the process of human -6-+endometrial stromal cell differentiation into decidual cells (a process called decidualization) during implantation of the embryo. To evaluate the role of this gene we utilized an in vitro cell culture model of human endometrial stromal cell decidualization. Exposure of the cells to PGE2 (known to enhance in vitro decidualization) caused and induction of NR4A2 gene expression. Given that we could induce this expression with cAMP analogs, butaprost (EP2 agonist) or CAY10580 (EP4 agonist) suggested involvement of the EP2 and EP4 receptors in PGE2-induced NR4A2 expression. This was supported by a significant decrease in PGE2-induced NR4A2 expression using PF04418948 (EP2 antagonist) and L-161,982 (EP4 antagonist). Finally, since the effect of cAMP analogs could not be mimicked by EPAC activation suggests the effect of PGE2/cAMP on NR4A2 expression is not mediated the EPAC pathway. NR4A2 can act as a transcriptional activator, as a monomer, binding to NBRE DNA elements in the promoter regions of genes. After bioinformatics analysis we identified several genes whose expression is known to be upregulated during decidualization that contain NBRE elements in their promoters. Of these we verified binding of NR4A2 protein to the promoter regions of 3 genes (15 to 20-fold enrichment) by ChIP-PCR analysis. Finally, knocking down NR4A2 expression in the endometrial stromal cells using shRNA lentivirus dramatically decreased their ability to undergo PGE2-induced decidualization. In summary, NR4A2 expression is induced by PGE2 in human endometrial stromal cells and NR4A2 likely plays a key role in human endometrial stromal cell decidualization.

Timothy A. DeKoster and Jesse T. Trushenski, Ph.D.

Department of Zoology, Center for Fisheries, Aquaculture, and Aquatic Sciences

Composition and quality of farmed-raised versus wild caught channel catfish (Ictalurus punctatus)

Approximately half of the global supply of seafood comes from capture fisheries, but the rest is supplied by the aquaculture industry. Channel Catfish is the largest segment of U.S. aquaculture, but wild-caught catfish are still sold regionally. We assessed wild-caught and farm-raised Channel Catfish to determine whether these sources vary in terms of fillet composition or quality. Ten farm-raised fish were harvested from the SIUC pond research facility (617-1134 g) and ten wild-caught fish were collected from Kinkaid Lake and the SIUC pond research facility water storage reservoir (726-2895 g). Fish were slaughtered via ice water slurry, filleted, and samples were stored frozen for analysis of drip-loss, pH, proximate composition, and fatty acid profile. Farm-raised and wild-caught fish did not vary with respect to drip-loss, however, pH was lower among farmed fish (6.2 vs. 7.01 ± 0.17). Differences in proximate composition (moisture: wild-caught = 720 ± 22 g/kg, farm-raised = 614 ± 22 g/kg; lipid: wild-caught = 58 ± 23 g/kg, farm-raised = 172 ± 23 g/kg; protein: wild-caught = 886 ± 29, farm-raised = 722 ± 29; and ash: wild-caught = 55 ± 3 g/kg, farm-raised = 44 ± 3 g/kg) were largely the result of higher lipid levels in the fillets of farm-raised fish, indicating better condition in these individuals. Fatty acid profiles differed between wild-caught and farm-raised fish, with farm-raised fish containing lower levels of n-3 fatty acids (10 vs. 21 ± 2% fatty acid methyl esters [FAME]), long-chain polyunsaturated fatty acids (9.5 vs. 23 ± 3% FAME), and saturated fatty acids (24 vs. 28 ± 1% FAME), and higher levels of monounsaturated fatty acids (46 vs. 35 ± 3% FAME). Results to-date reveal that farm-raised Channel Catfish are somewhat different from their wild-caught equivalents, but that both sources provide high quality seafood for the American public.

Kesia Denney

Family and Community Medicine, School of Medicine

Empathy: Setting the stage for social interactions

This study sought to investigate the relationship between children's empathy and peer interactions. More specifically, this study examines peer problems in children as a predicting factor in lack of empathy in school aged twins. Prior research has shown that children who are more empathetic, compared to peers who were less empathetic, had greater social understanding (Finday, Girardi, & Coplan, 2006). This suggest that children who are empathetic are likely to have more positive peer interactions and thus fewer peer problems. However, less is known about whether early peer problems predict children's lack of empathy later. Thus, the aim of this study was to investigate peer problems in preschool children as predicting lack of empathy in the early school years.

The children in this study were tested as part of the Southern Illinois Twins/Triplets and Siblings Study (SITSS; DiLalla, 2002; DiLalla, Gheyara, & Bersted, 2013) at age 5. At this time, parents were asked to rate their children's externalizing and internalizing problem behaviors. One of the scales on this measure assesses peer problems, and this scale was used for the present study. During follow up studies, when children were between the ages of 6 and 10 years, children rated their own peer problems and parents rated children's empathy. Analyses will utilize correlations to assess whether peer problems, both at age 5 and at follow-up, relate to empathy in children when they are 6 to 10 years old.

One child from each twin or triplet pair was evaluated so that the statistical assumption of independence of the sample was not violated. It is important to understand the relationship between empathy and peer problems. This will improve intervention programs in school to help children learn important skills to increase more positive peer relations.

Andrew Derby and Michael Lydy, Ph.D.

Department of Zoology

The culturing of fathead minnows (Pimephales promelas) for research purposes

Viable aquatic species are required for administering various aquatic research experiments, such as toxicology tests. Fathead minnows (Pimephales promelas) are widely utilized for aquatic research, because they are abundant and relatively easy to culture. Culturing fathead minnows effectively, however, requires investigators to give close attention to the many biological and physical factors that impact the minnow. Biological factors include the incubation of embryos, the feeding of both larval and adult minnows, and prevention of disease within the culture environment. Physical factors that can affect the minnows include characteristics of the water supply, water temperature, photoperiod, and variety or type of construction materials (to create a conducive area for minnows to lay eggs). Understanding the important biological and physical factors for fathead minnow cultures is essential for creating a reliable and healthy minnow population that will allow for more accurate and successful aquatic research. This project identified the most efficient methods for culturing fathead minnows by examining and optimizing critical biological and physical factors effecting the minnows in the culture environment.

Nicole Dethrow, Emi Hayashi, and Amber L. Pond, Ph.D.

Department of Anatomy, School of Medicine

Establishment of a mouse model of denervation-induced skeletal muscle atrophy

Skeletal muscle atrophy, defined as a ≥5% loss in muscle mass and strength, affects many ill, injured and aging people. The most beneficial therapy for atrophy is exercise, but often the affected individuals are unable to participate in this activity. Pharmaceutical treatments currently used to treat skeletal muscle atrophy are not very effective. Thus, there is a real need for more useful therapies and this will require mechanistic research to identify novel pharmacological and dietary targets. Thus, we proposed exploring a denervation-based animal model for studies of mechanisms involved in the development of skeletal muscle atrophy, specifically, for study of the role of the MERG1a K^+ channel in skeletal muscle protein degradation. Working with mice, we have developed an IACUC approved protocol for sciatic nerve transection which produces complete paralysis of the lower leg and feet. Thus to verify that our model induces atrophy, we performed sciatic nerve transections and denervated the lower left legs of mice while performing a "sham" operation on the right legs of 60 8-week old ND4 Swiss male mice. We sacrificed five mice on days 0 through 7, 10, 14, 21 and 28 and harvested muscles of the lower legs. Indeed, gastrocnemius muscle weights of the left (denervated) legs began to decrease after 5 days of denervation and fell significantly by 59% after 28 days of denervation while the right control legs increased in weight by 22%. The muscle fiber cross sectional areas of the left legs decreased by nearly 30% 7 days post denervation. Indeed, our model induces significant atrophy in the gastrocnemius muscles of mice. We will use our model to explore muscle atrophy with the goal of identifying novel pharmacological targets for development of therapies to reduce the severity of muscle atrophy.

Austin Diericx and Yoginder Chugh, Ph.D.

Department of Mining and Mineral Resources Engineering

Coal mine dust control using agglomeration of fine particles

Mining process coal creates coal dust, which has very fine particles (many can be under 10 microns in diameter). It is well established that exposure to these fine dust particles (less than 10 micron size) over a long time can lead to lung-related health diseases (black lung or silicosis). The body's natural defenses can filter out particles larger than 10 microns and that lowers the health risks. Research is underway at SIUC to agglomerate dust particles less than 5 microns in size. In the agglomeration process small particles bond together to become larger and heavier particles that can drop out of the air to reduce dust concentration. This is done by applying a micro-emulsion liquid to the airborne dust during the mining process. This process also prevents the dust to become airborne at a later time so that mine workers will not be exposed airborne dust.

Over the last one year several experiments were run to create an efficient micro-emulsion for mining applications. The novel micro-emulsion being developed uses readily available ingredients from a super market that are environmentally benign and fit for human consumption. Initially, small size samples were prepared using solution samples of 250-1000 ml and coal dust samples ranging in weight from 1-5g. The oil droplets were emulsified in water and other chemicals to develop a stable emulsion. This process can take from 30 minutes to several hours. Once the stable emulsion was developed, wettability studies of coal dust were performed to quantify improvement in dust control effectiveness of fine particles. It was found that micro-emulsion technology can control fine size coal dust.

Europe Doan and Judy Davie, Ph. D

Department of Biochemistry and Molecular Biology

Investigating TCEAL7 as a tumor suppressor gene in Rhabdomyosarcoma cancer

Rhabdomyosarcoma (RMS) is the most common form of soft tissue cancer among children and young adults. There are approximately 350 cases in the USA every year. RMS is a highly malignant cancer that derives from skeletal muscle precursors that do not differentiate into normal muscle. The Myogenic Regulatory Factors (MRFs) are a family of transcription factors that are the main initiators for the terminal differentiation of skeletal muscle. It is thought that MRFs are blocked from completing this task in RMS by unknown mechanisms. It is plausible that the down regulation of the transcriptional regulatory protein TCEAL 7 may cause the inactivity of the MRFs or the oncogenesis of RMS.

TCEAL 7 is a candidate for a tumor suppressor gene in RMS. TCEAL 7 is down regulated in many cancer cell lines, including 95% of epithelial ovarian cancer cell lines. The purpose of my study was to determine if TCEAL 7 is down regulated in RMS cancer cells, and if so, determine what role TCEAL7 plays in RMS, including effects on cell proliferation. I have found that TCEAL7 is indeed significantly down regulated in RMS cells, suggesting that TCEAL7 may be a tumor suppressor in RMS.

Julie Driebergen and Alessandro Catenazzi, Ph.D.

Department of Zoology

Spatial dependency of frog chytrid fungus prevalence on tropical mountain streams

The fungal disease chytridiomycosis is decimating amphibian populations worldwide. Chytidiomycosis is caused by *Batrachochytrium dendrobatidis* (*Bd*). *Bd* infects hosts by releasing the infective stages, zoospores, into permanent water sources, such as streams. Without water, *Bd* is susceptible to desiccation, and without a vector, such as an animal or floating particle, the zoospores cannot travel far to infect other hosts. The goal of this study was to determine whether streams are important environmental reservoirs for *Bd* in a Peruvian cloud forest. We tested this hypothesis by investigating whether distance from stream explained variation in disease prevalence and intensity. In these steep forests, streams are the main permanent bodies of water (i.e., there are no ponds or lakes). We hypothesized that prevalence of *Bd* decreased with distance from stream, because the chances of a frog being infected should decrease with distance from the putative source of the zoospores We conducted nocturnal surveys and for each captured frog we measured distance from nearest stream and collected skin swabs. We quantified infection intensity of *Bd* by using real-time Polymerase Chain Reaction from DNA collected on the skin swabs. We analyzed patterns around three elevations (1250, 1750, 2350 m), because overall *Bd* prevalence varies with elevation. We found no relationship between *Bd* prevalence and distance from stream at elevations where *Bd* is most prevalent (1250, 1750 m). At the highest elevation (2350 m), *Bd* prevalence decreased with distance from stream. There appears to be little to no relationship between *Bd* infection intensity and distance from streams at all elevations. These results do not support the idea that streams are important environmental reservoirs for *Bd*; they contradict previous studies that assume that streams increase disease risk for tropical mountain amphibians.

Logan Druessel, Derrick Davis and Brent Bany, Ph.D.

Department of Physiology

RGS2 expression in human endometrial stromal cells undergoing differentiation into dicidual cells

Unpublished microarray analysis from our laboratory suggests that the regulator of G-protein signaling 2 (RGS2) gene expression is unregulated during human endometrial stromal cell decidualization. RGS2 belongs to the R4/B subfamily of RGS proteins and is believed to play a more specific role in regulating the Gq/11 and Gi alpha subunits of the heterotrimeric G-protein complexes of G-protein coupled membrane receptors (GCPRs) that activate phospholipase C (PLC) and inhibit cAMP production, respectively. Although one report suggested RGS2 may interact with Gs alpha, this is currently controversial and has not been accepted. This is important as the current understanding is that RGS2 inhibits GCPR signaling which results in less PLC activation and less inhibition of cAMP production by GCPRs. Decidualization of human endometrial stromal cells is cAMP-dependent and thus it makes sense that RGS2 may play a key role in inhibiting Gq/11 and Gi, but not Gs, alpha subunit-dependent GCPR signaling during this process. We verified that RGS2 mRNA levels dramatically increase in human endometrial stromal cells undergoing either PGE2- or 8Br-cAMP-induced decidualization. The protein was localized to the cytoplasm and nucleus by immunofluorescence. Finally, to determine a potential regulator of RGS2 expression during decidualization, we identified a NGFI-B Response Element in the RGS2 promoter to which NR4A2 protein binds as demonstrated by chromatin immunoprecipitation-PCR methods (20-fold enrichment). In conclusion, our findings suggest the NR4A orphan nuclear receptors might regulate RGS2 expression in human endometrial stromal cell decidualization and RGS2 may play a key role in regulating proper GCPR intracellular signaling during the process.

Baylen Earles

Department of Plant Biology

Comparison of indigo production capabilities of human and plant P450s

P450 enzymes have the capacity to oxidize a wide variety of chemicals. One example is the human P450 enzyme, CYP2A6, which is known to metabolize a broad range of substrates, including indole. When the CYP2A6 gene is transformed into *Escherichia coli* along with another human gene, hNPR, which encodes for a protein that helps facilitate P450-catalyzed reactions, indole is converted into the blue pigment indigo. Using this bacterial indigo production system, P450 genes from woad (an indigo-producing plant) were compared to CYP2A6 for indigo producing activity. Variants of the woad P450 gene ItB4 were tested for indigo production, with the hNPR sequence replaced by AtR2, an ortholog from *Arabidopsis thaliana.* Incubation time, temperature, substrate additives and other conditions were analyzed for optimal indigo production. Blue pigments were produced in *E.coli* transformed with ItB4/AtR2, although significantly less than that observed in the CYP2A6/hNPR-transformed bacteria. Currently, mutagenesis procedures are being applied to ItB4, and the products will be screened for increased indigo production.

Miller Eaton, Nikesh Maharjan, Hansika Sirikumara, and Thushari Jayasekera, Ph.D.

Department of Physics

Electronic band engineering of MoS2 by controlled chemical doping: An ab initio study

Two-dimensional materials have recently aroused great interest in the material sciences due to their unique electronic and optical properties. Molybdenum disulfide specifically, which consists of strongly bonded planes held weakly together by Van der Waals forces, has exhibited much potential for nano-scale device applications. Its electronic structure has shown to be layer dependent and can be tuned easily through the introduction of various chemical dopants. Based on ab initio Density Functional Theory (DFT) calculations, we explored ways to engineer electronic bands in monolayer and bilayer MoS2; in particular via substitutional chemical doping and gas adsorption. Our results suggest interesting p-type conductivity of Nb-doped MoS2, which promise the use of MoS2 in future electronic devices.

Brenda Escutia and Sosanya Jones, Ed.D.

School of Social Work

Transfer students: Perceptions of transition challenges

Transfer students who begin their college education at a two-year institution are faced with the process of transferring to a four-year institution in order to continue their education to obtain a baccalaureate degree. This qualitative study seeks to explore the challenges transfer students face during this process of transferring to a four-year institution from a community college. Data was collected through semi-structured interviews with transfer students at Southern Illinois University, to gather information on their unique experiences and obstacles. Findings indicate that students experienced some challenges in advising, social interactions, finance, academics, and faculty relationships. Identifying challenges is important in order to smooth the transition process, which in turn can retain transfer students who have already proved that they are capable of succeeding in college. I would like to study workaholic or deviance among college students. I would also like to explore challenges for minorities on college campuses.

Rachel Fishel, Genna Prather, and Kanako Hayashi, Ph.D.

Department of Physiology

Abnormal ovarian development in Amhr2 Cre/+ Pten F/F Ctnnb1 Ex3/+ Mice

Ovarian cancer, while rare, causes more deaths than any other gynecological cancer. Our lab is interested in using transgenic animal models to explore ovarian cancer development. In our laboratory, we study two genes related to tumor development *Pten* and *β-catenin* which help in tumor suppression. To examine the role of these genes in tumor development, we used a Cre-recombinase driven by the *Amhr2* gene. Thus, Amhr2 Cre has the ability to delete genes from reproductive tissues such as the uterus, oviduct, and ovary. We noticed abnormal ovarian gross morphology in female Amhr2 Cre/+ Pten F/F Ctnnb1 Ex3/+ as early as 4 weeks of age. Additionally, reproductive tract wet weight was increased in knockouts versus controls. By 6 weeks of age, mice reach tumor burden euthanasia requirements with enlarged ovaries with ascites accumulation in the peritoneal cavity. Hematoxylin and Eosin staining of the ovaries reveal abnormal ovarian development with granulosa cell tumors. Immunohistochemical staining for Ki67, a marker for cellular proliferation, revealed the ovaries from Amhr2Cre/+ Pten F/F Ctnnb1 Ex3/+ mice were proliferating much more rapidly than age matched controls. Through experimentation of Cre on tumor suppressing genes, we can determine which mutations are critical for ovarian cancer development. Subsequently, preventative measures and treatment options can be explored.

Talitha Fisher and Lisabeth DiLalla, Ph.D.

Family and Community Medicine, School of Medicine

Parental physical affection and children's positive affect

The purpose of this study is to examine if positive affect in children is related to parental physical affection. One study (Khaleque, 2012) found that parental warmth and affection are positively correlated with children's independence, positive self-esteem, and emotional responsiveness. Another study (Schrodt, Ledbetter, & Ohrt, 2007) confirmed that strong indicators for a child's well-being are parental confirmation and affection. The present study further examined whether parental positive physical affection does in fact play a role in children's positive affect or if positive affect could simply be a personality trait of the child which elicits more positive physical affection from their parents. This study will utilize secondary data collected in the Southern Illinois Twins/Triplets and Siblings Study (SITSS; DiLalla, 2002; DiLalla, Gheyara, & Bersted, 2013) play lab. A cross-sectional research design will be utilized. Children between the ages of three and five years old will be analyzed for what is considered by lab protocol to be positive affect. A parent twin interaction conducted by the SITSS lab involves having both children in a room with one parent for ten minutes with a puzzle task that parents are to direct the children to complete. Parental positive physical affection and children's positive affect behaviors during the recorded interaction are coded by reliable coders. Children's positive affect will be compared to parent behaviors of physical affection across the three ages. It is anticipated that children who are exposed to high levels of physical affection will display higher levels of positive affect. These findings will assist in informing parents of certain ways to behave to increase positive affect in their children.

Martin Flores[1], Jessica Whitaker[2], Sylvia Fromherz, Ph.D.[3], and Andrew A. Sharp, Ph.D.[3]

[1]Physiology, Shawnee Community College; [2]Department of Physiology and [3]Department of Anatomy, Southern Illinois University Carbondale

Achieving chief expression in astrocytes of embryonic chicks

Proper development of the spinal cord requires interactions between neurons and glial cells as well as other processes. Astrocytes, a type of glial cell found in the spinal cord, are important in maintaining homeostasis of the adult central nervous system (CNS). While we know that the membrane potential of astrocytes plays a role in the regulatory functions of astrocytes in the adult CNS, the role of astrocyte membrane potential during development is unclear. In the last decade, the field of optogenetics has developed and allows for the molecular-genetic introduction of light-activated molecules into target cell populations of an organism. For example, our lab introduces DNA encoding for a light-activated cation channel (ChIEF) into neurons in the developing spinal cord. This allows for the subsequent activation of neurons during embryogenesis. My project centers on being able to achieve expression of ChIEF in astrocytes, and not neurons, by replacing the current ubiquitous CAG promoter with an astrocyte-specific promotor, the GFAP promoter. Currently, we are working to insert the modified GFAP promoter into the ChIEF plasmid using a pre-existing NheI site and a newly inserted AgeI site. Once we have finished the ChIEF plasmid containing the GFAP promoter, it will be electroporated into the neural tube of day 3 chick embryos. Spinal cords will be collected on embryonic days 19-20. As our plasmid contains sequence encoding for a fluorescent reporter molecule, we will be able test for protein expression with fluorescence microscopy. Ultimately, we hypothesize that achieving ChIEF expression in astrocytes will allow us to manipulate the membrane potential of astrocytes. Further experiments using light to non-invasively manipulate the activity of astrocytes will be performed to advance our understanding of the role of astrocytes in early neural development.

Nicholas Flowers and David Gibson, Ph.D.

Department of Plant Biology

Light-pollution and competition affect phenotypic variation in four grasses

Light has many functions within an ecosystem, and understanding its role on plants is important for ecological understanding of species interactions. Due to a lack of research, light-pollution may have many undocumented effects on plants within an ecosystem. In this study, we show that light-pollution has the potential to reduce the mass, leaf number, or height of four grasses in both field and greenhouse settings. We test to see if light-pollution and interspecific competition affect the performance of *Sorghastrum nutans, Panicum virgatum, Bothriochloa bladhii,* and *Bothriochloa ischaemum*. A field study and greenhouse experiment were conducted, during which we observed plants for responses to light-pollution (supplemental night-time lighting) and competition treatments (neighbor species identity), and their interaction. We quantified phenotypic variance across all species and within species in response to both treatments. Irrespective of species or competition, biomass of all plants was reduced 28.5%, and leaf number per individual was reduced 11.8% when exposed to light-pollution. In response to light-pollution and irrespective of competition, *Sorghastrum nutans* was 11.2-29.7% shorter than the other species. Light-pollution has the potential to reduce mass and leaf number of the four grasses studied, and the height of *Sorghastrum nutans*. In the presence of light-pollution at night, the process of oxygen evolution may continue in the chloroplast. Chlorophyll and the associated antenna pigments are more efficient at low levels of light intensity. This, coupled with respiration at night, may create oxidative stress on the plants reducing their performance.

Wilson L. Fogler, Matthew T. Springer, and Clayton K. Nielsen, Ph.D.

Department of Forestry, Cooperative Wildlife Research Laboratory

Comparison of four baits for attracting white-tailed deer during the rut in Southern Illinois

Using bait to capture and survey white-tailed deer (*Odocoileus virginianus*) is a commonly-used practice by wildlife biologists. Previous research for white-tailed deer has shown preferences for different bait types in different seasons. Understanding the effectiveness of different bait types for attracting deer during different seasons may help with potential biases in surveys or aid in capturing targeted sexes. During September-December 2014, we compared 4 different baits for attracting deer (2 corn/sugar based and 2 fruit based) in Southern Illinois. At each sampling location, 4 bait stations were established within 50 yards of each other. Bait sites were then monitored for deer use with Cuddeback Excite cameras. To determine if there was a bait preference we ran 3 repeated measures ANOVAs on total number of deer, bucks, and does visiting each bait type by week. We recorded 1,143 pictures of deer (231 bucks, 681 does, and 231 fawns). No difference was detected in deer visits between baits for all deer ($F_{3,20} = 0.262$, $P = 0.852$), bucks ($F_{3,20} = 1.155$, $P = 0.351$), or does ($F_{3,20} = 0.511$, $P = 0.680$), thus no preference for any of the bait types tested was indicated. More research into different types of baits may be necessary to determine if other baits may be preferred at this time period.

Alan Franklin

Department of Psychology

Learning method based on scoring method

This project has participants consisting of college students from a Midwestern university to examine how a scoring system will influence and affect learning method. The study uses a task designed to use multiple cards with Hiragana characters depicted on them that are weighted to win at different probabilities. The study uses a probabilistic reward task that differentially rewards the correct identification of winning Hiragana cards to examine the method students use to learn the probability the cards will win in three separate conditions. In the first condition, there is no score and the student is only informed if they won or lost that round based on what they choose. The second condition involves a score beginning with zero that will build as the student scores winning cards. In the final condition the student starts with maximum points and loses points for being incorrect rather than winning. The is trying to see if students in the building score condition will be more likely to learn which cards are more likely to win, while those in the falling score condition are more likely to learn which cards are more likely to lose and avoid cards with low probability to win. The no score condition will be used as a control. The implications of a potential difference in scoring system that influences how hard a student may work on a task will be considered.

Shantel Franklin

Office of Assessment and Program Review

An evaluation of syllabi for online courses: Moving ahead with the e-Transformation

Syllabi for online courses require a number of different features to provide effective learning resources than syllabi for face-to-face courses. The number of online courses at Southern Illinois University has increased by 34.68% from fall 2013 to fall 2014 and 60 more courses have been offered online in the last year. The purpose of this project was to evaluate syllabi for online courses offered during the fall 2014 semester, using a checklist devised from the published literature on best practices in online teaching. This data was collected in order to assess the need for developmental training for online course syllabi for instructors. The first portion of the project included evaluating online course syllabi selected from a random sample. The syllabi were then scored based on such items as measurable course objectives, authentic assessments, and instructor availability. Preliminary results suggest that some online course syllabi include many features of "best practices," but training and support needs still exist for instructors teaching online.

Margaret French, Leah Belsley, and Jared M. Porter, Ph.D.

Department of Kinesiology

Chemo-brain effects focus of attention when performing a visuomotor tracking task

"Chemo-brain" or "chemo-fog" is described as difficulties with memory, focus, attention, reduced motor functioning and difficulty executing motor skills that involve visual accuracy and tracking. Previous research has demonstrated that directing patients suffering from chemo-brain to focus their attention externally improves visuomotor tracking abilities. However, what has not been identified is what underlying performance production characteristics resulted in these behavioral differences. The purpose of this study was to further investigate focus of attention effects on continuous visuomotor skill performance in cancer patients. We hypothesized that instructions, which directed one's attention externally, would result in better motor performance (i.e., increased time on target) and increased movement efficiency (i.e., decreased muscle activation) than instructions directing attention internally or neutrally. Using a counterbalanced within-participant design, volunteers (N=13) performed a rotary pursuit tracking task with their dominant arm for a total of 15 trials (i.e., 5 trails per condition) that lasted 30 sec in duration. In addition, surface EMG electrodes were placed directly over the anterior and posterior deltoids of the dominant shoulder. The dependent variables were the total contact time for each 30 second trial (i.e., time on target) and the amount of muscle activation. Results indicated that the Control and External conditions had a significantly greater time on target compared to the Internal condition. Furthermore, there were no significant differences in the activity of the anterior deltoid, while the posterior deltoid was less active in the Control condition compared to the Internal and External conditions. The present findings add to a growing body of research that demonstrates utilizing an internal focus of attention negatively influences an individual's motor ability. It is important for practitioners to avoid using verbal instructions that direct one's attention internally.

Madeleine L. Gagesch, Kimberly T. Stevens, and Sarah J. Kertz, Ph.D.

Department of Psychology

Emotion regulation, anxiety and stress recovery

Anxiety is associated with difficulty recovering after a stressor (Melamed et al., 1999). However, possible mediators of the relationship between anxiety and poor stress recovery remain under studied. Emotion regulation is "the process by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions" (Gross, 1998). The aim of this study was to test emotion regulation strategies as a mediator of the relationship between anxiety and stress recovery. We hypothesized that emotion regulation difficulties may mediate the relationship between anxiety and stress recovery.

The sample included 214 students from a large Midwestern university. Participants provided informed consent, completed the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004), State Trait Anxiety Inventory-Trait subscale (STAI; Spielberger, 1983), and a stress recovery task. Participants were asked to prepare a speech in two minutes on the relationship between neuroendocrinology and depression that would be videotaped and evaluated by a faculty member. The participants rated their levels of anxious, mood, before learning about the speech (time 1), immediately after the two-minute preparation time (time 2), and after they were told that they would not deliver the speech (time 3). Standardized residual change scores were calculated for change from time 2 to time 3 as a measure of stress recovery. Mediation analyses were conducted using the Indirect macro for SPSS (Preacher & Hayes, 2008). Anxiety was included as the independent variable, anxious residualized change score as the dependent variable, and DERS subscales as the mediators. The overall model was significant and explained 9.42% of the variance in anxious mood recovery, $F(7, 206) = 4.16$, $p < .001$. The overall indirect effects of impulsivity were significant suggesting that impulse control difficulties partially mediate the relationship between anxiety and poor anxious mood recovery.

Jovan Gathings

Department of Communication Studies

The WNBA and gender normativity

In Western culture, athletics has been known to be very gendered and socialized, and it also has the ability to perpetuate the stereotype that women aren't capable of performing sports the way men can. The WNBA (Women's National Basketball Association) is one of the more widely-known professional sports leagues for female athletes. The WNBA was launched in 1997 and was financially backed by its counterpart organization the NBA. Since that time the league has struggled with decreasing viewership, attendance, and revenue. Despite the WNBA's struggles, players have maintained a clean image of competitive women's athletics while often challenging the gender-normative structure of the female sports enterprise. In this project, I examine the ways various components of the WNBA either oppose or perpetuate this gender-normative sports structure. I will focus on qualitative observation of in-game performance and play-by-play commentary. I identify three themes that display how gender normativity is opposed or perpetuated in the WNBA: Male players as benchmarks of athletics, the role of women athletes' bodies and performance, and expectations of competitiveness.

Elizabeth Geerling, Lan Hai, and Prema Narayan, Ph.D.

Department of Physiology

High estradiol is essential for ovarian cyst formation in mice with a gain-of-function mutation in the luteinizing hormone receptor

Luteinizing hormone (LH) plays an important role in reproductive development. Males with a gain-of-function mutation in the luteinizing hormone receptor (LHR) undergo precocious puberty, Leydig cell hyperplasia, and have high testosterone levels, resulting in a condition called familial male-limited precocious puberty (FMPP). Our laboratory generated a mouse model to study FMPP, known as a KiLHR mouse. Our studies revealed that the female KiLHR mice undergo precocious puberty, are interfile, and have abnormally large ovaries with many hemorrhagic cysts. KiLHR mice have high levels of steroid hormones, so we hypothesized that the elevated steroid hormones could be the cause of ovarian hemorrhagic cysts. In order to test our hypothesis, KiLHR mice were first injected with flutamide, a drug that inhibits testosterone from binding to the androgen receptor. Ovaries from injected animals were collected, sectioned, and stained with hematoxylin and eosin. These ovaries showed no differences in the sizes of ovaries or numbers of cysts. Thus, we concluded that high levels of testosterone are not the cause of hemorrhagic cysts. We then injected the female KiLHR mice with letrozole, a drug that inhibits aromatase, the enzyme responsible for converting androgens into estrogens. We observed that ovaries of the letrozole-injected mice were significantly smaller than those of the control group and had fewer bloody cysts. This indicates that elevated levels of estradiol are responsible for the hemorrhagic ovarian cysts in KiLHR mice.

Miranda Gibson[1], EiEi Hlaing[1],
Stephanie M. Clancy Dollinger, Ph.D.[1], and Terry Brown, D.O.[2]

[1]Department of Psychology, Southern Illinois University Carbondale, Carbondale, Illinois
[2]Director of Sleep Disorder Center, St. Joseph Memorial Hospital, Murphysboro, Illinois

Effects of obstructive sleep apnea on cognitive performance

The objective of this study is to identify cognitive components that are directly affected by the absence or presence of obstructive sleep apnea (OSA). Individuals living with OSA tend to show evident cognitive dysfunction due to hypoxemia and fragmented sleep, but only in certain cognitive areas. The current study seeks to answer which cognitive areas, after removing education as a variable, are significantly effected by the disrupted sleep of OSA patients, based on a combination of several cognitive measures. Sixty-seven recently diagnosed OSA patients and forty-three controls cleared of OSA by the ApneaLink™ portable sleep monitor (Apnea Hypopnea Index < 5) participated in the study. Three domains of cognitive performance are measured: verbal (fluency and recall), executive function (Wisconsin Card Sorting Task, WAISS III Block Design visuospatioal reasoning task, and Inhibition Task), and attention (WAISS III digital span forward and backward tests, Reitan Trails making tests Parts A and B). The results show no differential effects of age or gender between the patient group and the control group. Results also indicate that perseverance error in the Wisconsin Card Sorting task, accuracy in the Inhibition task, digit span forward, phonemic fluency, and visuospatial reasoning score in the Block Design showed the most significant cognitive dysfunction when comparing the patient group (individuals with disrupted sleep) to the control group (individuals with normal sleep). The most significance was found in the perseverance error percentage in the Wisconsin Card Sorting task and the accuracy score on the Inhibition task. In conclusion, performance impairment was the greatest for executive functioning, as shown by the Inhibition task, making this area most susceptible to negative long-term effects of OSA.

Alex Glasnovich

School of Information Systems and Applied Technologies

Using machine learning and electronic health records to predict patients interested in quitting tobacco

The main focus of my research is to determine what key questions need to be asked on the patient's health history form to assess the patient's willingness to quit tobacco use. By accurately assessing the patient's willingness to quit tobacco use, I expect to help healthcare providers to cut down the tobacco intervention time. Currently data from Health Information National Trends (HINTS) is being used. HINTS is a service of the National Cancer Institute with the support from the Health Communication and Informatics Research Branch of the Division of Cancer Control and Population Services. A predicting model will be created from the data and used for determining the importance of the questions in assessing the patient's willingness to quit tobacco use. Since the form contains health questions related topics such as heart disease and cancer along with tobacco usage it is anticipate that this data will be able to help form more predictions. The data has over 300 attributes. I will use the model to identify questions from the form that can assist with the predictions. The model to be created uses Machine Learning and R programming. The main algorithm used for the predicting model will be the Random Forest.

Alex M. Glasnovich, Geovane F. Piccinin, and Marcelo Bandeira da Silva

School of Information Systems and Applied Technologies

Tobacco User Profile Viewer (TUP Viewer)

TUP Viewer is a web based educational resource designed to support students and healthcare faculty in the practice of Tobacco Cessation Treatment Planning based on profile analysis. Using records of fictitious and unidentifiable patient data to provide the users an interface to conduct searches based on a set of criteria. The users can visualize the results graphically, analytically and explore the relationship between the attributes of tobacco use on potential health conditions, which is essential in providing tobacco cessation treatment. The system has three kind of users: administrator, instructor and student. The administrator can add new fictitious data supplying the database with a profile that is interesting to demonstrate for the students. In addition, all the users can search profiles based on attributes as demographic information (gender, ethnicity, age, etc.), tobacco use (number of products used per day, number of minutes after wake up, interest in quitting, etc.) and health condition (blood pressure, and Body Mass Index, etc.). According to all these criteria, a graphic is created showing the diseases that the patients that match with the search criteria have. The diseases are classified in Red, Yellow, and Green, according to their gravity and the graphic shows the percentage of each disease category, the total number of diseases, and the number of patients that matched the search criteria.

Alex Gonzalez

Office of the Associate Provost for Academic Programs

UCOL 101 Tablet Survey

The purpose of this study was to assess the usage and effectiveness of the Mobile Dawg Digital Initiative used to promote retention amongst freshman students. The data was collected through anonymous surveys taken by 495 freshman students enrolled in UCOL 101 during the fall 2014 semester. The UCOL 101 Tablet Survey was designed to analyze usage, discover potential issues, and determine the overall effectiveness. Based on the results, the majority of students (73%) are still using the SIU-issued tablets, while 27% of the tablets issued were not used after the first week of the semester. Students cited issues related to lack of hard drive storage, keyboard malfunctions, and already having a device as reasons for not utilizing the tablet. It is important to understand issues such as these in order for SIU to provide incoming freshman with the resources they need to feel welcomed to our University. On the other hand, in the *SIU Student Survey*, 31% of the respondents said that the freshman tablets initiative impacted their decision to attend SIU. All things considered, the freshmen tablet initiative has proven to be relatively successful and it is our intent to keep progression forward.

Ryan Gougis

Department of Criminology and Criminal Justice

Ferguson, media, and the public's perception of police use of force

Prior research has established that there is a lack of trust between the public and law enforcement officers. Though most recently events in Ferguson has brought more attention to the issue; it can be argued that various occurrences of police illegitimacy has created a build up to the events that occurred in Ferguson. Some people traveled to Ferguson in efforts to assist with protesting. However, for most people some sort of media outlet was their only way of receiving information about the events that led up to no indictment of Officer Darren Wilson. Most recent research has proved that how people perceive the police and overall justice system is what they believe in regards to police legitimacy. This research will focus on the particular issue of police use of force in regards to Ferguson and how various media outlets contribute to the formation of public perception. This research will also compare and contrast public perceptions of police use of force after the events of Ferguson. Also, perceptions of police on the local level as well as the general population of police.

Cassandra Goyer, Samantha Sparks, and Erin Venable, Ph.D.

Department of Animal Science, Food and Nutrition

Effect of recycled crumb rubber on air quality of indoor arena during riding class

Air quality, particularly in riding arenas, has long been an issue for horse owners and equine professionals. The constant inhalation of particulate matter has been linked to bronchitis in riding instructors (Kollar et al, 2005). In addition, concerns exist regarding potential damage caused to the horses' lungs. The objective of this study was to test the hypothesis that recycled crumb rubber can significantly decrease air particulate matter when applied on top of existing arena sand. Treatments were as follows: A (Control - existing sand floor), B (recycled rubber 1.5"), and C (recycled rubber 3"). Air quality was measured using three DC1100 monitors (Dylos Corporation; Riverside, CA). Stationary monitors were located in three fixed positions within the arena for the duration of the study. Data collections occurred during advanced riding classes on Tuesdays and Thursdays for three weeks using randomly assigned horses and riders. Data were analyzed as a three-way ANOVA with fixed effects using a Tukey post-hoc test with SAS (version 9.4; SAS Institute Inc.) and significance established at $P < 0.05$. We observed no significance associated with monitor or time. However, Treatment B had significantly greater air particle reduction as compared to the Control for both 0.5 um and 2.5 um particles. We observed no difference between Treatment B and C. It should be noted that the researchers noted several challenges regarding the use of recycled crumb rubber. There was an unexpected issue with manure disposal and rubber material adhering to it. This was unexpected and created a management issue regarding manure disposal and composting. In addition, several pieces of wire were observed within the rubber material and caused concern regarding the horse's hoof health. Further use of this type of product should incorporate an advanced screening or cleaning system to prevent this type of contamination in the finished product.

Matthew Grammer and Kanako Hayashi, Ph.D.

Department of Physiology

Mapping the genome of mice using Polymerase Chain Reactions (PCR)

Polymerase Chain Reactions (PCRs) are a basic molecular technique used for genetic analysis such as in the Human Genome Project or detecting the presence of viruses or bacteria. To perform a PCR, DNA is heated so the DNA becomes single stranded. Once in a single stranded form, specific DNA sequences are isolated using complementary nucleotide primers. Then, DNA polymerase moves along this target sequence of DNA to produce a compliment to the original sequence of the DNA molecule. After this step is complete, there are 2 copies of the DNA target sequence. This process can be repeated up to 40 cycles to give a vast amount of the desired sequence. Researchers use gel electrophoresis to separate these products based on their size. In our laboratory, this technique allows us to detect the presence of genetic modifications to the genome in transgenic mice. We use this information to track genes related to ovarian and endometrial cancer, and to control the prevalence of these genes in our mice colony. We collect genomic DNA from the mice and perform an extraction to isolate the DNA molecules from the mouse's cells. After extraction, we mix the DNA with a mixture of a primer solution specific to the gene of interest, solutions containing the necessary molecules for replication, and a thermo-stable DNA polymerase. We then load the samples into the thermocycler in order to perform the PCR. After this process is finished, we then load the samples into an agarose gel with ethidium bromide for gel electrophoresis where products can be detected by ultraviolet light.

Kenyahtta Gray and Sandie M. Bass-Ringdahl, Ph.D.

Rehabilitation Institute, Communication Disorders and Sciences

An investigation of early vocalization development in young children with Autism Spectrum Disorder

Research will focus on the early vocal development, specifically distinguishing differences in canonical babble between children who are developing typically and children who are diagnosed with Autism Spectrum Disorder. A current project is underway to collect normative vocal development data from children who are typically developing for the validation of a recently developed questionnaire (Moeller & Bass-Ringdahl, 2010) to track early speech development. The normative data is collected in two stages. The first involves a visit to SIU in order to evaluate the hearing sensitivity of the participant and to collect early speech and language milestones through the use of parent questionnaires. The second stage involves the collection of a 16 hour vocal sample from the home. This data is collected through the use of a small recording device that the child wears in a specially designed shirt. The proposed study will involve the collection of similar data from children who attend the Center for Autism Spectrum Disorders. Data will be collected in the home setting for children enrolled in the study.

It is anticipated that distinct differences in the type, quantity, and pattern of vocalizations will be found between the two groups of children. Specifically, children with Autism Spectrum Disorder are expected to produce reduced quantity of vocalizations. In addition, children with Autism Spectrum Disorder are expected to produce vocalizations differing in pitch and intensity of production.

Sohaib Hameed, Kevin S. Bradley and Amber L. Pond, Ph.D.

Department of Anatomy, SIU School of Medicine

MERG1a does not modulate Murf1 expression in skeletal muscle through the NFkB transcription factor family

Skeletal muscle atrophy is the loss of muscle size and strength that often occurs with disease states, normal aging and as a consequence of the decreased muscle use that can accompany injuries and extended bed rest. Numerous proteolytic systems contribute to atrophy, including the ubiquitin proteolytic pathway (UPP) which is estimated to be responsible for as much as 75% of protein loss in skeletal muscle atrophy. ERG1 (ether-a-gogo related gene 1) encodes a K^+ channel partially responsible for cardiac action potential repolarization in humans and mice. We have shown that the mouse ERG1a (MERG1a) channel participates in the onset of skeletal muscle atrophy by up-regulating UPP activity and does so by inducing expression of *Murf1*, an E3 ligase which contributes to UPP activity. However, the mechanism by which MERG1a modulates *Murf1* gene expression is not known. Because *Murf1* expression is linked to activation of NF-kB proteins, a family of transcription factors known to induce transcription of atrophy-related genes, we hypothesized that ERG1 expression may induce NF-kB expression and, thereby increase *Murf1* expression. We tested this hypothesis by ectopically co-expressing *Merg1a* and an NF-kB luciferase activity reporter in mouse gastrocnemius muscles and determining the NFkB activity each day for 0 through 7 days. Surprisingly, contrary to our hypothesis, we found that MERG1a DECREASES NFkB activity. Further, we determined that sciatic nerve transection (i.e., denervation) does not lead to an increase in *Merg1a* expression although *Murf1* expression is still up-regulated. The data show that the MERG1a channel does not increase *Murf1* expression through NF-kB activity in atrophic skeletal muscle.

Ashani M. Hamilton

Department of Animal Science, Food and Nutrition

Impacts of genetic selection on the parasitic immunity of goats

Meat goats are plagued by the consistent and prevalent threat of gastrointestinal parasites. Internal parasites such as the barberpole worm have been evading the reach of different anthelmintic and de-wormer programs due to their ability to rapidly adapt and develop a resistance. This survey pilot project investigated some of the managerial factors that influence parasitic infection rates in goats throughout the southern Illinois area. Fecal egg counts were utilized in calculating the parasitic load of five randomly chosen goats from ten farms, located in a 4-hour radius of Carbondale, IL. Along with the collection of fecal egg counts, a survey was issued to the goat producers at each farm. A review of the survey indicated that factors such as rotational grazing, the use of pharmaceutical dewormers, and the utilization of copper as a feed additive were what a majority of producers considered to be effective means of controlling the threat of internal parasitism. Data obtained from the fecal egg counts and producer surveys were analyzed using ANOVA/LSD, significance set at $P<0.05$ (IBM SPSS Statistics for Windows, v. 22, Armonk, NY). Copper as a feed additive correlated with the lowest overall amount of parasite eggs found in goats. Additional data and research is needed to strengthen a final conclusion on how the variation of management practices will benefit the growth and longevity of the meat goat industry in southern Illinois.

Abdullah Hariri and Sam Chung, Ph.D.

School of Information Systems and Applied Technologies

Flipped classroom for penetration testing in a virtualized environment

We are in the century of knowing no bounds. Technology has been expanding rapidly that it is hard sometimes to catch up. The demand for high quality education has increased tremendously in the last 10 years as well as the need to prepare students who are willing to receive such high quality education. Equipping students with the necessary skills and the right experiences help them to master what they are interested in the most. In this research, we apply the concept of a flipped classroom for a penetration testing course. The concept allows students to interact with the instructor in an active way, the instructor records a video that explains the lesson. Students watch it as much as they need and whenever they want all in cyberspace as a virtual classroom. That gives the instructor more time to create in-class activities and brings students with questions to answer in the real classroom. The concept eliminates the stress of the old classic Banking concept of education, in which teachers deposit and withdraw information in and out students' mind. Also, in our penetration-testing course we create a virtual laboratory that allows students to practice their skills in a safe virtualized environment harming no real Networks or databases. The virtual classroom is developed with a Content Management System (CMS) that is web based. Holding a workshop for penetration testing in a virtualized environment, and using a flipped classroom concept will give a chance to the participants to learn efficiently and effectively.

Luke Harl and Philip Anton, Ph.D.

Department of Kinesiology

Diminished balance and activities of daily living performance in cancer survivors who have undergone chemotherapy

Cancer survivors often complain about balance issues that have presented either during or following chemotherapy treatment. To date, empirical data regarding this potential functional deficit are limited. This study determined if differences exist in balance performance between cancer survivors who have undergone chemotherapy treatment and apparently healthy controls. Cancer survivors (C) were of various cancer types and had completed a course of chemotherapy treatment within the past 2 years (n=9). Controls (H) were age and physical activity-matched to C (n=10). Neither group had any diagnosed vestibular abnormalities. Standing balance was tested in both groups using the Accusway Balance Platform® (AMTI) and participants also completed several activities of daily living tasks. C demonstrated significantly greater center of pressure area (A; cm^2) (C: 1.2±.4 vs. H: .8±.2; p=.046). While not statistically significant, C demonstrated greater center of pressure average velocity (V; cm/s^2) (C: .93±.3 vs. H: .72±.1; p=.078). H had significantly better stair climb/descent (C: 43.2±3.3 vs. H: 32.9±4.5; p=.025) and sit to stand time (C: 32.7±8.1 vs. 25.3±2.2; p=.048). Lift/carry time was better for H, but not significantly (76.4±16.5 vs. 72.9±11.3; p=.153). A strong correlation existed between A and stair climb/descent (r=.79), while moderate correlations existed between: A and sit to stand time (r=.59); V and stair/climb descent time (r=.52). H outperformed C on all variables measured. While not all differences were significant, the results indicate that chemotherapy treatment may have a lasting impact on balance performance and this balance deficit may be related to diminished functional task performance in this population. Further examination of this issue is warranted, including the use of exercise interventions designed to address chemotherapy-related balance deficits.

Savhannah Haslett

Department of Zoology

Interacting effects of ranavirus infection and metamorphosis on the nutrient stoichiometry of amphibians

Metamorphosis in larval amphibians is a period of massive remodeling to tissue and organ systems, which imposes a high energetic and nutrient cost. This is also a period of high vulnerability to emerging pathogens such as *Ranaviruses,* which suggests that there may be an energetic and nutrient cost to immune responses to infection. Recently we showed that physiological stress, as mediated by glucocorticoid hormones alters the carbon, nitrogen, and phosphorous nutrient use and allocation in larval amphibians. These results suggest that the stress of metamorphosis and pathogen infection could also alter animal nutrient stoichiometry, however, these dynamics have not been explored. Larval amphibians have a large effect on the nutrient cycling in their habitats, and their presence and health are important in maintaining the ecosystems in which they live. Given that amphibians are being decimated by emerging disease, exploring these dynamics also has broader implications for our understanding of ecosystem function in a changing world. This project aims to investigate the nutrient dynamics of ranavirus infection through stoichiometric analysis of C, N, and P in excrement and tissue. To accomplish this, water samples and tissue samples were analyzed. To quantify viral shedding and better model how Ranavirus outbreaks occur in the wild, water samples were taken after an induced stress response to mimic the pressures of metamorphosis and infection occurring at the same time.

Elizabeth Haubert

Department of Curriculum and Instruction

Fathers and feeding roles

This study examined the role fathers play in infant feeding decision-making and the impact the feeding method has on his perception of his relationship with his infant and his fathering role. Seventy-nine fathers participated and completed a questionnaire and a semi-structured interview. After the first constant comparative analyses, three groups emerged, exclusively breastfed, exclusively formula-fed, and both breast- and formula-fed and analyzed quantitatively. Further delineation by SES yielded significant differences between the fathers of high SES and low SES on perception of attachment but not on their fathering role nor on feeding attitudes. Constant comparative qualitative analyses revealed differences between the groups. Implications will be discussed.

Matt Hautzinger, Mallika Dasari, and Punit Kohli, Ph.D.

Department of Chemistry and Biochemistry

Fabrication and characterization of organic photovoltaics using a graphene substrate

A major obstacle to large scale energy production with photovoltaics is the cost of production. Third- generation solar cells (polymeric, organic, and dye-sensitized solar cells (DSSC)) have shown to be a possible solution to the cost of converting sunlight into usable energy. They are produced with inexpensive materials and simple processes.

Organic photovoltaics (OPVs) work with a layered architecture. They consist of four discrete layers that are easily processed: a top electrode, an active layer that undergoes the photochemical reaction; A hole injection buffer layer; and a bottom electrode/substrate material to support the device. Our research focuses on creating a cheap and more efficient electrode to be used. Currently indium tin oxide coated onto a glass substrate is the most commonly used for these applications. Our method of growing graphite onto a porous substrate aims to replace the expensive and brittle ITO commonly used in thin film architectures.

Our multi-layer graphene electrode is made using a quartz filter, soaked in sucrose (as a carbon source) and iron-oxide nano-particles used to catalyze the reaction. This produces a multi-layer graphite electrode which has the good electronic properties needed for our photo voltaic devices. The electrode has been characterized with multiple types of spectroscopy.

The devices we fabricate using our carbon electrodes are very simple and easy to process. A buffer layer is coated and annealed, followed by the mixture that is our active material (P3HT/PCBM). Coated on top is a transparent layer of gold to act as the top electrode. Our devices have shown efficiency of up to .98%.

Matthew Heberlie and Steven C. Goetz

Department of Aviation Management and Flight

Viability of electrically powered aircraft

The costs of operating aircraft in a training environment have substantially increased, thus deterring future aviation students from pursuing careers as pilots. As the cost of flight training continues to increase, the student loan debt of pilots is also increasing. In an act to counter this, research has been conducted to examine alternative forms of energy to power aircraft. Instead of retrofitting internal combustion engines, the most feasible option that appears to resolve this issue is through the implementation of electrically powered aircraft. This type of aircraft could reduce costs of operation substantially across training fleets throughout the United States, particularly at Southern Illinois University Carbondale (SIUC). The Cessna Skyhawk, being the main aircraft utilized for flight training at SIUC, will be used to provide internal combustion data as a control. This data will then be compared with the data collected from electrically powered aircraft. To date, SIUC has not conducted any research on the integration, advantages, or drawbacks of electrically powered aircraft. The objective of this comparison is to explore the viability of incorporating electrically powered aircraft at SIUC. Simultaneously, this study could act as a catalyst for future research in electrically powered aircraft integration across flight training environments.

Brian Heine, Brogan Gust, Kaili Ranta, Drake Anthony, and Boyd Goodson, Ph.D.

Department of Chemistry and Biochemistry

Rb/Cs hybrid spin exchange optical pumping of Xe129

Hyperpolarized ^{129}Xe is used in a diverse range of applications in nuclear magnetic resonance imaging (MRI) and spectroscopy (NMR). In, MRI, hyperpolarized Xe has been used as an inhaled contrast agent to study the lung. In addition, the frequency of the 129Xe signal—its "chemical shift"—depends upon the environment, giving a unique tool to probe chemical / biological systems. As gas phase NMR/MRI are inherently low-sensitivity techniques, success requires the production of gas with high polarization in large volumes. The technique used to produce the "hyperpolarization" is spin exchange optical pumping (SEOP), where atoms of an alkali metal vapor (normally Rb) are optically pumped on the D_1 electron transition with a poweful laser, resulting in highly polarized electron spins; polarization is then transferred to 129Xe nuclear spins during collisions, allowing 129Xe to be "hyperpolarized" over time. The degree of 129Xe polarization is limited in many aspects by the time required for polarization to occur, compared to how quickly this non-equilibrium polarization relaxes away. It was recently shown that Cs may be instrinsically more efficient than Rb for hyperpolarizing 129Xe via SEOP, but the laser technology that can reach the Rb D1 line (794.8 nm) is far superior to what can be obtained at the Cs D1 line (894.3 nm). Thus, we are investigating if a so-called hybrid approach might provide the best of both worlds: specifically, we are investigating if a hybrid Rb/Cs approach might boost the efficiency of 129Xe polarization wherein a laser at the Rb D1 line optically polarizes the Rb, which would rapidly polarize Cs spins via.Rb/Cs electron/electron spin exchange, in turn then exploiting the advantages of Cs/Xe electron/nuclear spin exchange. Optimal Rb/Cs ratios, operating temperatures, and other parameters must be determined, and success will be monitored in situ by low-field NMR and optically detected ESR.

Luke Alexander Henley, Ahmed Al-Asadi, and Saikat Talapatra, Ph.D.

Department of Physics

Hydrothermal synthesis of ZnO nanostructures

Understanding nanomaterials growth processes are extremely important for rapidly expanding branch of nanotechnology research. As the technology of the world becomes smaller and performance enhances, the material the technology consists of must also decrease in size. One interesting nanostructure that has come into light recently is Zinc Oxide (ZnO). This compound has properties of a semiconductor and therefore are good for a variety of applications related to energy storage, optoelectronics etc. In this abstract we will present our efforts in synthesis of a variety of ZnO nanostructures (for example, nanowires, 2D nanosheets and micro cubes) using hydrothermal process. A detail analysis of some structural as well as optical properties of the synthesized materials will be shown. Effect of various growth parameters, such as growth substrate, pH values of chemical solutions, growth times etc. will be presented and discussed.

Bradley Henning, Kyle Walker, Shailey Brumley, and Jared M. Porter, Ph.D.

Department of Kinesiology

Directing attention externally enhances golf ball putting performance

For nearly two decades, experimental findings have demonstrated that directing a learner's conscious attention externally rather than internally improves motor skill learning and performance. The purpose of this study was to measure if increasing the distance of an external focus of attention improved learning and performance of a golf putting task compared to a baseline condition. We predicted that motor skill performance would increase as the distance of an external focus of attention also increased in relation to the participant. Participants were randomly assigned to one of four experimental conditions (i.e., control, putter, ball, target). Participants in the Control condition were not provided attentional directing instructions. Participants in the Putter condition were instructed to focus their attention on the putter when performing the task. Participants in the ball condition were instructed to focus on the Ball when performing the task, and participants in the Target condition were instructed to continually focus on the target for the duration of the task. Volunteers performed a total of 30 practice trials in one day. During the practice phase of the experiment, participants were asked to repeat the prescribed instructions after every 5 trials. Participants returned after a 24 hour period of no practice for post testing. An analysis of post test performances indicated that all of the external focus conditions (i.e., putter, ball, target) performed significantly better than the control condition (i.e. baseline). Further analysis indicated that putting performance increased as the distance of the external focus also increased, thus the experimental hypothesis was supported. The results of this experiment provide converging evidence with previous research that increasing the distance of an external focus of attention improves motor skill learning and performance.

Michael Holm

Department of Zoology

Predator-Prey traveling waves in Dictyostelium: Effects of species and media on wave speed

Mathematical models of predator-prey systems often display a phenomenon called traveling waves, in which a wavelike increase in predator abundance (and prey decline) moves through space. Amoebas in the genus *Dictyostelium* appear to form traveling waves in consuming their bacterial prey on solid media, and so provide an opportunity to investigate this phenomenon in the laboratory. Our focus was to look at the effect of *Dictyostelium* strains/species, bacterial density, and colony geometry on wave speed in this system, using a factorial design. We used two strains of *Dictyostelium discoideum* (NC4 and Car) and a second species, *D. purpureum*, with *E. coli* B/r the bacterial prey. Bacterial density was manipulated using two different concentrations of SM growth media (SM/4 or SM/20). Two different colony geometries were used, bacterial lawns vs. streaks, on 90 cm plates. Each combination of treatments was replicated three times. After inoculation with Dictyostelium, the location of the wave front was marked on the plates for seven days and the wave speed calculated. The species/strains clearly had different wave speeds, with *D. discoideum* Car the fastest followed by *D. purpureum*, with *D. discoideum* NC4 the slowest. There was also a significant interaction between media concentration and colony geometry; wave speed differed between lawn and streak when SM/20 was used, but not SM/4. Another significant interaction was observed between the *Dictyostelium* strain/species and wave speed on different days. While NC4 speed remained constant, both *D. discoideum* and *D. purpureum* increased through time, and even accelerated until all prey were consumed. Studies of individual amoeba behavior are planned to help explain differences among strains in their wave speed.

Mallory Holzhauer

Student Health Services

Your medical home away from home

Student Health Services is an ambulatory health care facility accredited by the AAAHC, that provides complete, coordinated, and comprehensive medical care by facilitating partnerships between individual patients and their health care team. Your Medical Home Away from Home will be a services that allows the Student Health Service's medical team to become accessible, coordinated, and patient centered, all while maintaining quality and safety. SIU Students will be assigned a team of health care providers comprised of physicians, physician assistants, nurse practitioners, pharmacists, nutritionists, health educators, and counselors. Students will also be included in health care related decisions and have an input over their health and well-being. All students have access to the on-line web portal system that provides 24 hour electronic access to make health care related appointments and secure messaging. Medical Home Health Care Teams coordinate individual patient's care across the varying departments within Student Health Services. We continue to improve quality and safety performance standards by continuing professional staff development, quality improvement and technology integration.

Anna J. Hooppaw and Derek J. Fisher, Ph.D.

Department of Microbiology

Identifying signals involved in the regulation of RsbU and CTL0852 sensor phosphatases within the partner switching mechanism of Chlamydia trachomatis

The gram negative, obligate intracellular bacterial pathogen *Chlamydia trachomatis* is responsible for the most common sexually transmitted bacterial infection and is the leading cause of preventable blindness worldwide. It has a unique biphasic developmental cycle in which it differentiates from the extracellular, infectious elementary body into the intracellular, metabolically active reticulate body. We hypothesize that development is regulated, in part, by a partner switching mechanism that utilizes two inner membrane located sensor phosphatases, RsbU and CTL0852. To enable high-throughput screening for ligands controlling sensor phosphatase activity, the putative signal receptor regions of RsbU and CTL0852 were combined with the signal transduction (HAMP) and adenylate cyclase (AC) domains from a mycobacterial class III AC. As a control, the *Escherichia coli* serine chemoreceptor domain (Tsr) was also fused to the HAMP and AC domains. In *E. coli*, cAMP produced by adenylate cyclase leads to the activation of the *mal* and *lac* operons, which can be visualized using indicator medium or a β-galactosidase activity assay. RsbU-HAMP-AC, CTL0852-HAMP-AC, and Tsr-HAMP-AC were expressed in *E.* coli AC-null strains BTH101 and DHMI and AC activity was measured on MacConkey Maltose medium, LB X-gal medium, and with β-galactosidase assays. Preliminary results demonstrate that the RsbU-HAMP-AC fusion exists in an "on" state while the CTL0852-HAMP-AC fusion is in an "off" state. The Tsr-HAMP-AC fusion was AC-positive and could be negatively regulated by the addition of its ligand, serine. Future efforts will seek to identify ligands that alter the activity of the RsbU and CTL0852 fusions without altering the Tsr-HAMP-AC fusion control.

Heather G. Huffman[1], James A. MacLean II, Ph.D. [2], and Joseph L. Cheatwood, Ph.D.[1]

[1]Department of Anatomy and [2]Department of Physiology

Rhox8 expression in rodent brains

Homeobox genes govern many developmental events. The *Rhox*, -(X-linked reproductive Homeobox)-, genes are a recently discovered set of Homeobox genes. Characteristically, the Rhox gene set has high expression in testis during development, but only a select few of the genes in this set continue to show high expression after birth. Therefore, they are candidate for controlling many developmental events. Of all 33 mouse *Rhox* genes, *Rhox8* is unique because it is the only one in the set that shows expression in the somatic cells in the embryonic testis. *Rhox8*, *Rhox5*, and *Sox9* were all found to be highly expressed in positive control adult mouse testis tissue. Of these only *Rhox8* had moderate expression in mouse cortex. As expected, we found *Rhox8* to have moderate expression in the adult rat cerebellum, *Sox9* had minimal expression, but *Rhox5* had no detectable expression. Also, *Rhox8* is expressed in the developing mouse embryo around embryonic day 13.5; however, there is variation in expression depending on which primer set is used which suggests splicing variations. We recently determined that by using *Rhox8* primer set 698/699 that adult mouse cerebellum has a lower expression level than adult mouse cortex. Mouse spinal cord has been found to express *Rhox8* at a higher rate than the adult cerebellum and adult cortex. *Rhox8* is expressed in the adult cortex, cerebellum, spinal cord, and whole brain using primer set 1652/1653 as well. We hope to compare primer sets expression differences in order to determine any splicing variations. Additionally, we plan on using immunohistochemistry and western blot to further study *Rhox8* expression of different brain regions and in the spinal cord. Currently, we are hypothesizing that *Rhox8* plays a role in the function of oligodendrocytes; however, further studies are needed.

Brandi Husch and Jason Henry

Department of Plant Biology

Antimicrobial properties of liverwort extracts

With the current controversial state of our health care system in the United States, it is becoming more common for patients to seek alternative forms of medicine. A desirable alternative to traditional medicine is holistic medicine because it takes a natural approach to healing the body as a whole- mind, body, soul, and emotions. Because compounds that plants produce are often used in these treatments, this study focuses on identifying antimicrobial activities of an ancient group of plants called liverworts. One characteristic that makes liverworts unique is they commonly contain single membrane bound organelles, called oil bodies, that originate from the endoplasmic reticulum and are known to synthesize and store essential oils. It estimated that 90% of all liverworts contain oil bodies. These essential oils include terpenoids, isoprenoid compounds, and other secondary metabolites that have several interesting uses, ranging from aromas in perfumes to the potential use in antitumor drugs. Liverwort extractions have been shown to have antibacterial properties, but only a few species have been tested. In this study, extracts made from natural grown Conocephalum conicum showed positive results when tested against E. coli using a disk diffusion essay. Because published studies have conflicting reports, an emphasis in my work was to fine-tuned the experimental protocol to achieve consistent results. Continued testing on additional liverwort extracts using taxa grown in culture is producing positive results. The extraction procedure and results to date will be presented in my poster.

Todd E. Ihle, Kishore K.S. Thakur, and James D. Sissom

School of Information Systems and Applied Technologies

Campus Switch Replacement Project: A project management case study

The Campus Switch Replacement Project is a five-year plan implemented by Network Engineering to modernize the network infrastructure across the entire SIU campus. The primary goal of the project is to enable Gigabit Ethernet to each and every data jack across campus. There are many secondary goals as well, some of which are as follows: dramatic expansion of Single-Mode Optical Fiber; topology redesign and standardization; significant reduction of individually managed network equipment through use of stacking switches; and the direct connection of Ten-Gigabit data links between core routers, distribution switches, and access switches. This approach has been made possibly by researching the design of the network, targeting the areas of greatest need, and developing a plan to improve the services offered to the campus community as broadly and quickly as possible. This Case Study will examine many aspects of the project and provide an overview of the progress made and why it is a significant investment in the future of the campus.

Sabrina R. Imundo

Sustainability Office

Let's Shut 'Em Down

Living in the dorms my freshmen year and working in an office environment at Southern Illinois University's Carbondale campus I noticed a few things about my work environment and the behavior of other students in relation to saving energy and resources. In the dorms it seemed that students generally would keep their curtains closed during the day and keep their lights on or some would have the tendency to leave lights on in their rooms when leaving. Upon inquiring why the lights were left on when no one was home I was given the general response of, "I'm not paying for it. So it doesn't matter." Meanwhile, at the office I worked at I noticed coworkers would not turn off their computers after using them. The computers were always on, even on weekends, even on breaks, even when no shift was going to use the computers. Eventually the computer monitors would go to the screen saver and would eventually go into sleep mode. Since classes were back in session in January 2015 the divergent rate for recycling only totaled 16%. That number is very low and is below our recycling standard as a university. All these observations beg the question "why does no one care about saving energy or resources at this university?" While efforts are being made by various offices and students, as a whole the university could be doing more to reduce our energy and resource consumption and increase divergent rates.

I believe that creating an interactive awareness campaign in part at campus offices and at the university housing areas in Thompson Point, East Campus and Wall and Grand Apartments will not only encourage energy conservation but directly call to action the physical movements in shutting down electronics and lights.

Bryan Jenks and Pamela Smoot, Ph.D.

Department of History

We Shall Overcome: Southern Illinois University Carbondale students and Civil Rights Movement

The Civil Rights Movement reached its peak in the 1960s and Southern Illinois University Carbondale (SIUC) students did more than their part in this monumental effort to teach the nation that democracy really meant equality. With the formation of the Student Nonviolent Freedom Committee (SNFC) in July of 1962, SIU students placed themselves on the frontlines of the Civil Rights Movement. Black and white, male and female students fighting to uphold the belief that all people were created equal. Their philosophical and religious ideals of nonviolence to end racial discrimination in southern Illinois became the organization's foundation for social change. Not only did these students help their own community overcome racial injustice, but they initiated movements in Cairo and Murphysboro, Illinois. This study carefully examines the activism of SIUC students and the manner in which they fought to eliminate the social injustices of the time.

Holly Johnson and Philip Anton, Ph.D.

Department of Biological Sciences

Exercise program helps improve health outcomes for cancer survivors going through radiation treatment

Low to moderate exercise intensity training has been shown to improve fitness parameters and quality of life (QOL) in cancer survivors, but the influence of exercise during radiation treatment is less clear. The typical radiation regimen is an intense experience where patients receive treatment 4-5 times per week for a period of 5-6 weeks. This barrage of radiation often leaves patients at a low QOL and this study was designed to determine if structured exercise concurrent with treatment would help limit the QOL decline. Participants in this study were of various cancer types, but all were undergoing radiation treatment during the intervention period (during the first 6 weeks). Group E (n=13) participated in a 12-week intervention that included two, 1-hour sessions of exercise training (flexibility, balance, resistance, aerobic). Group C (n=11) received usual care for their cancer but did not participate in structured exercise. All subjects were tested pre and post intervention on fatigue and QOL status, as well as several activities of daily living (ADL) tasks. E improved significantly on treadmill walking (38%, $p = .011$), lift/carry (47%, $p = .018$), sit to stand (20%, $p = .046$), fatigue (-27%, $p = .023$) and QOL (24%, $p = .029$). G E improved on stair climb/descent, but not significantly (13%, $p = .091$). C had no change in sit to stand and treadmill walking, but experienced decline in lift/carry (-12%, p=.12), stair climb/descent (-23%, p=.062), and QOL (-33%, p=.039) and an increase in fatigue (31%; p=.027). Clearly the intervention helped to not only maintain QOL and ADL performance, but actually improve those variables. It is hoped that studies like this will help encourage more oncologists to involve their patients in structured exercise interventions.

Hong G. Jung and Sam Chung, Ph.D.

School of Information Systems and Applied Technologies

Architectural modeling of a web application using Ruby on Rails: A case study

There are many of web application development programming languages such as PHP, JSP, ASP, etc., but an architectural framework is often not included. The purpose of this research is to evaluate how a web application using Ruby on Rails is strong in terms of software architecture and object oriented design among other web development programming languages. Software architecture has to do with planning, designing and constructing a software system. Object-oriented design has to do with designing software in terms of interacting objects. For this purpose, we test the following hypothesis: If we implement a web application with RoR, the web application is strong in terms of software architecture and design since it uses Model-View-Controller (MVC) for architectural design and object-orientation for software design. In order to prove this hypothesis, we first implement a web application example of shopping cart from a well-known RoR reference book. Then, by using a software re-documentation methodology called 5W1H Re-Doc with a Computer-Aided Software Engineering (CASE) tool, Sparx's Enterprise Architect, we create a visual model in Unified Modeling Language (UML) for the application that consist of 4+1 views - Use Case, Design, Process, Implementation, and Deployment view. From implementation view, we check how MVC is implemented and give 0-3 scores: 0 for without MVC, 1 for containing just one of them, 2 for two of them and 3 for all of M, V, and C. From design view, we check how M, V, and C can be described as classes. From the result of the grading on both architecture and object orientation, we can argue that web application with RoR is strong in terms of software architecture and design.

Jason Kaatz

Department of Plant and Service Operations, Engineering Services

Proposed energy efficient measures at Altgeld Hall

This project involves a retro-commissioning of Altgeld Hall at Southern Illinois University of Carbondale. The objective of this project is to reduce the energy use and total cost associated with lighting and HVAC (Heating, Ventilation, and Air Conditioning) equipment and implement these actions promptly. Most buildings have not been formally analyzed for possible problems and new and simple solutions to reduce energy costs. With this being said, many buildings may not be as energy efficient as they could be. By retro-commissioning Altgeld Hall, wasteful energy uses will be reduced and replaced with more efficient uses. This project covers the several different methods being carried out, which include: installation of occupancy sensors in particular rooms which will shut off lights when a room is unoccupied. Another is demand control ventilation, which controls the amount of outside air coming in through the air handlers. When rooms are unoccupied there is no need to provide as much outdoor air to maintain normal oxygen levels to these rooms. Lastly, a shutdown of the air handlers during nighttime hours where the building is unoccupied. This report will cover what each method entails, how each method will save energy, and how these methods will be carried out. Highly desirable improvements will have an estimated payback period of under 1.5 years.

Paige Kannall and Buffy S. Ellsworth, Ph.D.

Department of Physiology

The role of FOX01 in growth hormone production

The pituitary is a hormone-secreting gland located near the brain that controls various functions necessary for normal growth and other processes. FOXO1 is a protein that comes from the family of forkhead box (FOX) transcription factors. This transcription factor is located in the pituitary, and can also be found in many other tissues including the heart, ovaries, and the brain. FOXO1 also is responsible for cell specification, cell proliferation, and organ development in many segments of the body. The transcription factor structure allows FOXO1 to bind to DNA and control the rate of transcription. Because of this, FOXO1 is vital for normal development and physiological processes in the body, although its function in the pituitary has not yet been clearly determined. To study FOXO1's pituitary function, we use a knockout mouse model. Using a recombined allele, we delete FOXO1 from the pituitary but not the rest of the body. We can't knockout FOXO1 from the whole body, because without it, the mice embryos terminate around embryonic day 10.5 due to incomplete vasculature. In this study, I'm using our knockout mouse model to find out how deleting FOXO1 affects growth hormone production in the pituitary postnatally. To do this, I am optimizing a staining protocol on embryonic day 18.5 mice, and comparing the knockout growth hormone production to normal growth hormone production in mice at postnatal day 3. These results will help us understand the function of FOXO1 in the pituitary.

**Jesse Kays[1], Dave Palm[2], Robert Higgins[3],
Matt Geisler, Ph.D.[2], David Gibson, Ph.D.[2],
Qiang Cheng, Ph.D.[3], and Jane Geisler-Lee, Ph.D.[2]**

[1]Department of Mathematics, [2]Department of Plant Biology, and [3]Department of Computer Science

Belowground competition with kin and non-kin in Arabidopsis

In the soil, plant roots wage an unseen war for resources. A plant exhibits a "fight or flight" response that results from an encounter with another plant. Plants may even have the ability to distinguish between kin and non-kin. An understanding of this belowground competition can be gained from studying the macroscopic behavioral patterns of belowground root systems. Digital imaging techniques provide the means to quantitatively observe these plant-plant interactions while computational imaging and processing techniques provide the means to quantify the interactions. Two ecotypes (kins) of *Arabidopsis thaliana*: Wassilewskija (Ws) and Columbia (Col) were used. Plants were grown in Magenta^{R} boxes of 150ml gel with sufficient nutrients. Four treatments (T1-4) were compared: T1 and T2 with a single Col and Ws per box respectively, and T3 and T4 with five plants per box. T3 consisted of three Col and two Ws, in a checkerboard pattern with the center plant being Col while T4 consisted of two Col and three Ws, with the center plant being Ws. This allowed us to test how the center plant behaved in the presence of kin and non-kin. Images of four sides of the box were taken via high performance Nikon single-lens reflex digital camera. Skeletons of each root system were extracted digitally by cropping each image to include only one root system, running the new image through an edge-detection algorithm, and generating 2-D and 3-D root density graphs in MATLAB. T1 and T2 plants grew with semi-symmetry. However in T3, the center Col grew toward its non-kin Ws neighbors. The two corner Col grew into their backyard space in T3 if the center plant was kin but grew more aggressively toward the center plant in T4 if it was non-kin. In sum, Col appears to recognize its kin and non-kin and behaves differently.

Shelby Kemp and Michael Olson, Ph.D.

Department of Kinesiology

Low back fatigue influences postural variability

Low back muscle fatigue influences movement variability during static standing. Evaluating the variability of electromyography (EMG) signals from back and lower leg muscles is hypothesized to provide information explaining the difference in movement control between pre and post fatigue stance conditions. Purpose: To evaluate stance sway kinematics and muscle activity during static standing before and after paraspinal muscle fatigue. Methods: Eighteen healthy individuals (7 men, 11 women) (74.3 ±16.8 kg, 1.71 ± 0.12 m, 22.6 ± 4.5 yrs) participated. Each participant maintained isometric back extension (while seated) at 50% of the determined voluntary maximum, for up to 10 minutes, to fatigue the paraspinal muscles. During stance conditions, these individuals were instructed to focus on a target while standing with feet shoulder width apart. A multi-camera system was used to track markers positioned on each participant. From the kinematics data, variability of postural sway in the anteroposterior (AP) and mediolateral (ML) directions could be evaluated. Variability of the positioning and velocity of sway were analyzed. EMG data were collected bilaterally from thoracic and lumbar paraspinal muscle groups along with soleus and tibialis anterior muscle groups. EMG data were analyzed for signal variability differences. A one way ANOVA was used to analyze dependent variables between pre and post fatigue conditions. Alpha was set at 0.05. Results: AP sway variability did not change, but the AP sway velocity variability was significantly greater after fatigue ($p < 0.05$). ML sway was significantly greater after fatigue ($p < 0.05$) while ML sway velocity variability was not affected. The right lumbar paraspinal EMG variability decreased significantly (0.07 ± 0.03 mV to 0.0008 ± 0.0007 mV, $p < 0.05$) as did the left soleus EMG variability (0.006 ± 0.01 mV to 0.0031 ±0.005 mV, $p < 0.05$), with no changes in the other muscle groups. Discussion/Conclusions: It was hypothesized that analysis of variability would explain differences in movement control between pre and post fatigue conditions. Since muscle activity variability was either decreased or did not change, the proprioceptive components, which determine the parameters of movement for balance, may have been modified to induce modifications in sway variables.

Samantha Kevin, Ashani Hamilton, and Brian Small, Ph.D.

Department of Animal Science, Food and Nutrition and
Center for Fisheries, Aquaculture and Aquatic Sciences

Channel catfish cholecystokinin expression in response to different dietary soy products

The majority of U.S. soybean production goes into livestock feed, including fish feeds. Although fishmeal has been primarily fed to animals for its high protein content with a great balance of quality essential amino acids (EAA), it is not environmentally sustainable and has become cost-prohibitive for the production of several fish species. Wild populations of fish used in the production of fishmeal are declining and are insufficient to support the dramatic growth currently occurring in aquaculture production. Of the alternative plant -protein sources, soybean meal has the best known profile of amino acids to meet the requirements for fish growth. Even so, soybean meal may not be ideal due to anti-nutritional factors and observations of decreased appetite linked to specific soy proteins. In humans and rats, the observed decrease in appetite and food consumption is due to the major protein constituent in soybean, beta-conglycinin. It is thought that this protein inhibits appetite by causing an increase in the body's production of cholecystokinin (CCK), a hormone that inhibits appetite in vertebrates. As such, CCK stimulation may be a concern for aquaculture nutrition because of its negative effects on feed intake which could result in diminished weight gain in fish fed a ration high in soy protein. In this study, three dietary soy protein ingredients (soybean meal, soy protein concentrate, soy isolate) were tested and compared to a fishmeal control for their effects on CCK expression in channel catfish intestine and hypothalamus. Differences in the fold-change of CCK expression were observed. This research describes the effects of soy protein ingredients on central and peripheral regulation of CCK as a potential explanation for reduced feed intake in fish fed soy proteins.

Nathan Knight

University Museum

Planning, preparing, and installing a major museum exhibit

This project was centered on creating the “Faner at 40” exhibit that is currently on display in the University Museum North Hall. This process began with my mentor, Eric Jones, explaining the purpose of the exhibit and preparing me to acquire the resources and information needed for this exhibit. For the planning phase we first organized what would be presented in the exhibit. We did not want to focus on just the building itself, but also the impact it had on the University. This exhibit was designed to have four main sections: campus planning, concept and construction, a time line, and the art of Faner. Once we knew what each section was going to cover we were ready to acquire the needed photographs and information. The preparation of the exhibit is the most time consuming, and the most important. Since most of the exhibit would be displayed as images, these images had to be found and researched. I began by scanning several photographic slides taken by University photographers. These images were sorted for digital storing. We then gathered information from an assortment of locations. We spoke to an emeritus employee of University exhibits and searched through the Museum's collection of The Obelisk, a yearbook that was once produced by the University. I took new photographs from the same point of view as some of the old ones and used Saluki Alumni to fill in as models to create “then and now” posters for the time line section. Once the images were gathered, numbered, and properly stored, the exhibit could be created. After the posters were designed using Photoshop, I was able to print and install them. This exhibit will remain on display until March 6th, 2015.

Emily Koberstein, Sherrie Parks, and Stephanie Clancy Dollinger, Ph.D.

Department of Psychology

The relation between self-reported alcohol and cannabis use and prospective memory in college students

The aim of this study is to see if there is a relation between drug use and prospective memory performance. Prospective memory is the ability to remember to do something in the future and is a vital aspect of everyday living. Prospective memory can be broken down into short-term, long-term and event-based or time-based components. Most research on prospective memory has primarily examined differences between young and old adults (e.g., Einstein & McDaniel, 2005; Rendell & Craik, 2000; Schnitzpahn et al., 2014). The current study examined possible effects of self-reported alcohol and cannabis use on prospective memory performance. A computer based Virtual Week task was used to assess prospective memory; and a questionnaire was used to assess substance use in college students at a large Midwestern university. Prospective memory performance was examined in five groups; non-drug users, alcohol-only user, cannabis-only users, alcohol and cannabis users, poly-drug users. It was hypothesized that prospective memory scores would be lowest in college students who reported poly-drug use followed by students who reported combined alcohol and cannabis use. Alcohol-only and cannabis-only users were expected to have similar results, while non-drug users were expected to perform the best on the prospective memory task. Findings and implications of drug use on prospective memory in college students is discussed.

Henry Krol, Alicia Olechowski, and Reza Habib, Ph.D.

Department of Psychology

A review of literature comparing and contrasting implicit and explicit memory

Interest in human memory dates back thousands of years and its scientific study is nearly as old as the field of Psychology itself. During that time, one of the most important discoveries is that memory is not unitary but rather divided into systems and subsystems, each dealing with a specific type of information. At the broadest level, memory can be divided into short and long-term. Long-term memory can be further divided into episodic and semantic. Memory can also be divided phenomenologically - whether it depends on conscious or unconscious retrieval. This distinction is referred to as explicit memory and implicit memory, respectively. Explicit memory is the conscious retrieval of prior experiences whereas implicit memory reflects changes in present performance that are based on prior experiences but without the conscious retrieval of those prior experiences. An example of explicit memory is performance on a classroom exam -- information learned previously in the course must be brought to mind consciously so that it can be recorded on the exam booklet. An example of implicit memory is playing piano - prior experience enables a musician to play the instrument in the present, but playing the piano does not depend on conscious recall of prior learning episodes. Many variables have been shown to dissociate implicit from explicit memory. For example, whereas amnesic patients have difficulty recalling information explicitly, implicit memory in these patients is preserved. Similarly, whereas the capacity for explicitly memory increases from childhood to adulthood and then decreases into old age, implicit memory remains relatively stable across the lifespan. My project has involved reviewing and summarizing the research on implicit and explicit memory in order to write a review for Oxford Bibliographies, a website published by Oxford University Press that combines the best features of an annotated bibliography and a high-level encyclopedia.

Melanie Kurinec and Matt Purdy

Career Services

Impressive first impressions: A study of communication between student and employer

For this project, we tested how effective it would be to provide information to students prior to entering the career fair and how this would impact their overall performance at the event. Based on previous survey results, both students and employers felt that the in attendance could use improvement with career fair etiquette. This etiquette includes proper body language and introduction, such as handshakes and eye contact. This also includes how to effectively promote your skillset to an employer and build a strong, memorable connection in hopes of receiving a position.

We thought it would be beneficial to provide an informational session to the students attending while at the career fair so they have the proper etiquette and tips fresh in their minds while interacting with employers. One of our employers offered to host hourly informational sessions during the career fair to answer any questions students may have about interacting with an employer and to inform attendees of techniques that recruiters really like to see. Our intention was to improve the overall performance of the students attending the career fair but our results did not show an overall sign of improvement. After comparing surveys distributed to up to 110 students who attended the 2015 fair, the results appeared to be extremely similar to the survey results from the fall 2014 university career fair. Though this was a preliminary experiment, there is much that could be improved to produce better results.

Donald Larsen, Miru Tang, and Qingfeng Ge, Ph.D.

Department of Chemistry

DFT study of Oxygen Evolution Reaction on the FeOOH surface

A Density Functional Theory (DFT) study of solar water splitting, forming O_2 and H_2 from water on a metal-oxide surface, will allow people to use solar energy more efficiently and hopefully using FeOOH will maximize our yield. After using a DFT calculation instead of a different method gave us the most accurate and reliable conclusions. The FeOOH acts as a catalyst in this reaction because it allows for a much higher yield and is cheap enough to be cost-effective. Other metal-oxide have possibly worked better, but costs a lot more, and then in the long run it could be better to use the FeOOH versus the other metal-oxide. The main purpose of this project is to come up with a viable catalyst for solar water splitting via Oxygen Evolution Reactions and with the aid of a DTF calculation rather than experimentation. This project will also find an application with something in the near future, like jobs in a solar water splitting factory; maybe even a new resource for dependable energy.

Brian Laurore

Department of Mechanical Engineering and Energy Processes

Interlaminear sheer strength test with composites

In this research, the interlaminate shear strength in Carbon Fiber epoxy composite laminates was tested by short-beam method. Carbon Fiber consists of very thin filaments of carbon atoms bounded together with plastic polymer by pressures. Carbon Fiber is extremely important to the innovation of our society today. It is five times as strong as steel yet weighs two-thirds less. The short-beam test consist of a bar of rectangular cross section with two supports which the sample of carbonates is placed with the load midway between the supports. This work has found a positive the correlation of number of plies in the carbon composite laminate to the interlaminate shear strength. The data collected will be able to be used for screening materials or for quality control.

Asia Lee and Cheryl Burke Jarvis, Ph.D.

Department of Marketing

LGBT inclusivity in advertising in revealing the necessity for gender identity in out-of-closet advertising with the in group/out group association

Researchers have found sociological effects on consumer attitudes toward explicit homosexual content in advertising. In particular, the in group/out group association involves the social construction of group memberships among consumers. This research uses a multi-methodological approach to redefine the in group/out group association relative to biological sex, sexual orientation and gender identity in out-of-closet advertising. By connecting the social construction of marketing to the social construction of the in group/out group association this research further investigates gender roles in marketing. As a result, this study is expected to reveal a psychographic variable that is usually overlooked and subjected to either biological sex or sexual orientation in marketing; gender identity.

Kristopher Lewis

Department of Radio, Television, and Digital Media

Wonderreel

Wonderreel and WSIU Public Broadcasting collaborated on a research and creative project exploring the interest and appeal of international children's television programs. The Wonderreel consists of many international children's program genres and formats, historic and contemporary. The research was conducted at schools and afterschool programs in Carbondale and Herrin, Illinois. Nearly 200 children ages 7 to 11 were exposed to a series of short program videos and their responses were recorded. Data from observations, surveys, and interviews were analyzed and a results report was prepared. Photographic and video graphic recordings were captured throughout the research process. Wonderreel CEO Russell Miller consulted on the creation of a short documentary video of the research project. The video, *Wonderreel Content Preview in Southern Illinois*, was shared widely with all project participants and is available on WSIU's website at http://www.wsiu.org/educators. The video was shown at Cinekid international film festival in Amsterdam to a strongly favorable reception. In part as a result of the video, Wonderreel secured financing to proceed with the next phase of their business plan. Benefits of this project include the advancement of a valuable business concept as well as individualized skill development in creative media such as video editing, graphic design, and sound mixing.

Chen Li, Nicole Staples, and Gregory Budzban, Ph.D.

Department of Mathematics

Mathematical modeling in sports performance

As a nation whose sports' industries are highly regarded and followed, it is not surprising that mathematical modeling has begun to be widely applied to sports. Our project involves using data visualization and statistics to identify more accurate categories of players in the game of basketball. Traditionally, players are categorized into five basic positions but this may not be the best way to produce a successful team. We want to show that there are several more identifiable positions into which they fall. The two groups we have chosen to analyze are the Men's and Women's basketball teams of the NCAA Missouri Valley Conference. Separating the men and women into two different groups we normalized nine basic statistics based on time played. We then found the Euclidean distance between each player using the nine normalized statistics as individual feature vectors. The distances between the players help us to identify natural groupings that occur based on statistics alone. Utilizing a parallel-coordinates data visualization software package, we hope to show statistical and visual evidence of the existence of these "new" unidentified positions. These new positions could change the strategy basketball coaches use to recruit players as well as the combination of players they put on the court at one time.

Annie Linhart

Touch of Nature Environmental Center

Standard operating procedures for new high ropes course elements and a staff portfolio and evaluation system

Touch of Nature Environmental Center is home to several high-impact individual high ropes course elements. In recent years, we have added two more elements, a Pamper Pole and Zip line. These elements serve as experiential learning tools for a multitude of participants throughout the year. Since these elements are individual elements and not part of a traversing high ropes course our staff must learn all of the Standard Operating Procedures and nuances of each high challenge element. An updated Standard Operating Procedure (SOP) was created for both this year as well as a staff training guide for each. In addition to the SOP's, a new staff management system has been developed. This new system allows for Touch of Nature to monitor student worker and extra help workers' training and experience levels as well as provides a good starting point for workers to develop their own portfolio for future reference.

Destini Dawson, Sasha Litt, and Janet Fuller, Ph.D.

Department of Anthropology

Representing Spanish in communities: Comparing linguistic landscapes within Illinois

Spanish and English have co-existed for many years in the U.S. In the 1960s, the Latino population was estimated at roughly 6 million, where today those numbers have dramatically increased to about 50 million. Within Illinois, Chicago began seeing large numbers of Mexicans immigrants at the turn of the 20th century, soon followed by Puerto Ricans 30 years later. However, the history of Latino migration to southern Illinois is more recent, beginning in the late 20th century. After the 2000 Census, the media began to take special interest in the Latino segment of the population, as did companies and political parties alike. With all this new found attention, goods and services, and signs which advertise them, began to be directed toward these groups. The study of Linguistic Landscapes is the analysis of visibility of languages on public and commercial signs in a given territory or region. By looking at linguistic landscapes we can uncover language ideologies and how language embodies identity and community. Language commodification, or how language can be used for commercial exploitation, is yet another way the Spanish language can be explored in various contexts. During our research we wanted to look closely at how Spanish speaking populations are being represented throughout linguistic landscapes in Illinois. To do this, we traveled to Cobden and Carbondale in southern Illinois, and the neighborhoods of Gage Park, Humboldt Park, Albany Park, Little Village, and Pilsen in Chicago to take pictures of the linguistic landscapes to analyze the languages used there. Our findings indicate clear differences between southern Illinois and Chicago, with the former offering a very limited indication of the presence of Spanish speakers. In the linguistic landscape of Chicago, Latinos are alternately constructed as a poor, Spanish-speaking minority group and a bilingual, transnational market for everything from insurance to hamburgers.

Alicia Luebbers[1], Patricia Walker[2], and Sara G. Baer, Ph.D.[2]

[1]Department of Zoology and [2]Department of Plant Biology
and Center for Ecology

Influence of dominate grass ecotypes on community diversity and productivity

Guidelines for ecological restoration recommend seed should be collected within 160 km longitude and 321 km latitude of a restoration site. This recommendation is based on the assumption that seed of local ecotypes are locally adapted to a region. Species diversity is a common restoration goal and ecotypes could influence diversity through variation in their productivity. This study examined the role of ecotypic variation in *Andropogon gerardii,* the dominant species in tallgrass prairie, on diversity and productivity in restored prairies. Replicate plots were sown with equal amounts of *A. gerardii* seed from southern Illinois (SIL), eastern KS (EKS), and central KS (CKS) in an agricultural field. Plots were also sown with the same subordinate species. Rainfall interception shelters covered half of each plot to test ecotype responses to drought. We measured aboveground net primary productivity (ANPP) and species composition in September of 2014, six years after sowing. There were differences in total grass ANPP and total ANPP among the ecotype treatments. Total grass ANPP in prairie sown with the CKS ecotype was lower than the SIL ecotype ($P = 0.004$). Total ANPP in prairie restored with the SIL and EKS ecotypes was significantly higher than prairie sown with the CKS ecotype ($P = 0.002$). Species composition also varied among the ecotype treatments, with evidence for local adaptation in the focal species. Cover of *A. gerardii* was higher in prairie sown with SIL ecotype of this species relative to both EKS and CKS ecotypes ($P = 0.011$). Total forb cover was highest in prairie sown with the CKS ecotype ($P = 0.032$). Results suggest that the local dominant grass ecotype can have a negative impact on diversity (indicated by high grass production and cover). Thus, there may be a tradeoff between using local ecotypes of a dominant species and restoring biodiversity.

John Marchetta

Department of Physics

Casimir Levitation: Stabilization of a neutral atom above a dielectric ring

For some symmetrical geometries, specifically a hole in a dielectric plate, the Casimir energy varies non-monotomatically and produces a repulsive regime for certain polarizations. It has been shown that the Casimir force is repulsive only for spatial points very close to the plate, where the magnitude and region of repulsion is completely dependent on the radius of the hole. For large distances the effect of the hole become negligible and the force returns to being attractive. Because of this effect, there exist a point where a neutral atom centered above the hole is stable under perturbations on the axis perpendicular to the plate. However, the atom is unstable to lateral perturbations on the plane that is parallel to the plate and will fly off this stable point. In my project I am reducing the plate to an infinitesimally thin ring placed on the xy-plane and centered at the origin, constraining the atom to the positive z axis. I predict that there exist a certain angular frequency which we can induce on the atom, that is already stable in z axis, so that it stabilizes its self in the xy-plane, thus becoming fully trapped. The Leviton is a perfect analogy in magnetodyamics. Recently we found out that by adding a second ring to our model and placing the atom half the height of the two rings, while deviating it away from the origin, that the atom stabilizes under later perturbations on the xy-plane but now becomes unstable in the z-direction. However, just like the inverted pendulum, I believe forced vertical oscillation would create stability in the z-direction, finding another solution to completely trap a neutral atom above a dielectric ring. But most importantly, my project proves that you don't need a degree from the Hogwarts to possess the power of levitation.

Jacob Marler

Department of Chemistry

Prostaglandin Analysis: The use of flaxseed as a source of n-3 PUFAs to reduce PGE2 concentration, which is correlated to increased severity of ovarian cancers

Prostaglandins are proinflammatory fatty acids that are believed to play a role in the cause and severity of ovarian cancer. This experiment specifically analyzed Prostaglandin E_2 (PGE_2), which is the most common prostaglandin found in various cancers. It has been shown that a diet of flaxseed in hens has reduced the concentration of PGE_2 lipids, as well as the severity of ovarian cancer. The mechanism causing these reductions is the subject of some speculation, but at present is unknown. It is expected, however, that these decreases are a function of anti-inflammatory n-3 polyunsaturated fatty acids (n-3 PUFAs), in which flaxseed is rich. The objectives of this experiment were 1) to test for differences in PGE_2 concentration among the diet groups, and 2) to determine whether this data can be applied to clinical studies. Hens from the 4-FLAX harvest were fed 0 percent, 5 percent, 10 percent, and 15 percent flaxseed. Blood serum collected from these hens was tested using the Cayman Chemical PGE_2 ELISA kit, which is used to quantify PGE_2 concentration in plasma. Results have shown that these concentrations vary based on diet. Further testing is ongoing to examine the utility of this data.

Timothy Marshall, Bruce A. DeVantier, Kim Cole, and Lizette R. Chevalier, Ph.D.

Department of Civil and Environmental Engineering

Assessing the use of microbeads to remove chlorinated by-products

Polyethylene microbeads (PEMBs) are an emerging contaminant resulting from scrubbing particles in popular personal care products. Once released into water systems, these plastic spheres absorb polychlorinated biphenyls (PCBs) and other hydrophobic contaminates. If consumed by fish and other aquatic life, these pollutants move up the food chain. In a separate issue, water treatment facilities are increasingly focused on removing haloacetic acids (HAAs), and trihalomethanes (THMs), by-products resulting from the reaction of chlorine or bromine with organic matter in the untreated source water. The focus of the project was to assess if the sorptive properties of the PEMBs could be used to remove these by-products. In collaboration with the Carbondale Water Treatment Plant, Cedar Lake water was used to determine if the PEMBs could be used to reduce total organic carbon (TOC), HAA and THM. Preliminary tests showed that the addition of PEMBs (0.5 g/L and 1 g/L) increased the TOC 1.1% and 2.4% (4.60 mg/L and 4.55 mg/L) respectively, which suggest that there may be slight variation in TOC from sample to sample. However, THMs were reduced 10-12% in a separate experiment where concentrations of PEMBs ranging from 0.3-0.9 g/L were added. Additional testing on the sample with 0.8 g/L PEMBs indicated a 12.6% increase in HAAs compared to a raw water sample. These results suggest that the PEMBs may accelerate the HAA formation reactions and retard the THM formation reactions. The low variability in the TOC results may indicate a small hydrophobic portion of TOC in the source water. These preliminary results, although not conclusive, encourage additional testing.

Sean Martin

Department of Technology

Improving drone navigation and control with artificial vision

Recent improvements in the size and performance of consumer electronics are making Unmanned Aerial Vehicles (UAVs) more affordable and sophisticated. These improvements are also causing a surge of interest in UAVs, and a widespread desire to discover roles they can fill other than surveillance. Some applications include inspecting mines, oil and gas prospecting, or precision crop spraying. These developments trend towards more complex interactions between UAVs and their environment and operators. Improving these interactions requires more accurate navigation, and intuitive operator control. Both of these can be improved using an artificial vision system on board the UAV. Artificial vision allows both the operator to give commands by simple gesture, and also aids other sensors in precise navigation. However, no study has attempted implementing a vision system that performs these two functions on a stand-alone platform. Therefore, this research proposes an attempt to construct such a vehicle, and find if artificial vision is capable of performing both tasks without using computing resources outside of the UAV. Recently released technologies may make such an objective possible; the popularity of smartphones especially has driven down the cost, size, and power requirements of very powerful computing platforms. The project utilizes the researcher's experience in computer programming and electronics to explore improving a UAV's navigation and control; providing valuable insight into the challenges surrounding this combination of technologies.

Alyssa N Martinez and Deborah A. Bruns, Ph.D.

Department of Educational Psychology and Special Education

A review of cardiac conditions and surgical interventions in 84 cases with full trisomy 18

Trisomy 18 (Edwards syndrome) is the most prevalent disorder after trisomy 21 (Down syndrome) with approximately one in 4000 births (Jones et al., 2013). The condition is often described as "incompatible with life." Cardiac conditions like ventricular septal defect (VSD) and atrial septal defect (ASD), if untreated, can cause early demise (Pont et al., 2006). Authors emphasize the need to consider surgery on an individual basis rather than deciding against interventions based on the trisomy 18 diagnosis (Graham et al., 2004; Lorenz & Hardart, 2014; Muneuchi et al., 2011). The objective of the study was review of 84 cases with full trisomy 18 focusing on suspicion, confirmation and treatment of cardiac conditions to determine the likelihood of cardiac surgery and positive outcomes (e.g., longevity).

At birth, 65 responses indicated the presence of VSD (n=84, 77.4%), 38 ASD (45.2%), and 50 patent ductus arteriosus (PDA) (59.5%). When asked at time of survey completion (64 living, 76.2%), 64 (98.5%) responded with VSD, 36 (94.7%) ASD and 30 (60%) PDA. Several additional conditions were also identified in the sample including pulmonary stenosis (n=13, 15.5%), tetralogy of fallot (n=7, 8.3%), bicuspid aortic valve (n=3, 3.6%), double outlet right ventricle (DORV) (n=2, 2.4%) and aortic stenosis (n=2, 2.4%). Several cases demonstrated spontaneous resolution of cardiac defects without intervention. Twenty-four cases had one or more cardiac defects repaired for 34 total surgeries. Twenty-one cases were still living at time of survey completion (87.5%). Age at surgery varied from two weeks to 41 months of age with most performed under one year of age. VSD repair (n=15) occurred frequently followed by PDA (n=10 including two ligation procedures). Six surgeries were reported for ASD and three to repair TOF.

Claudia Martinez

School of Art and Design

Inclusive connections: Accessibility of art museums online and onsite

Throughout their modern history museums were easily accessible to the upper class, serving as sites for exhibiting cultural capital. With after-hours cocktail parties and hard-to-interpret wall labels, museums are built with barriers of access that have keep a majority of the public from both accessing works of art and from experiencing art within cultural spaces. Museums, however, have taken steps toward eliminating barriers of accessibility for non-traditional visitors by adopting free admission models; developing targeted outreach programs for adults, teens and kids; and providing assistance, such as audio guides, for specialized exhibitions. Interestingly, the Internet has influenced visitors to demand museums additionally be accessible online, particularly with the transparency of their collection information. As vast collections are becoming readily available for cultural consumption, museums must consider what is the value of online access in regard to onsite access. Furthermore, audiences must consider the authenticity of museum efforts for engagement as museums strive toward becoming inclusive institutions.

Lea Matschke, Travis Neal, and David Gibson, Ph.D.

Department of Plant Biology

Does the invasive species Achyranthes japonica form a mutualistic relationship with mycorrhizal fungus?

Achyranthes japonica (Japanese chaff flower) is an invasive, perennial plant present in nine states. This species is particularly detrimental to native species as it grows tall and produces large numbers of seeds. In optimal conditions, chaff flower plants can grow up to three meters tall and produce up to 2,000 seeds. Areas often become heavily infested with the plant after shading from the leaves of the plants limits competition and the large seed outputs leads to a high density of seedling recruits. In order to investigate how to control chaff flower, understanding the plants' relationships with other organisms is important. An experiment was undertaken with the objective of determining if chaff flower could utilize mycorrhizal fungi for the uptake of nutrients. There were two experimental treatments: a soil treatment and a mycorrhizal inoculation treatment. Field soil from a southern Illinois chaff flower population was mixed with sand to reduce the phosphorous content of the soil, which is the nutrient most critical for mycorrhizal utilization. The soil treatment had three levels: autoclaving to ensure sterilization, microwaving to reduce all of the soil biota including fungi and bacteria, or untreated control. The mycorrhizal treatment was established following soil treatments by inoculating half of the soil in each treatment group with endomycorrhizal spores. Chaff flower plants were allowed to grow from seed for 121 days in the soil of each experimental group. The number of nodes and height of each plant were measured periodically throughout the experiment, and the biomass was measured at the conclusion of the experiment. The numbers of nodes and heights of the plants with exposure to mycorrhizae was generally higher than the plants without exposure to mycorrhizae only in the microwaved soil treatment group. In addition to this, a staining procedure was used to view any mycorrhizae colonized on the roots of the chaff flower plants.

Jacquelyn McCune

Wellness and Health Promotion Services

2015 Alternative Spring Break evaluation

The Alternative Spring Break (ASB) program was originally implemented at SIU in 2013, with 2015 marking its third year of operation. The ASB program was patterned after a national program called, "Break Away." The goal of Break Away is to move students along an "Active Citizen Continuum," where they go from being unconcerned about social or environmental problems to making social or environmental problems a priority in their lives (Break Away, 2013). Previous research (Raman and Pashupati, 2002) suggests that motivation, understanding, and service-learning outcomes (i.e., participation, knowledge, self-behavior) can affect one's position and movement along the active citizen continuum. Using these, and other process evaluation measures within a single-group, pre-post quasi-experimental design, this report assesses the extent to which the ASB experience was able to meet its objectives, and provides evaluative feedback regarding students' experiences with the program.

Siedah McNeil and Christina Campbell, Ph.D.

School of Social Work

Crime type predictive validity of YLS/CMI

The Youth Level of Service/Case Management Inventory is a popular assessment tool used for determining the treatment or intervention needs of juvenile delinquents. The YLS/CMI measures eight risk domains that are used to predict the likelihood of juvenile re-offense. The validity of the YLS/CMI has long been examined and the results suggest that the predictive validity of the YLS/CMI fares better for some youth than it does for others, for example in some studies, the YLS/CMI best predicts re-offense for males regardless of race as compared to females. This study examines the predictive validity of the Youth Level of Service/Case Management Inventory (YLS/CMI) and its applicability to recidivism crime type across race and gender. A second focus of this study examines how the treatment needs as determined by scores within the eight risk measures on the YLS/CMI fare in respect to re-offense crime type. Using recidivism case samples from a Midwest Juvenile court (n=1728), this study looks at the type of crime committed by the youth, their total YLS/CMI score, ethnicity, and race. The results of a ROC analysis show that the YLS/CMI predicts person, property, and status re-offense charges well for African American females but only drug re-offense for White females. The results also show that the YLS/CMI has validity in predicting re-offense charges for person and property charges of African American males and property charges for Hispanic males but drug and person charges of White males. The results of a multiple regression analysis suggest that higher scores on select risk domains are related to re-offense crime type. These preliminary results find that the YLS/CMI not only predicts differently for youth of variant gender and race but also for different crime types. These findings imply that the YLS/CMI assessment tool lacks validity in predicting equally well across gender, race, and re-offense crime type of youth. These findings also suggest that because those youth who score high on a particular domain of the YLS/CMI may be crime type specific, interventions can be better informed.

Siedah McNeil and Elisabeth Reichert, Ph.D.

School of Social Work

Human rights and dignity through the lens of Holocaust history

The Holocaust is rarely associated with human rights. Yet its occurrence was a pivotal point in defining human rights as we recognize them today. This project outlines the period of time leading up to World War II, highlighting the horrific events that took place during the holocaust, and the progression of human rights that followed. Recollections and observations from a short-term study abroad to Munich, Germany are used in analyzing the development and evolution of human rights and dignity. This project offers a conceptual framework for the existence of the right to humane treatment and other inherent liberties.

Shannon McQueen[1], David A. Burkart[1], Derek J. Fisher, Ph.D.[2], and Alessandro M. Catenazzi, Ph.D.[1]

[1]Department of Zoology and [2]Department of Microbiology

Assessment of antimicrobial properties of peptides derived from skin secretions of South American frogs

It has been demonstrated that frogs produce antimicrobial peptides as part of their innate immune system. These antimicrobial peptides protect the frogs from contracting many diseases in nature. The purpose of this project was to test peptides isolated from the skin secretions of three species of South American frogs (*Hypsiboas gladiator*, *Gastrotheca excubitor* and *Gastrotheca nebulanastes*) for antimicrobial activity against two gram negative bacteria, *Escherichia coli* and *Chlamydia trachomatis*. As *C. trachomatis* may only be cultured in eukaryotic cells, the peptides were first screened for cytotoxicity against human (HeLa) and mouse (L2) cells lines using a neutral red viability assay. Peptides from *H. gladiator* were cytotoxic for both cell lines. Consequently, the peptides from *G. excubitor* and *G. nebulanastes* will be tested for antimicrobial activity against *C. trachomatis* and the peptides from *H. gladiator* will be further evaluated to determine the potency at which the peptide kills 50% or less of the cells tested and the specific peptide responsible for the cytotoxic effects. To assess antimicrobial activity of the peptides against *E. coli*, bacteria were incubated with 1 mg/ml of peptides and then plated on solid medium to measure viability. Under the conditions tested, no significant differences between the solvent control and the experimental samples were found. Future experiments will focus on whether anti-chlamydial peptides are present in the samples and the study will be expanded to include a gram positive bacterium along with studies looking into the cytotoxic properties of *H. gladiator* against mammalian cells. Overall, the project has potential to discover novel cytotoxic peptides that could prevent the transmission of bacterial and eukaryotic diseases.

Jonathan M. Meats, Matthew T. Springer, and Clayton K. Nielsen, Ph.D.

Department of Forestry and Cooperative Wildlife Research Laboratory

Use of Capsaicin as a deer depredation deterrent on soybeans

White-tailed deer (*Odocoileus virginianus*) cause agricultural damage across their range causing the commercial production of deer deterrents. Capsaicin has been shown to have positive results within enclosures at reducing white-tailed deer browsing, but has not been tested outside of these environments. During 2014, we established 50 plots (10.76 ft²) each in 3 soybean (*Glycine max*) fields in Southern Illinois. We assigned 1 of 5 treatments to these plots: fenced (no deer browse), control (unfenced), and 3 concentrations of Millers Hot Sauce® (the recommended amount (0.062%), and 25 (1.55%) and 50 (3.1%) times the labeled recommendation). Plots were treated with capsaicin every 3 weeks beginning immediately after planting. We conducted weekly browse surveys to determine if browse rates by deer varied across soybean growth and time since treatments. We harvested plots by hand in October and weighed s oybeans to obtain yield estimates. We ran ANOVA blocking on fields to test for differences in biomass removed between treatments, week since planting, week since treatment, and overall yield. Browse rates differed between treatments ($F_{3, 116}$= 3.19, P=0.023) with higher concentrations of capsaicin having lower biomass removal. As soybeans progressed in development, biomass removed decreased ($F_{11, 1420}$= 76.7783, $P < 0.001$) and time since treatment showed increases in browsing rates ($F_{2, 1420}$=17.938, $P < 0.001$). Yield differed between all treatments ($F_{4, 146}$ = 10.215, $P < 0.001$) with recommended dosage plots and control plots having the highest yields. Our findings support previous research showing increases in yield from deer browsing occurring at moderate levels.

David Mersman

Department of Psychology

Does mindfulness predict the ability to shift cognitive focus?

The current study examines whether the ability to shift cognitive focus during a motor-skill task is associated with self-reported levels of mindfulness. Mindfulness was estimated by having participants reflect on a recent activity, and then complete the Flow State Scale, which divides the chosen activity into nine dimensions: challenge, action, goals, feedback, concentration, control, loss, time, and enjoyment. Motor-skill performance was then assessed with a computer-based manual-tracking task, during which participants used the mouse to track the path of a moving object. During the first half of the tracking task, participants were instructed to focus on either the movement of their hand (internal focus of attention, or FOA) or the onscreen cursor (external FOA). After completing half the tracking trials, participants were then instructed to switch their focus (from internal to external or vice versa). There are two important, preliminary findings. First, switching from internal to external FOA significantly improved tracking performance. Second, we also found that one of the nine dimensions on the Flow State Scale (concentration) was significantly correlated with how much participants improved when they switched from an internal to an external FOA. These findings support the idea that individual differences in mindfulness (concentration) may influence the ability to shift cognitive focus from one aspect of experience to another.

Matthew J. Meyer and John T. Legier, Ph.D.

School of Information Systems and Applied Technologies

Developing best practices in an online environment for place-bound/nontraditional students using the Desire2Learn (D2L) learning management system

Higher education has seen a significant increase in the enrollment of place-bound and nontraditional students in both online courses and online degree programs. Contributing factors to the increased online enrollments are being driven by the wide spread use of technology, student's access and flexibility to courses, and economic factors. Along with this growing access to the online educational environment barriers to student success includes: 1) ineffective instructional course designs, 2) usability, 3) readability of the course content, and 4) poor navigability within the online course. This research will evaluate the present Learning Management System (LMS) Desire2Learn (D2L) and focused literature reviews for best practices in development and delivery of online courses to place-bound and nontraditional students. Course shells will be developed based on literature reviews and the capabilities of the D2L LMS. Focus groups and surveys of nontraditional students will be used to evaluate and provide feedback on course design, presentation, navigation, readability, usability, and organization of activities and materials within the online course. Recommendation and best practices will then be implemented into the development of 12 Technical Resource Management (TRM) program online courses. Results of this research will be disseminated to all program faculty and adjuncts that teach in this online program, as well as, the educational profession that instructs both place-bound and nontraditional students.

Elijah Mihalik

Department of Chemistry

A DFT study of CO_2 reduction process

Metal-Oxide substrates can be used to reduce the amount of CO_2 in the atmosphere by serving as a catalyst for the reacting of CO_2 with H_2 into other, ideally, less harmful products, through the use of intermediaries. In this study, the surfaces SnO_1 and $SnO_{0.5}$ were used to study CO_2 reduction reactions. The first step was to determine which substance, CO_2 or H_2, bonded more readily to the surfaces of the substrates. After figuring out which species reacted more readily, I determined what intermediaries formed allowing for the combination with the substrate. I then determined how the other substrate reacted with these intermediaries, what products resulted, and the paths taken to reach these products. The results for both substrates were compared to determine which, of the two substrates, might be a more efficient option for removing CO_2 from the atmosphere.

Alyssa Miller

Department of Microbiology

Antibody responses in mice immunized intranasally with 20 nm nanoparticles conjugated to ovalbumin

A number of viral and bacterial pathogens such as influenza virus, SARS, *M. tuberculosis* etc., infect their hosts via epithelial surfaces of the respiratory tract. The nasal mucosa is often the first point of contact between the respiratory pathogens and their hosts, thus inducing local mucosal immunity in addition to systemic immunity is critical for protection against these pathogens. Work by other groups has shown that nasal antigen administration induces systemic, as well as mucosal immune responses. Nasal immunization also induces immune responses in the distal mucosal sites such as the female reproductive tract (FRT). Previously, our group has investigated the immunogenicity of chicken Ovalbumin (Ova) delivered by small-sized nanoparticles (NPs) and examined both systemic and mucosal immune responses in mice. Intranasal (i.n.) priming with 20 nm NPs conjugated to Ova (NP-Ova) induced systemic IgG1-dominated antibodies. A second sub-cutaneous (s.c.) immunization with Ova in complete Freund's adjuvant (Ova+CFA) or i.n. immunization with NP-Ova significantly boosted serum IgG1, IgG2c, as well as IgG1 in the intestinal and the FRT secretions. Here I have used ELISA to further characterize the antibody responses to NP-Ova initiated by different prime-boost strategies. I focused my analysis on the Ova-specific antibody response at two distal mucosal sites; namely the intestine and the FRT. These findings indicate that Ova conjugated to 20 nm NPs reach the internal milieu in an immunogenic form and induces mucosal and systemic immune responses without the use of adjuvants. This research will shed light on effective prime-boost immunization strategies for the development of successful mucosal vaccines and therapies.

Shelby A. Moore, Mary E. Kinsel, Ph.D., and Gary R. Kinsel, Ph.D.

Department of Chemistry and Biochemistry

Quantitative determination of methimazole in veterinary pharmaceuticals

Hyperthyroidism (i.e., an over active thyroid gland) is a disorder common in older cats. Cats having hyperthyroidism suffer weight loss despite exhibiting increased appetite and food intake. Methimazole (mercaptomethylimidazole) is prescribed for the medical management of this condition. Because methimazole has a bitter taste, it is compounded into a meat-based chewable tablet to improve palatability. The purpose of this project is to develop an analytical method to quantitatively determine the amount of methimazole in compounded meat-based tablets. The methimazole is extracted from the tablet using a simple solid phase extraction, with the solvent composition being dependent on the meat base of the tablet. The extracts are analyzed by High Performance Liquid Chromatography (HPLC) and the isolated methimazole with an internal standard is detected using an ultraviolet-visible detector at 254nm. The results for methimazole spiked tuna and liver based chews will be presented in this poster. Specifically, statistical data focusing on percent recovery and inter-sample variability will be discussed. For the tuna flavored chew the percent recovery is 79.77% with a standard deviation of 0.929. The percent recovery of methimazole from the liver flavored chew is lower than that obtained from the tuna based chews. Optimization of the extraction protocol from the liver based chews included evaluating different solvent compositions and the influence of temperature. Potential use of the developed extraction method and subsequent analysis for quality control of compounded methimazole will also be discussed.

Leslie Murray and Robert Hahn, Ph.D.

Department of Philosophy

Pythagoras, metaphysics and the secrets of ancient geometry

Pythagoras achieved fame for his mathematical and philosophical contributions to civilization. He was also well known for his contributions in astronomy, music, and metaphysics. Pythagoras is most widely known by the theorem that bears his name. Is it possible that ancient mathematicians saw a connection between the cosmic structure of the universe and the shapes that have emerged through mathematical shapes and formulas? Evidence of this knowledge can be traced backwards through history beyond the Greeks to the Ancient Egyptian's where Pythagoras was thought to have studied for twenty-two years. Ancient Geometry expert and historian Tons Brunes reveals a possible key to unlocking the secrets behind these ancient mysteries by detangling the hieroglyphic information of the Rhind Papyrus. This work may be the first step in understanding the relationship between geometry and metaphysical thinking that has been hidden for centuries. Brunes reveals a link in the Rhind Papyrus that connects the symbolic eight pointed star to the evolution of geometric thinking, ancient construction, and architecture. Brunes has potentially discovered a Rosetta stone for ancient mathematical conversion. He also illustrates how the eight pointed star could be used in multiple applications from accurate column construction to surveying large areas. These notions also reveal the emergence of a connection between geometry and the correspondence theory of truth and similitude theory of reference.

Aaron Neal and Robert Konzelmann

School of Architecture

Architectural tectonics in contemporary design

Architectural tectonics is the study of the relationships between design and construction, between representational and ontological, between assembled and massed, and between surface and substance. A significant thread of this theory is the understanding of the architectural joint. The joint serves as a point of connection in our assembled environment, be it physical, social, or symbolic. This research project, although covering the entirety of tectonic thought, specifically has focused on the role of the joint or detail in the creation of contemporary architecture. We start with the study of several prominent architectural works, examining their tectonic makeup, and the details associated with such buildings. This study led to the creation of a set of diagrams that graphically demonstrated how these architectural joints effected the overall design and construction of these works. During this process, one joint in particular stood out to us. The wooden chidori Joint, as used by architect Kengo Kuma, is a connection between wooden members that uses no adhesives of fasteners. This joint is used over and over again to create an entire building. The chidori provided an ideal platform for understanding the scale relationship between the detail and the whole, a construction that can sit in the palm of your hand and one that houses 40 employees. The culmination of the study was the construction of a new piece, founded on the knowledge gained through the study of the chidori, but with a new purpose and a new scale.

Darmez Nelson, Chelsea Vanderwoude, Anke Lehnert, and Chad Drake, Ph.D.

Department of Psychology

Implicit personality: A pilot study on the stability of cognitive repertoires

I will be using the Implicit Relational Assessment Procedure which was first used by Hughes, Barnes-Holmes, and De Houwer (2011) to determine if participants are introvert or extrovert. It uses latency and event related potentials to determine how a person really is. I used a test-retest reliability over a six week period. Participants took the same IRAP once a week for six weeks. I used a small sample of three college age students. We attempted to measure something stable which was personality. Participants should be consistent throughout the six week period. Once the participants completed the final IRAP, I would then chart the data and look for any trends. With the small sample my data has been moderately supportive. If the data is truly supportive then that means that people are introvert or extrovert with any given situation.

Amanda Novak and Zhengui Zheng, Ph.D.

Department of Physiology

The developmental mechanism of nipple loss in male mice

In humans, both males and females are born with nipples, but only the females possess mammary glands that allow them to feed their young. In mice and rats, however, only females have nipples. The males do not have any mammary glands and have lost the nipple. In recent years, it's been found that men and women have an increased breast cancer rate. Clearly, male mice are unable to develop breast cancer. By understanding the mechanism of nipple loss in male mice it will help to understand nipple formation in men. This study holds the potential for significant medical discoveries because by determining the mechanism behind nipple development and loss and comparing the two species, it will allow for a small window of understanding the human physiology behind breast cancer. Guinea pig males have nipples similar to humans; mice and guinea pigs are ideal models used to comparatively reveal how male mice lose their nipple. We compared male and female guinea pig nipple development with mice and found in male and female mice the nipple begins to develop around embryonic day (E) 11.5. At about E14-15.5, the males experience strong cell death, which results in the male mice born without a nipple. At approximately E23, the nipple begins to develop in guinea pigs in both sexes. At E30, which is similar to mice E15.5 in other organ development, both male and female guinea pigs have developed nipple buds and no cell death was detected. However, both sexes experienced similar cell death around E35, which is when the mammary epithelium starts to form. In order to discover the mechanism of cell death, androgen and estrogen receptors and key gene expression in the mammary glands and nipple formation will be compared and presented.

Saheed Obitayo and Harvey Henson, Ph.D.

Department of Geology

Remote sensing at Fort Kaskaskia using EMI surveying

Fort Kaskaskia is a state historical site near Chester, Illinois, on a hill overlooking the banks of the Mississippi River. The village of Kaskaskia was established at the opening of the Kaskaskia River as a missionary post. Shortly thereafter, settlers from other regions particularly Quebec and Louisiana began to move towards the farmland of the Mississippi valley and built a village and settlement around the region. The Fort was under construction by the French in 1759 after they had claimed the region around 1703. This Fort was designed to protect the village of Kaskaskia. The fort may never have been completed and it played no role in the French and Indian War. In this study, we focused on the interior and nearby exterior of Fort Kaskaskia which was last used by local residents for protection fearing attack by Britain's Indian allies during the war of 1812. The objective of this study was to locate subsurface features related to the history of Fort Kaskaskia which might give us an idea as to how it was used and by whom. To do this, we used the GSSI EMP 400 profiler which sends induced frequency currents into the subsurface of the earth and records the apparent conductivity along with a GPS location. We then use the Surfer software to create maps of the area using GPS coordinates. We set the EMI-profiler to three different frequencies so as to observe underground anomalies. The results indicate interesting anomalies on the west side of the fort while the central area has little or no anomalies. These results could tell us more about the history of the Fort. Analysis for the results are still ongoing.

Olivia O'Donnell and Valerie Boyer, Ph.D.

Rehabilitation Institute, Communication Disorders and Science

An evaluation of Southern Illinois primary care physicians' autism spectrum disorder screening techniques

The purpose of this study is to evaluate current primary care physician (PCP) screening techniques for Autism Spectrum Disorder the Southern Illinois region. In order to assess regional PCPs, it was pertinent to obtain the ones most commonly utilized by the area. By looking into the Center for Autism Spectrum Disorder's (CASD) intake database, we were able to view what PCPs are being utilized by the children referred to the CASD. It is essential for PCPs to understand and seek out behaviors commonly associated with ASD such as: lack of eye contact, delays in language, and repetitive movements (Caronna & Tager-Flusberg, 2007). When a PCP suspects a child of having ASD, it is of utmost importance that the child be referred to special services, because early intervention has proved to yield more successful outcomes in children with ASD (Corsello, 2005). Thus, after an exhaustive literature review of current ASD screening techniques, we have determined that in order to successfully screen for ASD, PCPs should do the following: be aware of signs and risk factors of, use ASD specific screening early in development, and refer to community resources as soon as suspicion arises (Johnson & Myers, 2007). Once we assessed the information that we accumulated, it was appropriate to create an online survey for PCPs to complete. We sent out links to the survey along with an explanation of the study that we are conducting to all 44 PCPs. We obtained the addresses of each PCP's office from an online search engine. Unless there was more than one PCP at any given facility, we addressed the letters to each PCP personally. We are using the feedback the PCPs gave us with the survey to analyze the difference between current national practices and current regional practices in hopes to bridge the gap so that children with ASD can have a quick referral to the surfaces they require.

Jordan O'Malley

Department of Marketing and Graphics

Poster design process for SIU's Spring 2015 Drag Show

Southern Illinois University Carbondale is known for taking pride in diversity among students. Perhaps when most think of diversity they are more inclined to specifically relate the term to race or religion but being a diverse campus is more than that. Diversity is all-inclusive. Many different characteristics make up diversity including sexual orientation and gender identity. SIU Carbondale is a proud ally to the L.G.B.T.Q. (lesbian, gay, bisexual, transgender, queer) community. While the official group's name has changed a few times from first being established in 1971, their mission has encompassed the same standing values. Saluki Rainbow Network claims, "We're here and we're queer (well, some of us are) and we fight for and strongly advocate for equal rights for our community and the equitable treatment of all people." This year the SIU Student Center teams up with Saluki Rainbow Network to put on the 17th Annual Spring Drag Show. I am a passionate ally of the LGBTQ community. I was honored and excited when presented with the proposal to create a poster advertising for the Drag Show. Drag shows at SIU Student Center are one of the better-attended events throughout the year. The shows can be exciting to watch but are also positive outlets of self-expression for those performing. Through the poster design process, my objective was to express myself as an artist and designer, as well as represent the SIU Spring 2015 Drag Show with a playful and intriguing approach.

Konstandinos Papazoglou, Dustin Seidler, and Benjamin Rodriguez, Ph.D.

Department of Psychology

An examination of social anxiety in college students

This study examines the experiences of social anxiety in undergraduate college students enrolled in an introductory psychology course. Specifically, the study examines the reliability and validly of several commonly used measures of social anxiety (e.g., the Social Phobia Inventory (SPIN), Liebowitz Social Anxiety Scale (LSAS)). Additionally the study will employ a Visual Analog Scale to assess social anxiety experienced in specific situations frequently encountered by college students. It is hypothesized that the SPIN and LSAS and their subscales will be positively related to each other as well as to the self- reported anxiety in specific social situations as reported on the visual analog scales. Based on previous research it is also expected that female participants will report more social anxiety in general and in specific situations compared to males. Finally comparisons will be made between the current sample and previous samples of undergraduates collected in prior studies with regards to level of social anxiety.

Gene Park

Department of Cinema and Photography

Recording collections of art in an educational institution

Finding a permanent method to record works of art in this era has never been more important than ever. Powerful consumer-level computers are available today and in conjunction with remarkable image capturing technology, there is no reason why every artist's work is not documented and stored digitally. It may not be the same to view the Mona Lisa on a computer screen as compared in person, yet the possibility that anyone with a computer and Internet access could view a high-quality version of it at all speaks volumes in it of itself. Not everyone have the ability to visit the Louvre, but access to the Internet becomes easier day-by-day. Many educational institutions encompass a museum of their own, and Southern Illinois University is no exception. SIU's museum contain countless, priceless works of art within its inventory; the solution to store these works digitally allows the museum to archive, append relevant information and provide a copy to these images publically if need be. Another reason to maintain digital imaging is to keep a viable record of special events, such as exhibitions and shows. Since the camera offers the ability to freeze time, documenting installations and especially student's art shows throughout the lifetime of the museum provides another witness to the history of this organization. In the end the results will be a culmination of this record-keeping process: an outlook highlighting the importance of retaining a copy of artwork and life within the museum world.

Jaclyn Parks

Department of Microbiology

Antibody responses in mice immunized vaginally with nanoparticles conjugated to ovalbumin

Nanoparticles (NPs) are increasingly being used for drug delivery and vaccine development. In spite of the progress in the field of vaccinology, there has been little or no progress on development of mucosal vaccines that target sexually transmitted infections (STIs) such as HIV, gonorrhea, syphilis, chlamydia etc. Local immune responses in the vaginal tract can help prevent STIs or limit the severity of disease symptoms, though it is generally thought that the mucosa of the FRT is a poor site for induction of immune responses, and very little is known about the modes of vaccination that would maximize both local and systemic immune responses. Our group has previously shown that 20-40nm NPs can be internalized by the ECs of the female reproductive tract (FRT); specifically the ECs of the uterus and vagina. When NPs are applied vaginally, they could be observed in the lymphatic ducts that drain the FRT, as well as the local draining lymph nodes within one hour of instillation. Furthermore, our group has investigated the immunogenicity of chicken Ovalbumin (Ova) conjugated to 20 nm NPs (NP-Ova) applied vaginally in mice. Vaginal priming with NP-Ova induced systemic IgG1-dominated antibodies. A second sub-cutaneous (s.c.) immunization with Ova in complete Freund's adjuvant (Ova+CFA) significantly boosted serum IgG1, IgG2c, as well as IgA in the intestinal secretions. Here I have used ELISA to further characterize the antibody responses to NP-Ova instilled vaginally. I focused my analysis on the Ova-specific antibody responses at two mucosal sites, the intestine and the FRT. These findings indicate that the FRT mucosa has mechanisms by which antigens from the FRT lumen are internalized and transported to the internal milieu, where an immune response is initiated.

Kaitlyn Pasel

Department of Psychology

A retrospective study of the relation between changes in family structure, transitions and academic performance

This project will retrospectively examine the potential impact of changes in family structure throughout a person's lifetime, as they are related to, academic performance and overall adjustment into college. Considerable research has been conducted examining the effects of divorce on a child. This study will extend this research by considering not only the initial divorce but also subsequent changes thereafter. This study will use a sample of college students from Southern Illinois University. Students enrolled in PSYC 102 that have agreed to participate in the study will be administered a questionnaire to assess the number of family transitions they have experienced (e.g., if and when parents divorced, remarriages, cohabitations, and significant breakups). They will also be asked to report their graduating high school GPA and SAT/ACT scores. Finally, the students will also be asked questions to assess how they are transitioning into college. The hypotheses are as follows: 1) It is expected that students that come from a home with two or more structural changes will exhibit lower academic achievement then those with one or fewer changes; 2) students that come from single-parent or step families will have more difficulty transitioning into college than those from intact two-parent homes. Findings from this study may contribute further to our understanding of effects of changes in family structure on individual development.

Jacob Patsch and Harvey Henson, Ph.D.

Department of Geology

Noninvasive geophysical investigation at Bridges Tavern and Wayside Store using EMI surveying

About 175 years ago Southern Illinois was a part of a tragic, yet significant, historical event. In 1830 President Andrew Jackson created the Indian Removal Act which demanded all Native American groups remaining in the eastern states of the United States to relocate west of the Mississippi River. A portion of the trail that over 12,000 Cherokee traveled along, passed through the southern part of Illinois entering at Golconda, IL and leaving over the Mississippi River north of Cape Girardeau, MO. This was a disastrous event for the Cherokee people and thus named the Trail of Tears.

In this study we focused on one specific site in southern Illinois that is strongly believed to have been a popular resting and trading point for the Cherokee. The Bridges Tavern and Wayside Store site along the Trail of Tears has already had a number of studies conducted on it to find proof of Cherokee settlement; many of them with promising results. This study takes a different, and non-invasive, approach to locating subsurface features related to the Trail of Tears event. We have taken an archeo-geological approach using the Profiler-EMP 400, which sends multi-frequency induced currents through the subsurface of the earth and records the apparent conductivity of the subsurface material(s) along with GPS locations. The Surfer (version 9) mapping program was used to input the conductivity data and create maps of the target area using the GPS coordinates. Several interesting underground anomalies were observed in the data which probably relate to the original Bridges Tavern and Wayside Store buildings and that could help prove this site was once part of the Trail of Tears historical event.

Brooke Patton and Scott Ishman, Ph.D.

Department of Geology

The impact of foraminiferal size variance on stable isotopic composition

The use of stable oxygen and carbon isotopes analyzed from foraminifera has become a standard in reconstructing past oceanographic conditions. These aid in the understanding of certain aspects of global climate change, including carbon isotopic compositions as indicators of changes in the global carbon budget and deep ocean circulation, and oxygen isotopic change reflecting temperature and ice cap volume change. Therefore, understanding what affects foraminiferal isotopes is essential, as it contributes to an understanding of carbon and oxygen fractionation, as well as various conditions during the Cretaceous, Tertiary, and Quaternary Periods. In this study, foraminiferal samples from multiple Antarctic cores were analyzed for their delta O18 isotopic values, and O18/O16 standard deviation. These analyses were used to test the hypothesis that size variation in the foraminifera results in systematic variability in their oxygen isotopic values. The variance in size was calculated as a difference between the largest and smallest foraminifera (microns), and was correlated with the average standard deviation for the species *Globocassidulina subglobosa*, *Neogloboquadrina pachyderma*, and *Bulimina aculeata*, three of the most prevalent species throughout the cores. It was determined that the standard deviation was not dependent upon size.

Madeleine A Pfaff and Eric M Schauber, Ph.D.

Department of Zoology

Effects of prescribed burns on ticks in Southern Illinois

The use of prescribed burning is a common forest management practice in southern Illinois. The use of fire changes forest ecology, including habitat characteristics and host dynamics that affect ticks. We compared tick occurrence between burn sites at various stages of succession post-burn (0, 1-2, 3-5, and >10 years), as well as white-tailed deer use of these sites.

Geovane F. Piccinin

School of Information Systems and Applied Technologies

A report of lessons learned during the development of a web system application

Although, software engineering has evolved during the last years, software development keeps being a very hard and complex task. We have learned with the experience and many methodologies, tools and process appeared to support the development reducing the time, cost, complexity and chances to fail. In fact, these are very good news, but it also means that the inexperienced software engineers or students of that field have to spend a long time learning these artifacts before to develop software professionally. There are so many options of programming languages, Integrated Design Tools (IDE's), methodologies and etc. that is difficult to cover all these concepts in a Software Engineering Class (for example) and to train the students creating an entire system taking care of all details related with the software within the semester. Because of that, it is a good approach if the students can get involved in real-world projects and experience the different issues that may exist in software development that are not covered in formal classes. Based on that, this work suggests an analysis of a software developed by students (called TUP Viewer, an Educational tool for Tobacco Cessation Treatment Planning) and the methodologies and processes used to manage it. The objective is to report our experience and identify the issues we faced and what were the points that we had difficulties because inexperience. Our lessons learned, a look of the code and structure of the system, and suggestions that can be used for students as an educational reference in software engineering will be presented.

Daniel Pineau and Sarah Kertz, Ph.D.

Department of Psychology

An examination of the moderators to the effect of a brief mindfulness intervention for acute pain

Mindfulness interventions have become increasingly popular, and have been incorporated into many forms of cognitive-behavioral therapies. Emotion regulation refers to the skills one has developed and maintained that can alter the emotions that they experience. Distress intolerance has been cited as a risk factor for the development of mental disorders. This study aims to analyze whether or not mindfulness as a stand-alone procedure, would be effective for individuals with high or low levels of emotion regulation and distress intolerance.

Participants are asked to complete a battery of surveys, including the Distress Intolerance Index (DII) and the Emotional Regulation Questionnaire (ERQ). Participants then completed a cold-pressor task (CPT), namely a vat of chilled water. After the task, participants listened to one of three separate recordings (mindfulness, faux mindfulness, distraction) and completed the CPT again. Using the change in time between CPT 1 and 2, this study looked to identify whether or not initial distress intolerance and emotion regulation scores moderated the rate of change.

Preliminary results (n = 109) indicate that the condition that participants were in had no significant effect on their ability to withstand the CPT, $p = .426$. A linear regression to determine whether scores from the ERQ and the DII were significant revealed that the Suppression portion of the ERQ was significant for CPT Time 1 and CPT Change scores, $p = .021, .020$ respectively.

Although the results for the DII and ERQ Reappraisal did not yield significant results, ERQ Suppression fell in line with my hypothesis. Participants better at suppressing and redirecting sensations would theoretically be better pre-intervention (Time 1), as well as overall (CPT Change).

Tanner Rehnberg, Kris Kirmess, and Gary Kinsel, Ph.D.

Department of Chemistry and Biochemistry

Triplet pooling reactions in MALDI matrices

While MALDI mass spectrometry is extensively used, the mechanisms which result in primary ion formation are still under debate. To date, empirical evidence from many trials is required to find the best matrices to be used in various situations. By providing a more thorough understanding of primary ion formation, a template may be created for a systematic way to discover and create ideal matrices.

By using a laser to excite electrons in the matrix and then measuring the lengths and intensities of the resulting fluorescence and phosphorescence, the states of those electrons can be closely tracked. Salicyclic acid and angiotensin II were used as the matrix and analyte respectively. When the matrix was hit with the laser, pairs of electrons were excited to the singlet state and then – after a spin inversion caused by singlet energy pooling – to the triplet state. We know this intersystem crossing occurred because the singlet state is characterized by fluorescence and fast photon emissions lasting only 1-2 nanoseconds, while the triplet state is characterized by phosphorescence and slow photon emissions lasting into the microseconds. Subsequent energy pooling in the triplet state gives an electron enough energy to be kicked off of the matrix and used by the analyte. This mechanism of primary ion formation is supported by a reproducible and predictable series of photon emission measurements and will hopefully lead to new and efficient methods for specific matrix production in the future.

Julianna Richie, Milinda Wasala, Baleeswaraiah Muchharla, and Saikat Talapatra, Ph.D.

Department of Physics

Electrical characterization of exfoliated graphene

We will present graphene based devices made with liquid-phase and mechanically exfoliated graphene. The mechanically exfoliated sample was prepared using Scotch® tape method to separate the layers of processed graphite. It was then deposited onto a silicon dioxide (SiO2) wafer and a layer of chromium followed by a second layer of gold was deposited upon the sample to create contact points. For liquid-phase exfoliation (LPE), bulk graphite was combined with isopropyl alcohol (IPA) and sonicated. Flakes of LPE graphene were deposited on per-fabricated electrodes. The samples were later exposed to electrical characterization test. A comparison of the electrical properties of these two materials will be presented and discussed in the light of chemical sensing experiments.

Carol Rivas, Heidi Rantala, Sophia Bonjour, Micah Bennett, and Matt Whiles, Ph.D.

Department of Zoology

Growth of branchiobdellida on crayfish

Branchiobdellidans are ectosymbionts of crayfish. Recent studies have found branchiobdellians and crayfish have a complex relationship which usually benefits both the crayfish and branchiobdellians. The symbiotic worms graze on diatoms, bacteria and protozoans that gather on the crayfish's body and gills. Even though branchiobdellians are obligate ectosymbionts, they can also live long periods without a host buy eating algae and metazoans found on substrates. They are also dependent on live crustacean to reproduce. Branchiobdellians are known to positively and negatively affect crayfish growth and survivorship; therefore, branchiobdellians indirectly affect the ecosystems by effecting crayfish. The overall growths of branchiobdellians are not well known thus this laboratory experiment has been conducted for the purpose of tracking and recording the growth pattern of branchiobdellians (Skelton et al., 2013). We assessed the growth patterns of different branchiobdellians from eggs to adults at a certain temperatures. Each crayfish was isolated in individual tanks and then searched for eggs and adults. We also distinguished the sex of each crayfish in case there is a correlation between the growth patterns in the worms and the individual sex of a crayfish. The overall concerns in this experiment were whether sex of the crayfish or temperature effects the life cycle of the worms. Additional research is needed to understand the life cycle of the worms and their symbiosis with the crayfish and the indirect effects on the ecosystem.

Caroline Robertson

Department of Anthropology

Memories of the Herrin Massacre

Herrin is a small town in southern Illinois that was built on coal mining and the formation of unions. Herrin has an infamous reputation around the state of Illinois, being the epicenter of "Bloody Williamson," a name the county has received because of its history of bloody family feuds, the KKK, and most famously the "Herrin Massacre." The "Herrin Massacre" is a tragedy that took place in the southern Illinois town of Herrin in 1922. The union mineworkers were on strike because of wage conflicts, therefore the owner of the Lester Mine replaced these men with non-union miners. This eventually led to deadly violence between the union and non-union mineworkers. My interest in this research is primarily with issues of community memory of historical trauma. To understand the violent event and if it still impacts the community today, I have interviewed 13 individuals about the memories of the massacre. These individuals are relatives and friends of those who took part in the Herrin Massacre. Through my research I have discovered the beginning of a healing process taking place in Herrin. The memories of the massacre are still foremost in my informants' minds; nevertheless there is some indication that the intensity of the conflict is lessening as a community memory.

Kayla Rodenberg

University Museum

Reestablishing history: The digital restoration of WPA murals at the University Museum

The restoration of artwork has to be carefully done at the first attempt. There is no room for error because you do not want to ruin it or create a bigger problem. With this in mind, we now can use technology to create a cushion for human error. The murals that were once plastered to the walls in Wheeler Hall when it was a library are now being digitally restored in Photoshop. These murals were harshly stripped off the walls and are currently still in this state. Now we are finally bringing these pieces of history, which were tucked away, back to light. The American New Deal agency and the Works Progress Administration funded them. Karl Kelpe was commissioned to paint the murals. Unfortunately, they no longer look like the originals and we have only been able to find one photograph of the murals in their original state. This leaves us unable to see how the completed murals once looked. The pieces are currently undergoing work for an exhibit in the fall semester. Through the process of digital restoration, the pieces will be saved from further damage and will create a visual record of the murals original states. With any type of historical artwork, we need to get to the point of digitally recording each piece immediately. They all eventually break down and we will no longer have them to view. The major problem with this is that future generations will no longer be able to appreciate their and other cultures. By storing these pieces digitally, we continue the process of preservation. This allows people to pursue new thoughts by researching their cultural foundations. When we leave our history behind, we are unable to learn from it.

Travis A. Rogers and Sarah J. Kertz, Ph.D.

Department of Psychology

Testing a theoretical model of child anxiety

Many advances have been made toward understanding anxiety in adults, but models of child anxiety have yet to be appropriately updated. This study investigated the role of family and cognitive factors associated with child anxiety. Forty-five mother-child dyads, with children between 8 and 12 years old (M = 9.87, SD = 1.32), were recruited from a community sample. Analyses included four predictor variables: (1) child attentional focusing, (2) child information processing, (3) parental behaviors, and (4) parental anxiety. Attentional focusing, parental behaviors, and parent anxiety were assessed by self-report measures; a working memory task assessed child information processing. Dependent variables included six domains of child anxiety: (1) harm avoidance, (2) separation/phobias, (3) social anxiety, (4) physical/tension, (5) obsessions/compulsions, and (6) generalized anxiety. All predictor variables were placed in a linear regression for each dependent variable. The overall model for harm avoidance was significant, $F(6,31) = 2.95$, $p = .02$. Parental anxiety ($\beta = -.61$, $p < .01$,) and response time (RT) in the information processing task ($\beta = .42$, $p = .02$) predicted harm avoidance, but neither child attentional focusing nor parental behaviors yielded significant results. Exploratory analyses were performed to investigate the effects of gender and child age. The model for harm avoidance in male children was significant, $F(6, 10) = 3.15$, $p = .05$; parental anxiety predicted harm avoidance ($\beta = -.79$, $p = .03$). The model was non-significant in females. When comparing models in younger and older children, (8-10 and 11-12 years), the model for younger children was significant, $F(6, 18) = 3.93$, $p = .01$. Parental anxiety ($\beta = -.74$, $p < .01$) and RT in the information processing task ($\beta = .77$, $p < .01$,) predicted harm avoidance. The model for older children was nonsignificant. Models for all other outcomes failed to reach significance. These findings suggest that, while parental anxiety and child information processing are useful in predicting one aspect of child anxiety (i.e., harm avoidance), these factors may not play a significant role in other domains of child anxiety, and further, the effects of these factors vary by child age and gender.

Jocelyn Rothschild-Frey, Cody Yarnell, Michelle Williams, Trey Beckerman, and Juliane Wallace, Ph.D.

Department of Kinesiology

Calf venous compliance in male and female children

Similar to changes in arterial compliance with fitness and aging, venous compliance in the lower extremities of adults improves with higher fitness and declines with increasing age. In young adults, males have a higher venous compliance than females, a difference that does not appear related to hormonal fluctuations. Interestingly, these same sex differences have not been seen in older adults. To date, calf venous compliance has not been characterized in children or adolescents. Purpose: To determine the calf venous compliance in pre-adolescent males and females. Methods: Twelve healthy 9-11 year old children volunteered for this project. Participants underwent anthropometric assessment, a submaximal graded exercise test, and assessment of calf venous compliance. Utilizing venous occlusion plethysmography, calf pressure-volume relations were determined using the quadratic regression equation [(Δlimb volume) = β_0 + β_1*(cuff pressure) + β_2*(cuff pressure)^2]. Calf venous compliance was calculated as the first derivative of the pressure-volume relation during cuff pressure reduction. Capacitance and capillary filtration volumes were determined from the increase in limb volume following cuff pressure inflation. Sex differences in anthropometric variables, fitness, and compliance (β_1, β_2, and the slope of the pressure compliance relationship) were analyzed with a simple ANOVA. Results: The male and female children were of similar age [6 male (10.3±0.8 yrs), 6 female (10.5±1.0 yrs)], size [(BMI-males 18.9±3.2 kg/m^2 vs. females 19.4±4.3 kg/m^2); (calf volume- males 24.6±4.0 cm vs. females 25.16±4.1 cm)], and fitness level (males 48.3±21.1 ml*kg^{-1}*min^{-1} vs. females 45.7±9.7 ml*kg^{-1}*min^{-1}). There were no differences in calf venous compliance [males; ΔLimb Volume = 0.7795±1.2535 + .1210±0.0041 (Cuff Pressure) - 0.0010±0.00063 (Cuff Pressure)^2 vs. females; ΔLimb Volume = 0.6800±0.3882 + 0.0890±0.0423 (Cuff Pressure) - 0.0007±0.0005 (Cuff Pressure)^2; slope -0.0022±0.0008 in males vs. -.0016±0.0009 in females]. The capacitance response tended to be higher in the males (2.31±0.84 % vs. 1.46±0.48 %; p = 0.058). Conclusion: Sex differences in calf venous compliance that appear to exist in young adults do not exist in children of similar age, size, and fitness level.

Leticia Russell and Matthew Schlesinger, Ph.D.

Department of Psychology

Examining the influence of shifting focus-of-attention on motor-skill performance

Our previous work investigates the influence of focus-of-attention (FOA) on motor-skill performance. In particular, we demonstrated that during a computer-based manual-tracking task, focusing on an external FOA results in better performance than an internal FOA. The current study extends these findings by asking participants to explicitly shift their cognitive focus during the experiment. Specifically, participants used the mouse to track the path of a moving object. During the first half of the tracking task, participants were instructed to focus on either the movement of their hand (internal FOA) or the onscreen cursor (external FOA). At the midpoint of the experiment, participants were then instructed to switch their focus (from internal to external or vice versa). We predicted that participants who started with an internal focus, and then shifted to an external focus, would improve on the tracking task, while those who shifted from external to internal focus would worsen on the task after shifting. The findings were consistent with both hypotheses.

Anthony Sabella and Andrew Wood, Ph.D.

Department of Plant Biology

Effect of bryophyte extracts on bacterial growth rate

Bryophytes have been recognized for their useful properties in ancient times as well as the modern era in applications including insulation, fire making, and wound healing. Previous studies have demonstrated that certain bryophyte species have activity against both gram positive and gram negative bacteria and concluded that bryophytes could be a good source for new, safe, biodegradable, and renewable antimicrobial agents. This study sought to investigate the possible effects of compounds produced by local bryophytes as anti-bacterial or bacteriostatic agents. Various species of bryophytes found in natural settings surrounding Carbondale, Illinois were collected and subjected to extraction procedures to produce solutions containing bryophyte metabolites. Bacterial cultures were grown in the presence of the bryophyte extracts and the growth rate was measured to determine the effect of the addition of the bryophyte extracts. Further exploration of the results of this study may be able to provide previously unstudied anti-bacterial compounds for use in medicine against the increasing numbers of anti-biotic resistant bacterial strains that threaten human health.

Francesca Sanchez

Department of Microbiology

The transport of soluble and particulate antigens from the female reproductive tract to the large intestine

The female reproductive tract (FRT) is composed of the fallopian tubes, uterus, cervix, and vagina. The FRT is covered by distinct epithelial cell layers, with the vaginal tract being lined with a protective stratified squamous epithelial layer and the endocervix and uterus being covered by simple columnar epithelium. Our group has previously shown that 20-40 nm nanoparticles (NPs) are efficiently internalized by epithelial cells (ECs) of the uterus and vagina. NPs applied vaginally could be observed in the lymphatic ducts that drain the FRT, as well as the local draining lymph nodes within one hour of instillation. One of the most striking observations that we have made is that vaginally applied NPs are transported from the FRT to the large intestine. In most published work, immunizations via the FRT are done in mice pre-treated with epithelial disruptors, adjuvants or progesterone. In this work, however, mice were immunized with NPs alone; the epithelium was not disrupted by any means, and no adjuvants were co-administered. Here I have used immunofluorescent microscopy to further characterize the transport of particulate antigens from the FRT to the intestines. I have also used water soluble dyes and proteins to determine if transport between these two tissues is determined by the nature of the antigen. These results indicates that the FRT mucosa has mechanisms by which antigens from the FRT lumen are internalized and transported to the internal milieu. This work will be very important for vaccine development and for understanding how pathogens (viruses, bacteria) may transport from the large intestine to infect the FRT.

Waheed Sawar and Leo Silbert, Ph.D.

Department of Physics

Avalanches of rod packings

Granular matter can be found everywhere throughout nature from the beauty of sand dunes to the rings of Saturn. Granular materials play a dominant role in numerous industries such as mining, agriculture, civil engineering, pharmaceuticals manufacturing, and ceramic component design – their importance cannot be overstated. Despite their abundance, various aspects of granular matter mechanics continue to puzzle scientists to this day. This project focuses on computer simulations of the flow properties of rod-shaped granular particles in the inclined plane geometry. It is often difficult to obtain quantitative data experimentally regarding granular flow so we will use the molecular dynamics simulation software package, LAMMPS (Large-scale Atomic/Molecular Massively Parallel Simulator), in this study. Our major motivation is to compare how flowing rods are distinct from existing studies on spheres. The system to be investigated implements a connected–sphere model for rods composed of ten granular spheres. The simulation proceeds by first generating a static packing of 100-1000 rods poured onto a bumpy base. Next, the system will be inclined to an angle that induces flow of the rods. Once flow has initiated, the inclination angle will then be decreased gradually until the rods cease to flow. This occurs at an angle called the *angle of repose*. We will identify this special angle for our rod packings through monitoring various mechanical and microscopic parameters of the system that include; the total pressure, coordination number, and packing density. We will then be able to compare our results to similar studies for spheres and discuss their differences.

Kelly Schmidt, Jyoti Kapali, and Buffy S. Ellsworth, Ph.D.

Department of Physiology

The role of FOXO1 in pituitary development at e16.5

One in 4000 babies are born with some type of pituitary deficiency. The pituitary produces many hormones including growth hormone. I am studying FOXO1's role in pituitary development. FOXO1, a forkhead transcription factor, is necessary for development and function of several organs in the body. FOXO1 can be found in many tissues of the body including brain, ovary, heart, and vasculature and regulates cell proliferation, cell specification, and development. An embryo without FOXO1 will not develop vasculature appropriately and will terminate at embryonic day (e) 10.5. FOXO1 is also found in the cells of the pituitary gland; however, its role in the pituitary gland is not fully understood. In order to determine the requirement for *Foxo1* during pituitary development, I am currently studying mice in which the *Foxo1* gene is deleted in the pituitary gland. The experiments that I have conducted will help to understand the role of FOXO1 in the pituitary gland in e16.5 mice. Mice at e16.5 were stained with an H&E stain, which showed no noticeable difference in pituitary morphology. Embryos lacking *Foxo1* have no somatotrophs, the cell type that produces growth hormone, present in the pituitary, unlike wild type littermates. A BrdU stain testing for cell proliferation demonstrated that cell proliferation does not vary between *Foxo1* nulls and wild types. Additionally, a PIT1 stain was performed to mark committed progenitor cells that will become somatotrophs, lactotrophs, and thyrotrophs. No difference in PIT1 was observed, suggesting that *Foxo1* is not effecting the production of committed progenitor cells. By better understanding FOXO1's role in the pituitary, specifically its effects on cell specification and cell proliferation, we can assess and apply those results to individuals with pituitary and hormone related ailments.

Kevin M. Schrader

Department of Physiology

Effect of diet on the proliferation of Cyclooxygenase-1 active cells in the reproductive tract of cancerous hens

Ovarian cancer is the fifth deadliest cancer and the most lethal gynecological malignancy in women. The lack of effective screenings results in 80% of patients being diagnosed with late stage cancer with a survival rate of 50%. The incessant ovulation theory states that the frequency of ovulation has an increased correlation in ovarian cancer due to inflammation creating a microenvironment high in oxidative species that can lead to neoplasia in the ovary and in the oviductal epithelia. Cyclooxygenase-1 (Cox-1) is an enzyme that controls the production of prostaglandins, important mediators of the inflammatory process. The study had two aims: to determine if there is an increase in Cox-1 producing cells in cancerous versus non-cancerous tissue and to examine the effect of an anti-inflammatory diet on the regulation of Cox-1 in the progression of ovarian cancer in laying hens. Laying hens are used because they are the only nonprimate to spontaneously develop ovarian cancer (a two-year-old hen has undergone roughly the same amount of ovulatory events as a perimenopausal woman). Cox-1 was measured alongside bromodeoxyuridine, a thymidine analog that incorporates itself into DNA during mitotic division. This is important in showing how mitotic division is affected alongside up-regulation of Cox-1 in ovarian cancer.

Dan Sears and Alessandro Catenazzi, Ph.D.

Department of Zoology

The reestablishment of Peruvian frog populations after extirpation caused by disease

Batrachochytrium dendrobatidis (*Bd)* is a pathogenic fungus that causes the amphibian disease chytridiomycosis and has resulted in recent massive population declines and even local extinctions throughout South America. *Hypsiboas gladiator*, a Peruvian stream-breeding frog, experienced a range contraction and disappeared from elevations above 1650 m following a *Bd* epidemic. The project's purpose was to study the ontogeny of *H. gladiator* tadpoles while swabbing for the presence of *Bd* at elevations below and above 1650 m to gauge the possibility of the species' return to its previous historic distribution. To examine this, sets of three mesh baskets containing five *H. gladiator* tadpoles were arranged at varying elevations encompassing both the current (1600 m) and historic (1900 m) range of the species. Tadpole mouthparts were swabbed weekly for five weeks, and DNA extracted from swab samples was amplified with real time PCR to quantify *Bd* infection intensities over time. We hypothesized that *Bd* would infect tadpoles in all baskets because *Bd* is present at both elevations. We also predicted that over time there would be a faster increase in prevalence and intensity of infection at 1600 m than at 1900 m because wild tadpoles enhance transmission at the lower site. Our results confirmed that *Bd* can infect tadpoles throughout the historic range. Furthermore, there appears to be a gradual increase in prevalence and intensity over time at both elevations and such increase is faster at 1600 m than at 1900 m. These results indicate that tadpoles remain vulnerable to *Bd* even at elevations where the species has been extirpated and suggest that great caution should be exercised before considering translocation programs to reintroduce *H. gladiator* to its historic range where *Bd* still persists.

Hailey Sellek

Department of Physiology

Characterization of Tac3 primers for quantitative polymerase chain reaction and mRNA expression evaluation in lactating rats

Fertility is a complex physiological state of reproduction that is influenced by multiple factors such as peptides within the neurons of the brain and circulating hormones in the blood. These factors greatly influence one another, although the specific mechanisms are not well understood. The peptide Neurokinin B, encoded by the *Tac3* gene, is one of the peptides involved with fertility, specifically in the arcuate nucleus region of the hypothalamus in the brain. At different stages of fertility, mRNA expression levels of *Tac3* fluctuate, as well as those of other peptides and hormones. Infertility is induced during lactation when a suckling stimulus is present. Previous studies have shown that *Tac3* exhibits an increase in expression during fertility and a decrease in expression at times of infertility. When compared to other peptides involved in reproduction, *Tac3* is the focus of a limited amount of literature. I hypothesize that a decrease in *Tac3* mRNA expression will be identified in the lactating rats exhibiting infertility. Measurement of mRNA expression is done by using primer sets of the specific peptide of focus in quantitative polymerase chain reaction (qPCR). A temperature gradient experiment was performed and 57°C was identified as the optimal annealing temperature through agarose gel electrophoresis. A single qPCR reaction product was confirmed by a single peak in the melt temperature curve. The efficiency of the qPCR reaction for *Tac3*, determined with serial dilution of cDNA samples, was 100.82%. In order to better understand the physiology of reduced fertility during lactation, it is important to observe the changes in gene expression in specific neuronal systems in the brain. The qPCR method to evaluate *Tac3* expression in the hypothalamus is established and suitable for determining differences between lactating and separated subjects and is still in progress.

Suddarsun Shivakumar

Department of Mechanical Engineering

Contact angle: A consequence of minimized Casimir energy

In 1805, T. Young, in his classic work, expressed the cosine of the angle subtended by the surface of a liquid droplet on a solid surface in terms of the surface energies of the respective mediums–solid, liquid and gas. More recently, London derived the van der Waals interaction energy using the then recent advent of quantum mechanics. Later, in 1937, H. C. Hamaker attempted to derive the interaction energies between two interacting mediums in contact. But, the van der Waals interaction energies for two bodies diverge as the bodies come in contact. To circumvent this undesired divergence, Hamaker introduced a cut-off distance parameter in his analysis, which typically is argued to be of atomic length. All future work on contact angles, since Hamaker, to our knowledge, has never been discussed without relying on this cut-off parameter. We here show that the contact angle is independent of the cut-off parameter, and free of divergence. Thus, contact angle is a measurable physical quantity.

Rachel C. Slick

Department of Languages, Cultures, and International Trade

Reinaldo Arenas, a study of his life and the social implications in his struggle for freedom

Dr. Alejandro Cáceres, my research mentor, is authoring a book focused entirely on Reinaldo Arenas; it includes a chapter about the Cuban writer's life, a chapter about his compositions, and a chapter of criticism and literary reviews of those compositions. My role in this project is not only to proofread the work my professor does (as his first language is Spanish, but he is writing in English). My role is to examine this man's life and to write about it in a modern context. He lived a life of oppression because he was a writer with ideas that disagreed with those of the Castro regime. On top of that, Reinaldo Arenas was an open homosexual which again, contradicted the beliefs of the Cuban dictatorship. The purpose of my work is essentially to read into how this man's passion for his art and his undying determination to make his opinions heard translate into the oppression that still occurs today, both against artists and minority populations. Specifically, by reading his "pentagonía" (series of five novels), I learned firsthand of the personal discrimination and political persecution he experienced. These five novels are indeed fiction, but were written strategically to mirror his own life and his own struggles. Delving into these novels reveals the same repression that certain populations still face today.

Marcella Smith and Seung-Hee Lee, Ph.D.

School of Architecture, Fashion Design and Merchandising

What variables promote fashion mobile shopping?

Shopping via mobile applications has grown over the years. Fashion mobile shopping has become very important when it comes to mobile commerce. The purpose of this study is to investigate what variables promote fashion mobile shopping. The variables that will be introduced in this study are as follows: compatibility, consumer involvement, self-efficacy, fashion mobile shopping satisfaction, and attitude toward mobile shopping. The research method used to conduct this study was a self-administrated questionnaire that contained demographic listings and items related to consumer involvement, compatibility, fashion mobile shopping satisfaction, self-efficacy, and attitude toward mobile shopping. Each item was accompanied by a 5-point scale (5= strongly agree; 1= strongly disagree).

Two hundred and twenty-one subjects in the Midwestern part of the United States participated in the survey. The average age of the individuals taking the surveys was 26, and 46.8% of the respondents have purchased fashion items on a mobile device. To test the hypotheses proposed for this study, multiple regression was performed for data analysis. As a result, the variables that provided to be significant are consumer involvement, compatibility, and fashion mobile shopping satisfaction for attitude toward fashion mobile shopping. These three variables explained 50.6 percent of the variances in attitude toward fashion mobile shopping. Consumer involvement showed the largest standardized regression coefficient, followed by compatibility, and fashion mobile shopping satisfaction. However self-efficacy showed that it was not significantly related to attitude toward fashion mobile shopping. Results also revealed that attitude toward fashion mobile shopping was positively related to purchase intention. Based on these results, fashion marketing strategies for fashion retailers would be provided.

Samantha Sparks and Erin Venable, Ph.D.

Department of Animal Science, Food and Nutrition

Technical note: A discussion on post-operative supportive care for cannulated horses

Cecal cannulation is the process by which horses are surgically fitted with a cecal port through which digestive contents can be sampled and analyzed for nutrient content, microbial profile, and other parameters associated with gastrointestinal health. Cannulated horses provide a unique opportunity for Southern Illinois University equine researchers to investigate critical challenges to equine health such as colic, and other gastrointestinal illnesses. SIU is home to eight cannulated horses whose surgery took place in March 2014. The horses were cannulated using a two-stage technique described by Beard et al., 2011. Although the surgical procedure is fairly well defined, post-operative care for the long term hasn't been well addressed. Cannulated horse post-surgical care is a very challenging experience. The care of these horses requires additional skills that are acquired through hands-on care. Care of their surgical site and cannula, as well as their behavior during cleaning and collection procedures is critical. The surgical site for each horse was bathed and maintained daily for approximately nine months post-surgery. Additional post-operative supportive care included cleaning and applying medications as needed as well as interpreting equine body language and behavior modification with positive reinforcement in order to foster good manners. Daily evaluation included an assessment of body condition score, appetite, behavior and attitude towards other horses and people, as well as continued monitoring of the surgical site. Vitals were monitored for each horse and assessed for changes. Some discomfort associated with the surgical site was predicted and observed. However, consistency in handling and approach as well as patience during cleaning and bathing resulted in improved tolerance and reduced anxiety during cleaning sessions. A protocol and flow chart describing appropriate steps and procedures was designed to allow for continuity of care for future students working with our cannulated herd.

Ryan Spencer and Tsuchin Chu, Ph.D.

Department of Mechanical Engineering and Energy Processes

Ultrasonic porosity measurement in carbon fiber epoxy laminates

In this research, through-transmission ultrasonic (TTU) Acoustography was applied to measure and quantify the porosity levels in carbon fiber epoxy composite laminates. The study employed several CFRP specimens of different thicknesses, with wide ranges of porosity prepared by altering the curing pressure during the processing stage. The Acoustography method, operating at 5 MHz, was easily able to detect and quantify porosity levels within the composite laminates. The Acoustography results were directly compared with conventional immersion TTU testing and acid digestion to validate porosity levels. It was demonstrated that the ultrasonic absorption coefficient showed an increasing trend with the increasing level of porosity in composite laminates. The mechanical property, inter-laminar shear strength (ILSS), of CFRP decreased with the increasing void content. These findings are significant because Acoustography is being developed as a faster alternative to traditional ultrasonic inspection of composites and porosity is an important anomaly to quantify utilizing NDE methods.

Victoria Steinberg and Pamela Smoot, Ph.D.

Department of Africana Studies

The trials and triumphs of women in engineering, then and now

This research project explores the trials and triumphs of U.S. women in engineering from the nineteenth through twentieth centuries. Included in this study are women of diverse ethnic and racial backgrounds who have established careers in civil, mechanical, electrical and industrial engineering; at Southern Illinois University Carbondale. The study seeks to compare and contrast the experiences of early women engineers with those of today. It will illustrate the strides made by women in the profession and highlight their outstanding accomplishments. This research serves to identify and raise the awareness of obstacles with which women engineers are often confronted, to provide strategies to overcome these obstacles and to encourage other female students to pursue engineering degrees. Additionally, it will enlighten them about the wide-ranging opportunities available in the profession.

Kira Stork[1] and Vicki Lang-Mendenhall[2]

[1]Rehabilitation Institute, Communication Disorders and Sciences and [2]Touch of Nature Environmental Center

Family dynamics of Autism Spectrum Disorder

Autism Spectrum Disorder (ASD) is a developmental disorder characterized by restricted interests, repetitive behaviors, impairments in social interaction and verbal and nonverbal communication (Mohammadi and Zarafshan 2014). Research has shown that ASD not only affects the person with the disorder but their support system as well. The purpose of this study was to review existing literature that focused on the family dynamics of those who have a family member with ASD and provide resources to improve their quality of life. One potential resource is respite care, which "gives families a chance to shift the focus from the child's needs to the family members' needs, so parents have time to do more typical activities" (Doig et al. 2009).

The articles reviewed for this research had similar findings relating to the increase in parental stress levels, impaired family functioning, and disproportionately less time spent with the typically developing children The literature contains evidence proving that couples who have children with ASD are often times more stressed in their marriage which may lead to social isolation, increased financial strains and decreased alone time with their spouses. (Barker et al. 2011) found that the limited empirical research that has been done supports respite care on aspects of parental well-being such as anxiety and stress. Another challenge for parents found by (Mount and Dillion 2014) is the attempt to ensure typically developing siblings received adequate parental involvement. Respite care allows parents the time to build their relationships with their other children in a more intimate environment. Future directions include providing a respite day care for families who have children with ASD to conduct research to determine if respite care in fact decreases the level of stress and anxiety on the parents through a support group setting, while allowing siblings one on one interactions.

Kira Stork, Mackenzie Housman, and
Maria Claudia Franca, Ph.D.

Rehabilitation Institute, Communication Disorders and Sciences

Vocal habits of singing voice majors

Objective: This study was designed to investigate the vocal habits of singing voice majors in order to understand the effects of substantial voice usage.

Method: Forty university music students majoring in singing, with age ranging from 18 to 36 years responded to questions related to their vocal habits as well as feelings and attitudes regarding their voice usage. Twenty-one participants were female and nineteen were male, all pursuing college degrees in music, and majoring in voice. This study involved the use of the Singing Voice Handicap Index (SVHI) and self-reported data regarding demographics and voice usage using the Singing Voice Profile, created for this study.

Results: In this study of 40 participants there is 5 categories of singing voice majors; 18 Musical Theatre, 10 Classical Voice, 8 Music Business, 3 Music Education, and 1 Voice Performance. The results from this study indicate that there is a significant finding between consumption of caffeinated soda and the frequency of hoarseness, voice loss, and hoarseness after singing. The findings also shows there is a significance correlation between not being able to perform because of voice problems and hoarseness, undesired variation, fatigue from singing, and no rest after using voice for a prolonged period of time.

Conclusions: The results of this study suggest that vocal habits have an impact on the quality of voice. Inappropriate use of voice can impede the quality of performance for singing voice majors. This research yields promising data for the effects of vocal habits of singing voice majors.

Ruth Ann Suddarth[1] and Harvey Henson, Ph.D.[2]

[1]Department of Geography and Environmental Resources
and [2]Department of Geology

Cultural significance of John A. Logan boyhood home using electromagnetic induction

The following report presents data that has been collected at the John A. Logan Museum in Murphysboro, Illinois. This site was the location of the Logan family home where General John A. Logan was born and raised. His father, Dr. Logan, donated the land that became Murphysboro in 1843. General John A. Logan will forever be remembered as a Civil War hero and founder of Memorial Day.

Intensive archeological excavations have been conducted in previous years, as well as data collected through ground penetration radar. The goal of this research involves the use of non-invasive electromagnetic induction (EMI) to find historical artifacts that would further our understanding and appreciation of the John A. Logan site and history. Preliminary interpretation of data, using the Surfer mapping program, shows promising results of interesting historical and recent subsurface features. Several anomalies are apparent that could help expand our understanding of the late 19th century, and specifically the Logan family legacy.

Byron W. Suits, Paul Edwards, and Michael James Lydy, Ph.D.

Department of Zoology and Center for Fisheries, Aquaculture and Aquatic Sciences

Toxicity of fungicides, azoxystrobin and propiconazole, to non-target aquatic species

In 2006, the emergence of soybean rust in American crops precipitated a change in fungicide environmental policies Azoxystrobin and propiconazole have since been used independently and in combination in commercial products for the prevention and treatment of fungal plant diseases. They are typically applied via ground and aerial techniques, opening transport pathways through wind drift and runoff. Consequently, aquatic ecosystems near agricultural fields may be affected by increased concentrations of these potentially harmful chemicals. In order to assess the potential toxicity of azoxystrobin and propiconazole to non-target species, toxicity bioassays are conducted which incorporate multiple routes of exposure. *Daphnia magna* and *Chironomus dilutus*, common bioindicator species for determining the potential toxicity of chemicals to aquatic species[1], are commonly used to determine water only and sediment exposure toxicity levels, respectively. Acute toxicity tests were conducted for each species to determine the LC_{50} values for use in an ecological risk assessment for these two fungicides. Toxicity bioassays are a fundamental and widely used tool in [2] determining the potential toxicity of pesticides to non-target species. Presently there is still a good deal of research on these compounds and their environmental effects due to their relatively recent release into American agriculture. It is the goal of this research to help close the remaining knowledge gaps concerning the effects of these compounds and the environmental hazard they present.

Anna Sullivan and Rachel L. Cook, Ph.D.

Department of Plant, Soil, and Agricultural Systems

Urease inhibitor performance in cover cropping systems

Urea is a common nitrogen fertilizer that is crucial for maintaining yields in agricultural crops. Urease, an enzyme found naturally in soil, catalyzes the hydrolysis of urea fertilizer to ammonia gas, which can be lost in volatilization. Urease inhibitors can be used with surface applications of granular urea to prevent volatilization, providing more time for the fertilizer to be dissolved into the soil and taken up by plants. It has been shown that urease activity increases with residue cover, thus making urea applications more susceptible to volatilization in no-till and possibly cover cropping systems. This research investigates differences in ammonia volatilization when urea is applied with and without urease inhibitors on soils collected from cover crop vs no cover crop and tilled vs no till systems. 7.6 cm soil cores were taken from each of these cropping systems, left intact, dried, rewet to 60% field capacity, treated, and incubated in a closed system for 5 days. Ammonia gas was collected in suspended cotton discs saturated with an acidic solution, extracted, and analyzed with flow injection analysis. We hypothesize that without urease inhibitors, soils in cover cropping and no-till systems will have more volatilization than tilled or no cover crop soils. When urease inhibitors are used, volatilization will be delayed and decreased.

Oneal Summers and Rebekah Durig

Department of Mathematics

Constructing the gyroid

If you like the aesthetic of the gyroid, it's easy enough to make one on a small scale using the equation $0=\sin(x)\cos(y)+\sin(y)\cos(z)+\sin(z)\cos(x)$. But our research is interested in pushing past approximation to create accurate and precise molds for large-scale gyroid sculptures.

Using the work of Alan Schoen, discoverer of the gyroid and geometer studying triply periodic minimal surfaces, our work focuses on using Mathematica to model surfaces and 3D printing to create physical models of them. As a result of our work, we will be able to construct models of gyroid approximations in rectangular and spherical coordinate systems, as well as constructing an accurate hexagonal piece of the gyroid that can be replicated and used to generate the entire three dimensional surface.

We also will be compiling an instructional manual targeted at showing high school math clubs how to make 3D printed objects using Mathematica.

Brent Sunderlage

Department of Plant, Soil and Agricultural Systems

Can foliar-applied gibberellic acid influence sex determination or pistillate flower morphology in Amaranthus tuberculatus?

Waterhemp (*Amaranthus tuberculatus*) is a problematic agronomic weed that has become progressively more difficult for growers to control due to multiple herbicide resistance. The dioecious nature of waterhemp and capacity to produce up to 1.2 million seeds allows for the accumulation of herbicide-resistant seeds in the soil seed-bank following failed herbicide applications. Gibberellic acid (GA_3) is a plant growth hormone that has been shown to promote masculine flower characteristics in dioecious hemp, spinach, and cucumber when exogenously applied. This research examines the effects of foliar applied GA_3 on phenotypic sex ratios, changes in pistillate flower morphology, and seed production in glyphosate-resistant waterhemp. Plants were grown under greenhouse conditions, and GA_3 was applied at 10, 100, and 1,000 ppm at two different flowering intervals. Applications of GA_3 was performed every three days beginning at 30 cm in plant height until visible bud emergence or until sex was determined by the emergence of stigma or anthers. Applications were made by hand misting until leaf run-off. Male and female plant ratios were recorded, and estimated ovary size was measured three weeks after bud emergence. Estimated ovary size was quantified with stereomicroscopy and computer image analyzing software (Image J®). Plants were harvested at 11 weeks after bud emergence or at earliest senescence; then seeds were collected and quantified. Sex determination was not influenced by the rate of GA or duration of applications. In addition, ovary size was not reduced using 10 or 100 ppm GA_3 rates, regardless of duration of application. However, GA_3 applied at 1000 ppm significantly reduced ovary size in both flowering intervals. Seed production was reduced by 72% relative to the non-treated control when 1000 ppm of GA_3 was applied until sex determination. Foliar-applied GA_3 at high concentrations may offer future utility to growers as a tool to limit the propagation of herbicide-resistant waterhemp seed following failed herbicide applications.

Jaime D. Sykes

Department of Anthropology

Measurement methods in dental anthropology: Caliper measurements versus computer measurements taken from photographic images

Metric assessments of dental remains are important to biological anthropologists because of their potential ability to discriminate between the sexes, and give insight into the phylogenetic relationships between different hominin and hominid groups. Anthropologists most commonly use sliding calipers in order to take dental measurements, but with recent increases in biometric technology, new image processing programs are being created which can potentially give researchers the ability to take accurate measurements from photographic images. This study aims to examine the potential of the program ImageJ as an alternative to traditional caliper measurements. The buccolingual and mesiodistal diameters of the first and second maxillary molars of 93 individuals from the Hamann-Todd Collection were taken first with digital calipers, and then again with ImageJ using photographic images of the same samples in order to test whether or not measurements remain consistently accurate. Intraobserver error was calculated for both the caliper and ImageJ measurements and was determined to be 1.17% and 2.93% respectively. A paired sample t-test was performed using SPSS which determined that ImageJ and caliper measurements are statistically different within a 95% confidence interval. In light of these results, the author suggests that ImageJ is a useful research tool when used alone, but may skew the results of a study if used in conjunction with caliper measurements. ImageJ is not appropriate for forensic use or for other identification projects which are highly sensitive to error.

Melissa Tanaka and Jared M. Porter, Ph.D.

Department of Kinesiology

Muscular power in elderly women is enhanced when attention is directed externally

In the last 15 years, a growing body of literature has shown that a performer's focus of attention has a meaningful effect on motor performance and learning. Findings from this area of research strongly suggest that directing the performer's attention externally towards the result of the movement produces more effective motor performance and learning compared to focusing attention internally on one's body movements, or neutrally. However, little research has been conducted investigating the effects of altering focus of attention on muscular power, especially in the older population. Thus, the purpose of this study was to evaluate the effects of different foci of attention in older women who were assessed on the Wingate test, which is a measure of maximum muscular power. Using a counterbalanced within-participant design, participants (N=23; age 59-69 yrs.) completed a maximum effort cycle ergometer test (i.e., Wingate test) for a duration of 10 seconds following 3 types of verbal instructions. The external focusing instructions (EXF) were designed to focus attention on moving the pedals as fast as possible. Internal focusing instructions (INF) were intended to focus on moving the legs as fast as possible. When participants were in the control condition (CON), they were asked to perform the task to the best of their abilities. Results indicated that the EXF (ES = .30, $p < .05$) and CON (ES = .43, $p < .01$) conditions resulted in greater muscular power compared to the INF condition. It appears that directing attention internally hindered power performance in older women, which is consistent with the predictions of the constrained action hypothesis. However, it also appears that directing attention externally did not enhance maximum muscular power in this population. These findings should be considered when assessing and prescribing power exercises in older adult populations.

Alex Taylor

School of Music

Music in Motion: Bringing students and music to SIU

Music in Motion is a successful and growing marching band festival put together by SIUC University Bands, which is managed by George Brozak, Ed.D., Director of Athletic Bands, and Christopher Morehouse, D.M.A., Director of Bands. Music in Motion brought together 17 different high school marching bands from Illinois and Missouri, with over 1,000 students attending. The students in each band performed their marching show at the SIU football stadium for seven different judges who gave critiques and tried their hardest to give the students advice on how to perfect the show. Not only did high schools get to perform, but so did the Marching Salukis as exhibition, so the students could see how a college band performs.

My job as one of the two managers of Music in Motion was to set up the event by communicating with schools, assisting judges and band directors with their needs, making sure scheduled times and performances were met and troubleshooting any problems quickly and as gracefully as possible. Many times the only problem we ran into were miscommunications on how to march onto the field, which was overcome without more than a couple of seconds of communication. Overall the event was largely a success; all the bands performed at their scheduled times and the event had almost no problems.

Courtney Taylor and Philip Anton, Ph.D.

Department of Kinesiology

Exercise enhances quality of life (QOL) and activities of daily living (ADL) performance in cancer caregivers

Decreased ADL performance and QOL are common in cancer patients undergoing treatment; however, the impact of the cancer experience is also often detrimental to individuals serving in a caregiver role. Research points to positive outcomes for cancer caregivers who participate in exercise interventions; however, data related to interventions occurring during treatment are scant. This study examined the influence of exercise on ADL and QOL in cancer caregivers whose loved one was undergoing chemotherapy, compared to caregiver controls not participating in structured exercise. Group E (n = 11) participants were assigned to an exercise specialist who constructed/supervised two exercise sessions per week spanning the 12-week intervention. The exercise program was based on each participant's medical/fitness status and QOL goals. Sessions were approximately an hour long and included aerobic, resistance, balance, and flexibility exercise. Group C (n = 9) were also caregivers, however they did not participate in any structured exercise. Before and after the intervention, all participants were assessed on ADL tasks. Pre and post measurements were also taken of QOL, exercise enjoyment, social support, and fatigue. Data analysis revealed significant improvement for group E on sit to stand (-2.1 s; $p = 0.041$), stair climb/descent (-5.3 s; $p = 0.002$), QOL (+3.4; $p = 0.040$) and exercise enjoyment (+4.5; $p = 0.033$). Scores for group C did not change on any variables except for declines in lift and carry (+8.7 s; $p = 0.021$), QOL (-2.3; $p = 0.001$), and fatigue (+1.2; $p = 0.049$). The results of this study indicate that exercise has a positive influence on ADL, QOL, and exercise enjoyment in cancer caregivers. The data also show that ADL, QOL, and fatigue levels suffer in caregivers not participating in exercise. These findings will hopefully translate into greater attention paid to this often neglected population.

Ramona Tucci

Department of Cinema and Photography

Oscar micheaux & early independent black cinema

There is a rich history that can be uncovered through the works of Oscar Micheaux. The African American writer and independent film-maker dared to challenge issues of race in 1910's America, a time when people of color were made to be silent. Though segregation enforced by film censors people of color had no opportunity to be seen in the mainstream Hollywood. Oscar Micheaux, who independently produced more than 44 films in his life time, gave a rich alternative to Hollywood that is not often studied in this era of silent film making. During this age, cinema was still a new technology and had many unknown possibilities and Micheaux was one who was willing to experiment with his films as an art form. He broke taboos with black and white actors performing together on screen. He used his films to provoke questions of race and class in American. In fact, even his financial constraints turned into a source for invention, as he experimented with montage, changing the meaning of the same shot when interspersed with different intertitles. As a film-maker, I am interested in Micheaux's work and life as a lens into the nature of independent film making in 1910. I will approach this history through primary (Micheaux's films and other records of the period) and secondary (biographies, and current views on his work) resources. I hope that this research will lead me to find answers to the following: How has the concept of "Race" movies changed (or not) in our time? How does cinema today still innovate and make it possible for those not given a voice to speak?

Ivan Vargas and Kevin Sylwester, Ph.D.

Department of Economics

Economic stability in the United States from 1983 to 2007

In the United States, the period from 1983 to 2007 is known for its degree of economic stability. Recessions were minor and infrequent; and periods of economic expansion were prolonged. This project investigates the "great moderation" and factors that caused a decline in the aggregate economic volatility in the United States from 1983 to 2007. Using data from multiple sources, this study examined factors such as structural change to the economy, monetary policies, and "good luck." I find evidence that suggests structural changes and monetary policy were contributing factors to the “great moderation.” However, this study found less evidence to support “good luck” or chance as a factor in the process.

Stephanie Venis and Tsuchin Chu, Ph.D.

Department of Mechanical Engineering and Energy Processes

Digital Image Correlation applications in biomedical and aerospace engineering

Digital Image Correlation (DIC) is a non-destructive method of testing that has grown in popularity substantially in recent years. DIC is the process taking a digital image of a surface before it has been deformed, and then again after to track the movement of pixels which will allow for the calculation of strain to the material. It can now be used in any number of fields, including aerospace and biomedical engineering. The application of this method has led to a whole new realm of understanding in everything from how to keep our aircrafts safe and operational to how to assess damage to the bones. The applications further increase as the option of two dimensional versus three dimensional DIC is considered. The benefits of this this technique can be seen in its ease of implementation and its accuracy as compared to alternative methods, which tend to be manual allowing for greater human error. Further explored here are the ways in which DIC can be applied to aerospace and biomedical fields, in addition to the methodology behind this technique.

William Vignovich, Gavin Stonehouse, Nancy Garwood, Ph.D., and Kurt Neubig, Ph.D.

Department of Plant Biology

Data basing the SIU Herbarium: Using specimen data to infer plant distributions over time

A herbarium is a collection of preserved dried plant specimens. These preserved specimens are often used for research in plant taxonomy, ecology and ethnobotany. The herbarium organizes the vast amount of plant diversity, gives a historical record of collections, and provides geographical locations to build maps of the natural distributions of plant species. Herbarium specimens are dried, frozen (to kill unwanted pests), mounted, and then given a unique accession number. The resulting specimens collectively form a "library" of specimens which can be referenced by scientists and non-scientists in the above mentioned applications for these reasons making specimen information is a critical operation for herbaria. We databased specimen information at the SIU herbarium, including family, genus, species, collector, collection date, geographical location, habitat, and additional information. There have been 70,615 plant specimens databased, with an estimate of ~15,000 specimens still waiting to be databased. These plants reign from almost 100 different countries; 59,629 plant specimens (84%) were collected in the United States. From the United States, 46% (33,106) of those specimens are from Illinois, and of those 46%, 76% (25,251) come from the 20 counties that form the Southern Illinois area. This large number of specimens from the greater Southern Illinois area will allow maps of plant distribution to be built. A history of plants from the past helps to better determine the distribution aspect through time, to help understand which plants are still here, what's not here, and to also examine the invasive species introduced into the Southern Illinois. All of this can be done from the herbarium database resources that are being built as a part of this project and are easily accessible for research purposes and public investigation.

Kent Wagenschutz

University Museum

Museum archive improvements and re-accreditation projects

An integral part of having a museum attached to the university is maintaining the social contract with the general public to collect, curate, and preserve artifacts for public use. In an effort to better accomplish these goals, the University Museum Archive completed renovations to their facility to expand the amount of climate-controlled environments available for storage. The ability to control the temperature and humidity of a storage area is important to prevent the drying and degradation of the collections, especially those containing organic or earthen materials.

One of the roles that my position at the Archive allows time and energy for is the reinstallation of the University Museum's collection of more than 400 Papua New Guinean artifacts to a renovated and expanded climate-controlled environment. Many artifacts had to be understandably removed from their usual locations to allow for construction and to minimize cleaning of dust and other construction related pollutants afterwards. Now, with construction having been complete in the fall of 2014, the artifacts must be reinstated to their protective homes. Some of the artifacts the university acquired from Papua New Guinea are hanging masks or totems along with other objects, most made of wood that contain other organic implements such as feathers or bones, paints and pigments, all materials that benefit from a controlled environment to ensure their protection and preservation for future educational uses.

Mason Wagner[1], Oscar Ortega[2], Sterling Jackson[3], Shaun Wolfe[4,5], and Wendy Sagesse[1]

[1]Department of Electrical and Computer Engineering, [2]Department of Mechanical Engineering and Energy Processes, [3]Department of Civil Engineering, [4]Department of Physics, and [5]Department of Mathematics

Accessing available resources at SIUC

For most students, one class period is not enough time to learn a complicated topic. Fortunately, there is an opportunity for supplemental help available. The tutors in the College of Science study area provide not only help with homework, but an opportunity for every student to succeed in Mathematics. How many students know of this opportunity, however, and of those that know, how many take advantage of the available help? With our research, we hope to answer this question. With data collected from a survey, we compiled information showing who already knew about supplemental help, who used the help, and why or why not. We also asked questions like, "Now that you know this help is available, do you plan to use it?" We also keep records of attendance every day to see how many people we are helping, and we will check to see if there are any new trends after the surveys are given out. With our research, we hope to make our supplemental help more efficient, more convenient, and generally more effective.

Charles Walker

Department of Psychology

Relations between identity styles, coping strategies, and substance use among college students

Students in college are primarily in the period of development known as emerging adulthood (18-25 years old). During this time identities are constructed and students face a variety of personal and academic challenges and stressors. An important issue on college campuses today is substance use (i.e., alcohol and marijuana). Programs and interventions are needed to help identify students at risk for developing substance abuse problems. In order to prevent substance abuse from occurring, it is important to examine coping strategies employed by college students. Additionally, an individual's identity style may play a central role in which coping strategy they use and may also influence their rate of substance use. The current study examined the relations between identity styles, coping strategies, and substance use during emerging adulthood, particularly among college students. It was predicted that emerging adults in college with a diffuse/avoidant identity style and an emotion-focused coping strategy would exhibit a higher frequency of substance use based on self-report. It was also predicted that students with an informational identity style and a problem-focused coping strategy would display a lower frequency of substance use. Those with a normative identity style and a problem-focused coping strategy were predicted to have a lower frequency of substance use, while those with an emotion-focused coping strategy would have a higher frequency of substance use.

Jacob Walker and Jun Qin, Ph.D.

Department of Electrical and Computer Engineering

Development of a novel portable noise signal acquisition device for local mining industrial application

Noise induced hearing loss (NIHL) is one of the most common occupational related diseases in the world. According to the World Health Organization, exposure to excessive noise is the major avoidable cause of permanent hearing loss worldwide. Although significant progress has been made in developing physical hearing protectors and in controlling work-related noise exposure, NIHL remains as a severe problem in many industries in the US. The mining industry has higher prevalence of hazardous workplace noise exposure than any other major industrial sectors in the US. According to the reports from the National Institute for Occupational Safety and Health (NIOSH), 80% of the US miners are exposed to noise level that exceeds the Permissible Exposure Level (PEL). The current noise measurement devices were developed based on the equal energy hypothesis (EEH), which states that NIHL mainly depends on the total acoustic energy of noise exposure. However, the EEH does not accurately rate impulsive noise and complex noise. Therefore, the existing noise measurement devices have limitations on evaluation of the high-level complex noise in mining industry. The objectives of this project are: 1) to develop a portable and accurate noise analysis apparatus utilized a customized PCB and preamplified microphones, and 2) to test the developed device both in our lab and in several selected coal mining facilities in the Southern Illinois area.

Ultimately a customized PCB was designed using tools such as DIPtrace, TINA Spice, LT Spice, and MPLab. Subsections of the system were isolated and designed to specific quality criteria. Further, the PCB will undergo testing in field alongside a professional standard device in order to determine the accuracy and precision of the device.

Kevin Walsh and April Haskett

Department of Chemistry

Interlaboratory comparison of stable isotope data: A chance to learn, improve, and be among the best

The Southern Illinois University Carbondale Stable Isotope Facility is heavily involved in on- and off-campus research projects in a variety of sciences and has been providing nitrogen, carbon, hydrogen, and oxygen isotope data since its debut in 2011. Isotope ratio mass spectrometry is a highly accurate and precise technique that is used for determining stable isotope ratios in various soil and liquid organic or inorganic materials. Participating in inter-laboratory comparisons organized by LGC Standards and International Atomic Energy Agency are excellent opportunities for maintaining a very good analytical accuracy and precision, therefore providing high quality data, and acquiring new certified laboratory standards. Since 2013 the stable isotope facility has been participating in the bi-annual proficiency testing organized by LGC Standards. The involvement of undergraduate students in sample preparation, analysis, and data processing has been of tremendous help in obtaining good data and laboratory ranking.

Cody Ward and Dale B. Hales, Ph.D.

Department of Physiology

Anti-inflammatory agents as a means of inhibiting PGE_2 production in ovarian cancer cells

Prostaglandins promote inflammation. We know that non-steroidal anti-inflammatory drugs (NSAIDs) can inhibit the production of prostaglandins by reducing the activity of cyclooxygenase-2 (COX-2). COX-2 is the rate limiting enzyme in the conversion of arachidonic acid to prostaglandins and specifically PGE_2, which is the most pro-inflammatory prostaglandin. High, constant rates of inflammation are associated with increased cancer incidence and severity.

The objective of this study was to determine if naturally occurring anti-inflammatory agents, such as omega-3 fatty acids, could reduce the production of PGE_2 in ovarian cancer cells. We previously determined that SKOV3 ovarian cancer cells do not constitutively produce PGE_2 using the Cayman Chemical PGE2 ELISA kit. As such, we designed an in vitro model in which PGE_2 production was induced using 10μM H_2O_2. Using this model, we treated cells with H_2O_2 to induce PGE_2 production. The SKOV3 cells were then treated with an omega-3 fatty acid, docosahexaenoic acid (DHA). DHA treatments were done at concentrations of 0.1, 1, and 10μM for 2 hours. We then used the Cayman Chemical PGE2 ELISA kit to determine the PGE_2 concentrations post-treatment. As H_2O_2 is damaging to cells, cell viability counts were also taken at the conclusion of the treatments. Using the results of this study, we will be able to use Western blot analysis to examine the activity of COX-2 in SKOV3 cells treated with both inflammatory and anti-inflammatory agents.

Ashlee Weaver and Karla Fehr, Ph.D.

Department of Psychology

The relationship between pretend play processes and anxiety

The proposed research was designed to examine how pretend play is related to anxiety. This relationship with pretend play needs more investigation in order to be able to assess and identify those with anxiety. It also may be possible to use pretend play as an intervention for anxiety. The current study examined the cognitive and affective play processes, which assess organization, imagination, comfort with the play, and frequency and variety of affect expression. Cognitive and affective play processes were used to test specific play processes in relation to anxiety. The current study also examined what types of pretend play are correlated with children's anxiety. The participants were preschool-aged children. Measurements of anxiety were completed by parental report with the Behavior Assessment Scale for Children, Second Edition (BASC-2), and the preschoolers' play was measured with the Affect in Play Scale, Preschool version (APS-P). It is hypothesized that pretend play will correlate with parent-report of their child's anxiety; the better the play skills, the lower the anxiety. Based on previous research of gender differences in anxiety indicating that females are more anxious, it is predicted that females will be rated as more anxious than males. Correlations will be analyzed to examine the relationship between play and anxiety. T-tests will be conducted to examine gender differences. If pretend play and anxiety are correlated, findings from this study may be important for parents and early childhood educators to be aware of. Implications for child development will be discussed.

Austin Weigle[1] and Kevin Smith[2]

[1]Department of Plant Biology and [2]Department of Chemistry and Biochemistry

Chromatographic analysis of absorbance of phenolic compounds in distilled spirits on the basis of wood species

Spirit aging and maturation conventions typically involve the use of oak barrels. The reason for barreling alcohol is that as the spirits age, compounds from the wood are absorbed by the liquid, granting many of the attributes that are associated with spirits: color, transparency, and sensorial aspects such as taste and aroma. Whereas studies dating to the turn of the twentieth century indicated that barreling resulted in varying turbidities of spirits at different proofs, studies conducted within the last ten years detail changes in the chemical composition of whiskey and wine during the barrel aging process. Research has revealed these compounds to be phenolic in nature. Studies have compared the differential effects between differing oak species on the absorbance of these compounds in whiskey, as well as that of differing species of wood on wine spirits. However, no currently known research has explored the affinity for malt barley whiskey-spirits to absorb these phenolic compounds from a variety of up to nine wood species over a month-long aging period, nor do so in reference to distilled ethanol in the form of Everclear. The species to be used as treatments in this experiment will be cherry, hard maple, hickory, red oak, sassafras, soft maple, white ash, white oak, and yellow birch. Honeycomb barreling alternatives of each wood species will be inserted into 750 mL samples of alcohol at a proof of 125 within half-gallon mason jars, on the basis of surface area to volume ratios that are consistent with commercially accepted barreling conventions. LC-MS analysis will then allow for comparative analysis between the retention times of experimentally derived samples in reference to data from selected literature, where samples are drawn weekly for one month.

Tyler Wells[1], Justin G. Boyles, Ph.D.[1], Mike W. Eichholz, Ph.D.[1], and Constantine I. Hatziadoniu, Ph.D.[2]

[1]Department of Zoology, Cooperative Wildlife Research Laboratory and [2]Department of Electrical and Computer Engineering

Experimental evaluation of changes in community-level processes caused by climate change

Human actions are drastically changing our planet, causing negative effects towards the plants and animals that inhabit this area as well. One of the most important issues is climate change, which can cause an alteration in the average biological and physiological processes of plants and animals. From the standpoint of conservation, these changes can begin at an individual-level and progress to community-level, where it can effect certain actions, such as competition, predation, and disease transmission. Experimentally, these alterations have scarcely been demonstrated to this date. We suggest that the bird communities in southern Illinois are an ideal model group to evaluate whether climate change indirectly alters the community-level process (predation) by acting on the individual-level process (energy balance of nesting birds). Our prediction is that a warmer climate will warm avian nests, decreasing the time predators (like hawks and Blue Jays) must spend brooding their eggs and keeping their chicks warm. This allows predators more time off their nest, in turn hunting for eggs and chicks of smaller avian species. Testing this prediction in a natural community will unfortunately require a costly and a large scale experiment. To better increase our chances of gaining funding from a national funding agency in the future (probably NSF or USFWS), we will propose a smaller proof-of-concept experiment. Succinctly, we will be creating a device to either heat or cool the temperature of a bird nest, thus changing the rate at which the eggs or chicks cool while within the nest. In this initial experiment, we will test the relationship between the temperature of the nest and predation rates using captive House Sparrows and insect prey. Dr. Hatziadoniu will supervise the design of the heating and cooling device and Drs. Boyles and Eichholz will supervise the experiment, so this project represents inter-college collaboration.

Morgan Wendling, Darcie Hastings, and Rebecca Atkinson, Ph.D.

Department of Animal Science, Food and Nutrition

Examining the ruminal microbial population when feeding new cereal grain forage varieties

Previously our lab examined the apparent ruminal digestibility of new cereal grain forage varieties that were preferred by cattle, which was determined via a grazing trial. Ruminal contents of the fermenters were sampled on d 0 and again on d 10 to examine the ruminal microbial population. The fermenters were utilized in a 4 x 4 Latin Square design and assigned to one of the following treatments: 1) grass hay + supplement (control, CON); 2) annual rye grass + supplement (RYE); 3) Buck Master forage wheat + supplement (BMW); or 4) Buck forage oats + supplement (BFO). The supplement was formulated to ensure that each treatment met or exceeded NRC requirements for a developing heifer. Ruminal samples were DNA extracted and PCR is currently being performed to determine difference in concentrations of *Butyrivibrio fibrisolvens, Selenomonas ruminantium, Fibrobacter succinogenes,* and *Ruminobacter amylophilus* between treatments.

Hannah West and Gary Apgar, Ph.D.

Department of Animal Science, Food and Nutrition

Evaluation of particle size impact on small farm economic viability

The purpose of this research project was to evaluate a Best Management Practice that may make the Southern Illinois University Carbondale swine farm more efficient. The goal is to enhance the efficiency of pig growth at the farm by evaluating the impact of grind size of ration components on the growth performance in cost of production for pigs; in addition we measured the interaction between particle size and type of feeder on performance and economic efficiency. Twelve pens each containing four pigs were used in the study. The pens were allotted according to initial weight and gender. Half of the pens were fed a finely-ground diet and the rest were fed a coarsely-ground diet. Data analysis is currently being conducted. In response to the outcomes discovered by this research, the swine farm will be able to improve its efficiency and economic return.

Kyle Whittington and Buffy S. Ellsworth, Ph.D.

Department of Physiology

The role of FOXO1 in pituitary cell proliferation

The pituitary is an endocrine gland located near the brain. The pituitary excretes hormones that control growth, other glands, and various other functions. Within the pituitary is a type of transcription factor called forkhead box transcription factors (FOX). These transcription factors are unique because of their structure and their distinct eighty to one hundred amino acid sequence that binds to DNA. It does this to control the rate of transcription of DNA. Each FOX is given a letter and number to identify them. In this study we are studying FOXO1. FOXO1's function in the pituitary is not entirely known. However, our studies have shown that in mice without *Foxo1* the number of somatotrope cells is reduced embryonically. My focus is on FOXO1's impact on cell proliferation. I hypothesized that, because of the decreased number of somatotropes in mice lacking FOXO1, cell proliferation will be lower in specimens without FOXO1. To study this we delete the *Foxo1* gene in just the pituitary and study its effects. If we deleted FOXO1 for the whole mouse then the embryo will not have any vasculature causing the embryo to terminate around embryonic day (e) 10.5. In this study I am looking at the effects of deleting the FOXO1 gene in just the pituitary and how it affects cell proliferation in mice at post-natal day three (P3). Using different genotypes I can study mice with and without FOXO1 in the pituitary. Then I can see how it affects the number of cells that are dividing within the pituitary. The preliminary results, of one litter, show that there is no difference between subjects with and without FOXO1. We plan on doing more litters to confirm our results.

Kayla N. Wiedau, R. Joseph Wuerffel, Joseph L. Matthews, and Ronald F. Krausz, Ph.D.

Department of Plant, Soil, and Agricultural Systems

Control of several Southern Illinois Palmer amaranth populations with fomesafen and lactofen

Glyphosate-resistant Palmer amaranth [*Amaranthus palmeri* (S. Wats)] is becoming increasingly prevalent in Midwestern row crop production; consequently, many soybean growers will be forced to rely heavily on PPO-inhibiting herbicides to achieve adequate control of this weed species. Using the most effective herbicide is important for preventing yield loss and limiting further spread of herbicide-resistant weed biotypes; therefore, understanding which foliar-applied PPO-inhibiting herbicide provides the greatest efficacy on Palmer amaranth is critical. Greenhouse experiments were established using four Palmer amaranth biotypes, two glyphosate-resistant (Madison and Massac Counties in Illinois), and two glyphosate-susceptible (St. Clair and Franklin Counties in Illinois) to evaluate the efficacy of two PPO-inhibiting herbicides: fomesafen (Flexstar®) and lactofen (Cobra®) commercially formulated with proprietary adjuvants (1x = 396 and 220 g ai ha^{-1}, respectively). Additional experiments were conducted to explore the effects of adjuvants on the efficacy of these herbicides. Two fomesafen-containing herbicides, one commercially formulated with a premium adjuvant system (Flexstar®) and one without (Reflex®), and lactofen (Cobra®) were sprayed at 1x rates on all four populations. The three herbicides were also sprayed at 1x rates across all populations with 28% UAN at 4% v/v added to the fomesafen formulated without an adjuvant and the lactofen. Results indicated that the addition of an adjuvant may be needed to provide adequate control of Palmer amaranth with a foliar-applied PPO inhibitor. Therefore, when considering options for postemergence control of glyphosate-resistant or glyphosate-susceptible Palmer amaranth, the appropriate adjuvant with the PPO-inhibiting herbicide is required to ensure adequate control of Palmer amaranth.

Alexandra Willis

Department of Psychology

Examining the genetic and environmental relationship between parent personality and childhood deviance

The purpose of this project is to examine the relationship between parent personality, child temperament, and children's externalizing behaviors. Additionally, in order to understand how much of the relationship between parent personality and child externalizing behavior is due to the environment that the parent and child share versus the genetic commonalities between the parent and child, identical (monozygotic; MZ) and fraternal (dizygotic; DZ) twins will be compared. For the current study, it is hypothesized that parent personality and childhood temperament are correlated with externalizing behavior in children. It is also hypothesized that these correlations are partially caused by the shared genes between the parents and the children. To examine this, data from twins aged 5 to 10 years and their parents were used. The children rated their own externalizing behavior and their experiences with bullying when they were 6 to 10 years old using the Strengths and Difficulties Questionnaire (SDQ) and the Multidimensional Peer-Victimization and Bullying Scale (MPVBS). Their parents completed questionnaires about their own personality using the Parent Personality Questionnaire (PPQ) and about their children's temperament when the children were 5 years old using the Behavioral Styles Questionnaire (BSQ). Both regression and correlation analyses will be used to analyze data for this project. If my hypotheses are supported, this would mean that genes play a large role in the externalizing behaviors of children, suggesting that it is not only environment that matters in child rearing. It will also mean that parent personality and child temperament both affect a child and that both genes and environment play important roles. This study will aid in the understanding of the relationship between parent personality and externalizing behavior in children and will indicate how much of this relationship is due to parenting and how much is due to genetics.

Ashton Wilson and Erin Venable, Ph.D.

Department of Animal Science, Food and Nutrition

The effects of exercise on the microbial metabolites of the equine cecum

Little is known about the effect of exercise on the microbial profile of the equine cecum. As hindgut fermenters, horses are particularly sensitive to gastrointestinal disorders. Previous work (G. Jager et.al., 2013; E.McKenzie et.al., 2010; Walshe and Duggan, 2011; and A. Schoester et.al.) has demonstrated an impact of exercise on the fecal microbial composition of horses and canines subjected to exercise. However, no information has been reported on the effects of exercise related to ammonia and volatile fatty acid production within the gastrointestinal tract. The objective of this research was to test the hypothesis that increasing exercise would impact the production of ammonia and volatile fatty acids within the cecum. Four cecally cannulated horses were used in a Latin square 4x4 to investigate the effect of increasing levels of exercise on cecal metabolites. Four exercise treatments (1 = no exercise; 2 = 5 minutes trot; 3 = 15 minutes trot; 4 = 20 minutes trot) were applied to test our hypothesis. All horses were fed to maintain BCS = 5 (±1) and were weighed weekly with mean BW of 521 kg (±24). Each horse was given daily turnout for 8 hrs (±1) and were stalled overnight in identical 3 x 4 meter stalls with ad lib access to water, salt, and 2.27 kg of mixed grass hay. Horses were fed pelleted complete grain (Strategy® Purina Mills, St. Louis, Missouri) twice daily at approximately 6:30 am and 4:00 pm. Exercise was conducted by lunging with trained handlers. Cecal samples were collected on day 1 of each period prior and on day 7 of each period following exercise. Data were analyzed using Proc Mix of SAS (v9.4 SAS Institute, Inc.) with significance established at $P < 0.05$. Chemical analysis of cecal contents demonstrated no significant difference in ammonia or volatile fatty acid concentration across treatments. Further work should investigate the impacts of longer and more frequent exercise periods with greater intensity.

Lyneesya Wilson

Department of Psychology

Self-esteem: An analysis of STEM versus non-STEM majors and ethnic identity

Beginning in the mid to late nineteen hundreds, self-esteem began to have a heavy presence in research. It became widely understood to be important to the lives of individuals, and researchers were trying to figure out causes for higher self-esteem in order to build it. This still holds true for research today as there is a lot not understood about self-esteem. This has since initiated many researchers to identify qualities self-esteem is connected to. Among many qualities, academic achievement as it relates to self-esteem has sparked a plethora of correlational studies. Specifically, this research will examine a connection between a STEM major's self-esteem and the self-esteem of a non-STEM major to see if one's major correlates with self-esteem. As a non-STEM major, I have noticed that career paths outside of science, technology, engineering, and math are often times not looked as highly upon. Although this is a generalization, this research determines if career choice could be related to self-esteem. In addition, there will be a cross analysis of self-esteem between ethnicities. There has been research studies that detected a higher level of self-esteem in African Americans such as *Components of Academic Success: A Profile of Achieving Black Adolescents* (Edwards 1976). Self-esteem in this study will be defined by the Rosenberg Self-esteem Scale (RSE) (Rosenberg 1965, 1979). Ethnicity in this study will be defined by the ethnicity the student identifies with as written on the questionnaire. The participants of this study were taken from the online research participant pool of college students attending Southern Illinois University in Carbondale. These students were asked to complete the questionnaire rating the questions from strongly to strongly disagree. This determined the self-esteem of the individual allowing for an analysis of the data to be made. This research aims to draw more connections between self-esteem and qualities of life in which it is connected ultimately making what is understood, in relation to self-esteem, to be greater than what is not understood. This in turn will determine the best methods in improving self-esteem for posterity.

Shaun Wolfe and Kevin Sylwester, Ph.D.

Department of Economics

The macroeconomic effects of fiscal policy on housing markets

What caused the recent financial crisis The Great Recession? It is largely believed to have been the result of a housing bubble. Many, such as Taylor (2007), believe it was caused by expansionary monetary policy in the early 2000's. I propose that the Bush Tax cuts played a role in creating the bubble as well. To test this hypothesis, I consider a more general question: How do housing prices respond to an increase in tax rates? Using a measure of tax policy from Romer and Romer (2010), I examine to what extent changes in taxes have contributed to housing price increases as measured by the Case-Shiller Housing Index since the mid 1970's. The advantage of the Romer and Romer tax measure is that it is exogenous to business cycle conditions that could also influence housing prices. Statistical analysis shows a large, however moderately significant and negative correlation between tax increases and housing prices.

Allison Wright, Lan Hai, and Prema Narayan, Ph.D.

Department of Physiology

Fertility study in a mouse model of Familial Male Limited Precocious Puberty

Familial Male Limited Precocious Puberty (FMPP) is a rare disease that is caused by activating mutations in the luteinizing hormone receptor (LHR) gene. The most common mutation is the replacement of aspartic acid by glycine. FMPP causes males to reach puberty at the age of 4, have high levels of testosterone and Leydig cell hyperplasia. A mouse model of FMPP (KiLHR) was created. These mice are sub-fertile and display precocious puberty, high levels of testosterone and Leydig cell hyperplasia. At about 6 months of age less than 10% of KiLHR males are fertile. The goal of this study was to determine the cause of the progressive infertility.

To determine if the infertility was due to an inability to mate or the inability of sperm from KiLHR mice to fertilize oocytes, superovulated wild type females were placed with KiLHR males for one night, and then dissected. Copulatory plugs were not formed in females mated with KiLHR males. However, when a plug was found, sperm was observed in the uterus, and fertilized oocytes were found. This suggested that the progressive infertility was due to a mating problem rather than an abnormality in the sperm.

To test the mating behavior of KiLHR males, ovariectomized wild type females were placed with KiLHR males and video recorded for 30 minutes. The number of attempted mounts was tallied as well as if the male ejaculated. The wild type males ejaculated with relatively low numbers of attempted mounts, whereas none of the KiLHR males ejaculated despite a high number of mounts. This suggested that the progressive infertility of the KiLHR mice was due to an inability to ejaculate. Further research is needed to determine the cause of the ejaculatory dysfunction.

Brad Wurl and Yanna Liang, Ph.D.

Department of Civil and Environmental Engineering

Energy sustainability: Converting sorghum bagasse to bio-oil

It is commonly recognized that continued use of fossil fuels is not sustainable. To maintain sustainable development of our society, we must replace fossil fuels with those that are renewable, environmentally friendly, and domestic. Biofuels produced from lignocellulosic biomass meet these criteria perfectly. In Dr. Yanna Liang's lab, a simple but effective process to pretreat sorghum bagasse and release fermentable sugars from it has been developed successfully. The remaining bagasse after pretreatment, however, needs to be better utilized besides burning for electricity. Thus, for this project, we aim to identify optimal parameters to produce bio-oil from this left bagasse through use of hydrothermal liquefaction (HTL). Two temperatures and five catalysts will be evaluated in terms of yield of bio-oil and carbon mass balance. The top three bio-oil having the highest bio-oil yield will be further analyzed regarding oxygen content, elemental composition, chemical composition, water content and viscosity. Characteristics of the best bio-oil samples will be compared with those of petroleum oil. Results from this project will reveal the optimal conditions for achieving maximal oil yield from the remaining bagasse after pretreatment. These optimal parameters, such as temperature and catalyst can be used in larger scales to generate bio -oil in large quantities, supporting sustainable development not only in our local community and region, but also at a global scale.

William Cody Yarnell, Allana Cronk, Margaret French, Juliane Wallace, Ph.D., and Jared M. Porter, Ph.D.

Department of Kinesiology

Focusing attention internally negatively effects standing long jump performance

Motor behavior research has consistently demonstrated that an individual can consciously focus their attention internally or externally. An internal focus is when a performer focuses on a specific part of the body such as the knees when jumping. In contrast, an external focus is when attention is directed towards the desired outcome of the movement; such has jumping to a specific point on a landing mat. Research findings routinely demonstrate that focusing externally improves performance more than focusing internally. However, no published reports have investigated how instructing an individual to focus their attention to various internal cues comparatively depresses motor performance. Purpose: Determine how various forms of an internal focus of attention impact standing long jump performance. Method: 51 male and female college students were recruited. Of those, 7 subjects were used for pilot testing. Later, 4 subjects were identified as outliers and removed from the sample. This resulted in 40 subjects being used in the analysis. Procedure: Following a 5-minute warmup, participants practiced a total of 10 standing long jumps. Participants were given instructions prior to each jump that were designed to focus attention towards a specific cue (e.g., toes, knees, arms, hips, and control). Participants were given a 1-minute rest between jumps. Jump distance served as the dependent variable. Results: Data were analyzed using a 2 (jumps) X 5 (conditions) ANOVA with repeated measures. The results of the ANOVA indicated that all of the internal focusing conditions jumped a shorter distance compared to trials completed in the control condition. Conclusion: The results of this study indicate that regardless of how attention is focused internally, motor behavior is equally depressed compared to trails completed in a control condition. This finding suggests that practitioners should strongly avoid instructions that focus attention internally towards any movement characteristic of the body.

Gregory Zimay, Fan Shi, Ping He, and Boyd Goodson, Ph.D.

Department of Chemistry

Characterization of a novel water-soluble ("PEGylated") catalyst for NMR/MRI signal by reversible exchange in aqueous environments

One problem associated with Magnetic Resonance Imaging (MRI) and nuclear magnetic resonance spectroscopy (NMR) is low detection sensitivity under normal conditions. However, utilizing Signal Amplification by Reversible Exchange (SABRE) researchers have been able to dramatically improve the efficiency of NMR and MRI in some cases. In SABRE, Iridium-based catalysts allow transfer of nuclear spin order from parahydrogen—an easily-prepared "spin isomer" of ordinary molecular hydrogen, H_2 to a substrate molecule in a weak magnetic field, thereby increasing sensitivity by orders of magnitude. One key drawback of SABRE has been that the primary catalyst used for SABRE, [IrCl(COD)(IMes] (IMes = 1,3-bis(2,4, 6-trimethylphenyl)imidazole-2-ylidene; COD = cyclooctadiene)]—at least in pre-activated form—is insoluble in water, hindering its use in aqueous media and slowing biomedical imaging applications. It was shown by our collaboration (with scientists at Vanderbilt) that the above catalyst does become water-soluble (and can perform SABRE in water) once activated in organic solvent, dried under high vacuum, and reconstituted in aqueous environments. However, this process requires extra steps and aqueous solubility is limited. A new variant of this catalyst was recently developed where the "IMes" group was covalently linked to PEG (polyethylene glycol). This new variant had greatly enhanced water solubility, and was SABRE active; however, this SABRE activity dropped to zero when used in pure water. The previously researched SABRE catalyst was already synthesized and characterized using NMR spectroscopy. Using that effort as my starting point, the goal of this project is to determine why the new PEGylated catalyst loses its SABRE functionality in aqueous environments, and to find new formulations of the catalyst to solve this problem. Possible causes of the failure include catalyst poisoning from a change in environment, failure of the catalyst to activate properly, and the inability to supply parahydrogen to the system sufficiently.

Stephania L. Zneimer[1] , Mihai Lefticariu, Ph.D.[3] , and Liliana Lefticariu, Ph.D.[1,2]

[1]Department of Geology, [2]Environmental Resources and Policy, and [3]Mass Spectrometry Facility

Tracking regional climate patterns through stable water isotopologues in precipitation and surface waters of Southern Illinois

Many communities in Southern Illinois depend on rivers and streams for their water supplies. These water resources are critical to economic activities, especially agriculture, mining, industry, and forestry. Weather events associated with climate change such as droughts and floods can impact the quantity and quality of surface waters. This project proposes to track changes in the local hydrological cycle associated with climate change by using stable isotope compositions (δ18O and δD) of precipitation and stream water in Southern Illinois. Data will be used to establish spatial and temporal isotopic gradients of surface waters as well as to refine modern water cycle and climate models. The stable isotope composition of precipitation varies geographically, so mapping its patterns along with those of river water can help identify source water dynamics. The project will be a one-year study of the stable isotope composition of precipitation in Carbondale, Illinois, and river water collected at various locations on the major rivers and their tributaries in Southern Illinois.

Specific problems that will be addressed during this study refer to the: (1) temporal variations in isotopic signature of precipitations in Southern Illinois (2) refined equation for the local meteoric water line, (3) local deuterium excess parameter (d-excess) of precipitation, and (4) spatial and temporal isotopic variations of river and steam water δ18O and δD in Southern Illinois. The data generated by this project will be use to decipher the potential changes in the water cycle in Southern Illinois due to climate change. Our results will be included into the IAEA's databases, namely the Global Network of Isotopes in Precipitation (GNIP) and Global Network of Isotopes in Rivers (GNIR). This project will provide a unique opportunity as there has been very little isotopic data collected from precipitation and surface waters to correlate regional climate patterns in Southern Illinois.

What students say about undergraduate research:

“It’s not somebody else’s research, it’s my own, which is really nice. You don’t have to have somebody tell you what to focus on or what to do. It’s a great opportunity to be able to put yourself in your field and get started. It’s really helped me starting my career.” -- Misty McElyea

“I view this project as part of a bigger effort of trying to find out how all of life is created. There may not necessarily be an immediate or obvious benefit; it’s not going to cure a disease or it’s not going to make anyone money. It’s just one of those questions that I think people are curious about, like how does life all tie together in the end. I feel like this project will contribute to that. And, this has given me a really good opportunity to figure out if this is the major I really want to do, instead of going through four years and not getting any real lab experience and hoping that I would like it. That’s really been the main benefit for me - experience and exposure to my field.” -- Nicholas Defreitas

“This opportunity to do real research as an undergraduate has enforced in me that this is indeed what I want to do with my life."
-- Sara Reardon

"I have learned more from doing research than in any class I've taken. Hands-on learning stays with you much better than learning from lectures and books. Research is slow and frustrating but the rewards and excitement of discovering new scientific information are beyond anything I could have imagined. No matter what I do in life, I will always be able to use the tools of research, especially the critical-thinking and problem -solving skills that are essential for success."
-- Renee Lopez-Smith

“This experience confirmed my ability to tackle a large project and to meet a deadline, but more importantly I was able to participate in something I enjoyed and also educate the public about a growing problem in our waterways.” -- Matt Wegener

Undergraduate Research Opportunities at SIU

REACH (Research-Enriched Academic Challenge)

This competitive program is open to SIU Carbondale undergraduate students in all disciplines, and offers approximately 20 grant awards each year to students working on independent research or creative activities with a faculty mentor. Awards consist of one-year grants of up to $1,500 combined with undergraduate assistantships of 10 hours per week. Students present project results at the Undergraduate Creative Activities and Research Forum held each spring semester on the SIU Carbondale campus. For more information about the program, visit reach.siu.edu, or contact staff in the Center for Undergraduate Research and Creative Activities office in the Student Services building, room 126, at 618/453-4433, or via email at reach@siu.edu.

Creative and Scholarly Saluki Rookies Program

This competitive program offers SIU Carbondale freshmen and sophomores the opportunity to engage in faculty-mentored, hands-on research or creative activities. Students explore their intended majors, develop relationships with faculty in their field, and gain valuable research and critical thinking skills. For more information, you may contact staff at the Center for Undergraduate Research and Creative Activities office in the Student Services building, room 126, at 618/453-4433, or via email at curca@siu.edu.

McNair Scholars Program

This federally funded program offers SIU Carbondale undergraduate students hailing from underrepresented groups, including minority and first-generation/low-income students, preparation for graduate school. It provides mentoring, GRE preparation, and academic support. McNair Scholars take part in a summer research institute and present research results at a campus symposium and at conferences in their discipline. For more information, you may visit mcnair.siu.edu, or contact staff in Woody Hall B139-B145, or at 618/453-4585.

Louis Stokes Alliance for Minority Participation

SIU Carbondale is a member of the Illinois Louis Stokes Alliance for Minority Participation, a statewide coalition dedicated to increasing the number of underrepresented minority students in science, mathematics, and engineering. Funded by the National Science Foundation, this program provides paid, mentored research experiences for SIU Carbondale undergraduates. For more information, visit ilsamp.siu.edu, or contact staff in the Center for Undergraduate Research and Creative Activities office in the Student Services building, room 126, at 618/453-4433, or via email at curca@siu.edu.

Undergraduate Assistantship program

The Undergraduate Assistantship program provides a unique opportunity for SIU Carbondale undergraduate students. The program offers on-campus research and/or creative activity opportunities for full-time SIU Carbondale undergraduate students. Students selected for an Undergraduate Assistantship work directly with a faculty member or professional level staff member in a project that leads to a poster or oral presentation at the Undergraduate Creative Activities and Research Forum held each spring semester on the SIU Carbondale campus. Selected students spend 5, 10, 15, or 20 hours per week working on the project and are paid $10/per hour. The UGA program, one of the programs in the Center for Undergraduate Research and Creative Activities, a unit of the Office of the Vice Chancellor for Research, has cooperating support from Human Resources, Payroll, Office of Sponsored Projects Administration, University Honors, and the University hiring departments. For more information and eligibility requirements, visit undergraduateassistantship.siu.edu, or contact staff in the Center for Undergraduate Research and Creative Activities office in the Student Services building, room 126, at 618/453-4433, or via email at ugrada@siu.edu.

SIU Carbondale Literary & Art Awards

The Center for Undergraduate Research and Creative Activities (CURCA) is one of the offices at SIUC that supports Grassroots and its events. CURCA provides Undergraduate Assistantships (UGA) for undergraduate students in Grassroots. In the 2014-2015 academic year, three UGA positions were awarded for the editors. CURCA also finances the monetary award of $3,000 for the SIU Carbondale Literary and Art Awards, and compensates the external judges for these awards.

All of the creative submissions accepted to be published in this magazine, *the Grassroots Undergraduate Literary and Arts Magazine,* are eligible for the SIU Carbondale Literary & Art Awards. External judges (bios on the next page), chosen by the faculty advisors of Grassroots, will judge each student's work in three categories: prose, poetry, and art/photography.

CURCA is a unit of the Office of the Vice Chancellor for Research and is a unique resource for students ready to expand their education beyond the classroom. There are different programs available designed to provide students with opportunities to discover through various hands on experiences. CURCA offers students the opportunity to cooperate with a faculty mentor on independent creative activities or research.

The greatly widespread opportunities available in CURCA have produced past grant-funded undergraduate creative activities and research.

CURCA is proud to be involved in the Devil's Kitchen Literary Festival held in October of each year organized by Grassroots. The Devil's Kitchen Fall Literary Festival is an annual three-day festival featuring readings, panels, and book signings by writers from across the nation. The festival is held on the campus of Southern Illinois University Carbondale. The Devil's Kitchen awards recognize one poet, one prose writer fiction and one literary nonfiction for a collection of work, a novel, or memoir published in the preceding year.

For more information visit http://grassroots.siu.edu/.

SIU Carbondale Literary & Art Award Judges

Prose category judge **Kristiana Kahakauwila**:

Kristiana Kahakauwila is the author of the book *This Is Paradise* (Hogarth, 2013) which was chosen for the Barnes & Noble Summer 2013 selection. She has been a writer and editor for Wine Spectator, Cigar Aficionado, and Highlights for Children magazine. She has taught English at Chaminade University in Honolulu, and creative writing at Western Washington University as an assistant professor. Website: http://www.kristianakahakauwila.com.

Visual Art category judge **Melodie Past**:

Melodie Past (MA in English/poetry writing), painter and photographer, sells her work internationally. She is the former managing editor of Inscape literary and visual arts journal. Her studio is in Kentucky. In addition to selling and exhibiting her art, Past emphasizes the importance of generating material by sharing her daily work on social media. Website: http://melodiepast.com.

Poetry category judge **Katherine Riegel**:

Katherine Riegel is the author of two books of poetry, *What the Mouth Was Made For* (FutureCycle Press, 2013) and *Castaway* (FutureCycle Press, 2010). Her poems have appeared in numerous journals, including *Crazyhorse, Eleven Eleven, failbetter, Mead, Poetry Kanto*, and *West Branch*; her essays have appeared in journals including *Brevity, Cream City Review, Fourth Genre*, and *The Rumpus*. She is co-founder and poetry editor of *Sweet: A Literary Confection*, an independent online magazine of poetry and creative nonfiction, and edited *All of Us* (Sweet Publications, 2014), an anthology of poetry that appeared in *Sweet* during its first five years. She writes for *The Gloria Sirens*, a collective blog dedicated to sharing and promoting the work of women writers. A graduate of the Iowa Writers' Workshop, she has been awarded residencies by The Ragdale Foundation and The Atlantic Center for the Arts. She teaches poetry at the University of South Florida in Tampa. Visit her at katherineriegel.com.

The Undergraduate Creative Activities and Research Forum is presented by CURCA (Center for Undergraduate Research and Creative Activities).

CURCA is a unit of the Provost and Vice Chancellor of Academic Affairs and is a unique resource for students ready to expand their education. There are different programs available designed to provide students with opportunities to discover through various hands on experiences.

To celebrate and recognize creative achievements and research by undergraduate students, CURCA, and the Provost and Vice Chancellor for Academic Affairs collaborating with SIU Technology Transfer Program and Student Innovation Incubator to sponsor SIU Carbondale's annual Undergraduate Creative Activities and Research Forum and Saluki App Competition.

For more information, see www.curca.siu.edu

SIU CARBONDALE
SOUTHERN ILLINOIS UNIVERSITY
CENTER FOR UNDERGRADUATE RESEARCH & CREATIVE ACTIVITIES