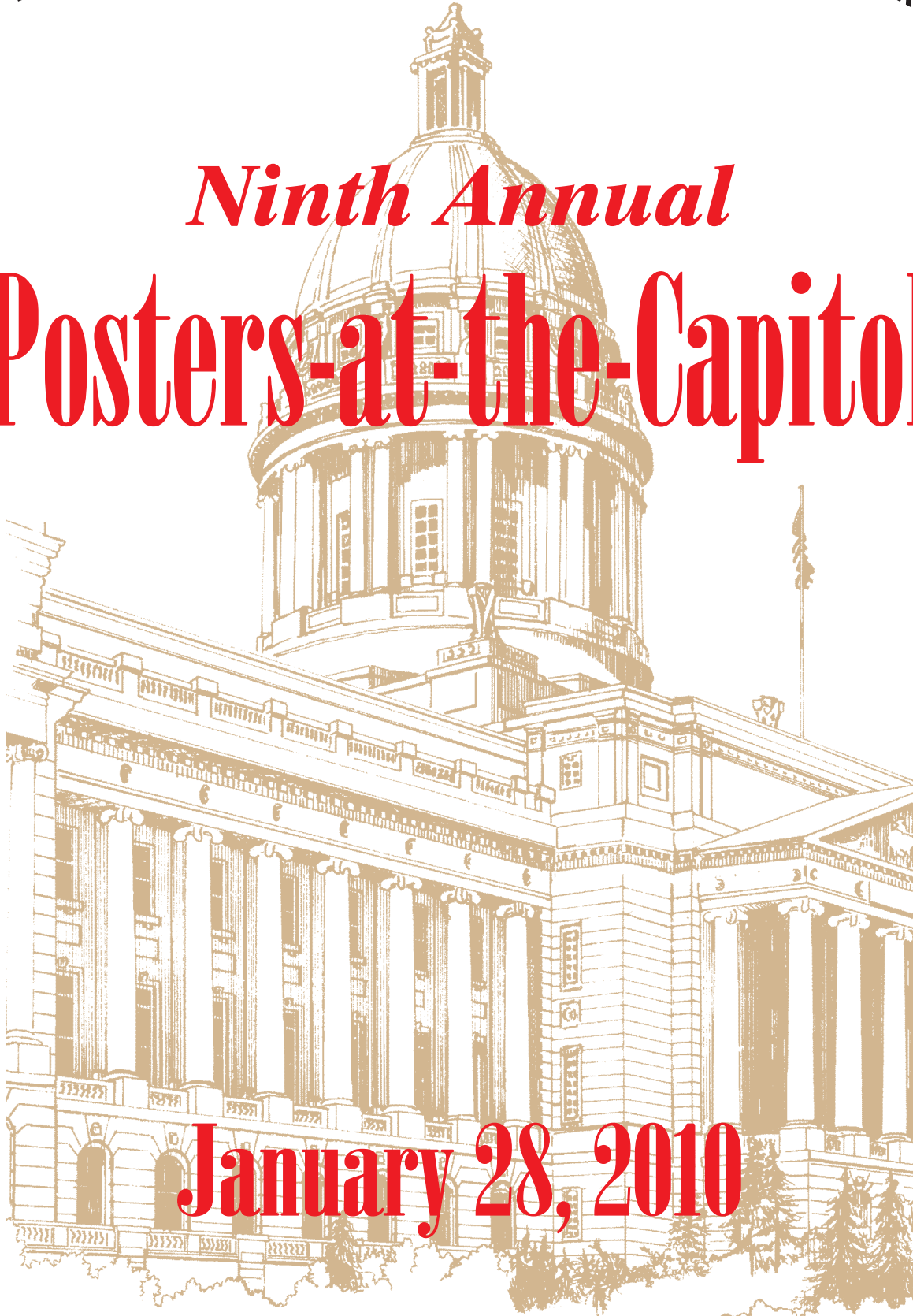


NORTHERN KENTUCKY UNIVERSITY • UNIVERSITY OF KENTUCKY

MURRAY STATE UNIVERSITY • KENTUCKY STATE UNIVERSITY • MOREHEAD STATE UNIVERSITY

UNIVERSITY OF LOUISVILLE • WESTERN KENTUCKY UNIVERSITY • KENTUCKY COMMUNITY AND TECHNICAL COLLEGE SYSTEM

# *Ninth Annual* **Posters-at-the-Capitol**



## **January 28, 2010**



**Welcome from President Doug Whitlock of Eastern Kentucky University:**

Eastern Kentucky University is proud to participate in the ninth annual *Posters-at-the-Capitol* program because we believe it clearly demonstrates the high quality of our public universities, the tremendous value of public higher education in our Commonwealth and the scholarly and creative achievements of some of our best and brightest students.

The projects represented in this exhibit reflect the collaborative efforts of students and dedicated members of our outstanding faculty – men and women who model a passion for excellence and lifelong learning. As they nurture our students to reach deep within themselves and realize their full potential, these faculty mentors bring great honor to themselves, our University and to the teaching profession.

Undergraduate research is an integral component of the teaching-learning process at ECU, where students are encouraged to explore all the possibilities behind the question “What if?” As a “School of Opportunity,” we are committed to providing all our students with diverse educational opportunities that enhance their classroom experiences and develop their intellectual curiosity. Each year, our students’ exemplary work is displayed in a week-long Undergraduate Presentation Showcase. This discovery and application of new knowledge is exciting for the student participants and uplifting to our entire University community.

I applaud all the faculty mentors in the *Posters-at-the-Capitol* program for providing such quality learning experiences for their students. To all the students, I offer my heartfelt congratulations and this challenge: let this experience mark only the beginning of your educational journey and a life committed to personal excellence.

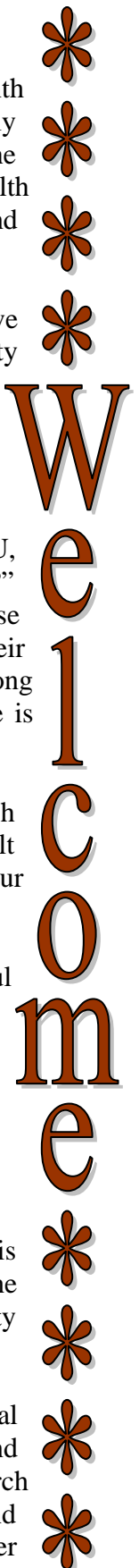
Writer A. Lou Vickery once said, “Four short words sum up what has lifted most successful individuals above the crowd: a little bit more.” Students, I am pleased to see that already you are living your life by that truth. Congratulations, and keep up the good work!



**Welcome from President Michael McCall of the Kentucky Community and Technical College System:**

The Kentucky Community and Technical College System is delighted to take part in this celebration. I applaud the efforts of the *Posters-at-the-Capitol* Organizing Committee and our university partners in promoting innovative student research and scholarship.

Engaging students in substantive research projects stimulates critical thinking and builds a strong foundation for advanced research and professional development after graduation. Undergraduate research opportunities also provide student-scholars the added benefits of faculty expertise and mentorship. Moreover, college students with solid research skills typically achieve greater educational outcomes and are also more likely to pursue postgraduate studies than those without these valuable skills.



***President McCall's Welcome Cont'd.***

I am extremely pleased that KCTCS students will have the opportunity to showcase their accomplishments in the research arena. KCTCS, where higher education begins for most Kentuckians, is committed to improving the quality of life for Kentuckians and the pursuit of applied research is one of the myriad ways KCTCS students can enhance economic development within the Commonwealth. Congratulations to the ***Posters-at-the-Capitol*** scholars. I wish each of you continued success on your journey of scholarly achievement.



**Welcome from President Mary Evans Sias of  
Kentucky State University:**

Undergraduate research is an essential part of the university educational experience. Kentucky State University therefore welcomes the opportunity to showcase its students and their work through ***Posters-at-the-Capitol***.

In today's complex world, the demand for talented researchers outpaces supply, a trend which worries policymakers, educators and industries. Undergraduate research gives students a glimpse of what it's like to be researchers and an advantage in applying for graduate schools and jobs.

Students' exposure to and involvement in the discovery of new knowledge through research engages their curiosity and makes learning more relevant. Society benefits as well, as students learn to think independently and to solve problems. They acquire communication and interpersonal skills as they meet peers with similar interests, collaborate with faculty and make public presentations.

We all benefit from encouraging students to learn new skills, to discover new knowledge and to apply those skills and knowledge within their chosen fields and within their communities.

Kentucky State University thanks and congratulates you on the 2010 ***Posters-at-the-Capitol*** and wishes you continued success.



## **Welcome from President Wayne Andrews of Morehead State University:**

I am delighted that the members of the General Assembly will again have the opportunity to observe and interact with our undergraduate students participating in the 9<sup>th</sup> Annual *Posters-at-the-Capitol* event. These student projects, completed in collaboration with faculty members outside the traditional classroom setting, provide an excellent example of the personal, value-added educational opportunities available at Morehead State University. I take great pride in the high priority that we have placed on faculty-mentored student-engagement activities in basic and applied research, artistic and other creative endeavors, and community and regional stewardship.

Active engagement of undergraduate students with faculty in research, scholarship, and other creative endeavors provides the type of rich, stimulating academic environment necessary for students to excel in the 21<sup>st</sup> century. Morehead State University is committed to the continued expansion of these scholarly opportunities for students in all academic programs through initiatives such as our Undergraduate Research Fellows program and our Celebration of Student Scholarship Week.

This annual student showcase clearly demonstrates the commitment of Kentucky's public institutions of higher education to faculty-mentored undergraduate research and the pursuit of academic excellence. I offer my sincere thanks to the faculty mentors who go the extra mile to meaningfully involve students in their scholarship, and my hearty congratulations to these student scholars for their outstanding research and creative accomplishments.



## **Welcome from President Randy J. Dunn of Murray State University:**

This year marks the ninth anniversary of *Posters-at-the-Capitol*. Murray State's involvement in this worthy event is both a testament to our students, who are seeking out these kinds of learning opportunities in growing numbers, and to our University as we all work to provide a greater number of high quality, research-based teaching and learning opportunities for MSU students.

Murray State University places a high premium on programs that promote one-on-one interaction between our faculty and students. Through our Undergraduate Research and Scholarly Activity office and our system of Residential Colleges, Murray State continuously supports faculty-student interaction. By providing our students with these kinds of learning opportunities, Murray State – along with all of Kentucky's public universities – is meeting the objectives of the Council on Postsecondary Education and the Legislature by ensuring that our graduates are well prepared for life and work.

I join the *Posters-at-the-Capitol* Organizing Committee in inviting all of our Commonwealth's citizens to visit and review the work of Kentucky's most gifted students. These undergraduates are contributing ideas that are impacting communities and changing lives. Congratulations to all those students and faculty whose hard work has made *Posters-at-the-Capitol* possible.





## Welcome from President James Votruba of Northern Kentucky University:

Two of the Strategic Goals of Northern Kentucky University are to “Strengthen our commitment to ‘up close and personal’ as a defining quality of the NKU experience”, and to “Expand student participation in undergraduate research and other forms of creative activity as a defining characteristic of NKU.” These goals point to the very important role that undergraduate research plays in the fabric of our university life. Direct interaction between faculty and students in undergraduate research and creative activities results in development by the students of critical thinking and analytic skills as well as oral and written communication skills needed to present their work. These interactions also foster the deep intellectual bond between faculty member and student that is a defining characteristic of our students’ education.

We are proud and pleased to present our students’ work at this, the ninth *Posters-at-the-Capitol*. We have observed the growth of this event and conclude that the quality of work has increased each year. These posters and presentations are the culmination of much effort by our students and their faculty mentors and exemplify the high quality work by undergraduate researchers at Northern Kentucky University. We know that the students displaying their work here are future leaders in the development of the intellectual infrastructure of the Commonwealth and are therefore confident of Kentucky’s future.



## Welcome from President Lee T. Todd, Jr. of the University of Kentucky:

Research is a powerful engine that helps drive the economic and educational missions of the Commonwealth. I believe that exposure to and participation in the research process is important for every college student’s academic career. The experience opens the mind to new ideas and new possibilities.

Now in its ninth year, *Posters-at-the-Capitol* is a welcome opportunity to recognize undergraduate research as an essential part of the educational experience; one that benefits students, faculty, and ultimately, the Commonwealth. For students, undergraduate research affords an opportunity to work collaboratively with faculty and peers, to participate directly in the creative process and the generation of knowledge, to experience the rewards of inquiry-based learning, and to expand upon the lessons learned in the classroom. Through undergraduate research, students experience personally the intellectual passion that is the foundation of scholarship at the University of Kentucky.

For faculty, there is no more rewarding teaching opportunity than to serve as a mentor for an eager young mind. The goals that inspire faculty and establish teaching as one of the truly noble professions include opportunities to excite imagination, foster curiosity, and celebrate the values of academic scholarship. Supervision of undergraduate research and creativity projects maximize those kinds of teaching opportunities.

***President Todd's Welcome Cont'd.***

The biggest benefactor of such inquiry and innovation may very well be our Commonwealth. The generation of new ideas will hold the key to Kentucky future and our ability to compete in the global marketplace.

The University of Kentucky is proud to offer our students the opportunity to experience creativity, innovation, and discovery from the moment they step foot on campus. That commitment is reflected by our recent efforts to expand support of undergraduate scholarship. Our Chellgren Center for Undergraduate Excellence offers students and faculty unique opportunities to enrich the undergraduate experience. By participating in the National Conference on Undergraduate Research, UK provides Kentucky students to compete and learn alongside top scholars from around the nation.

Thank you for being a part of this event and remember research is never ending. It has no limits and can take you anywhere you are willing to explore. Enjoy the journey.



**Welcome from President James Ramsey of the University of Louisville:**

The Legislative mandate given to the University of Louisville is to be a “preeminent metropolitan research university.” Building a strong research base is critical to our state. The University of Louisville is proud of its many outstanding faculty researchers and scholars who mentor undergraduate students in their laboratories and classrooms. The commitment to our students’ educational experience begins with enrollment, and their exposure to research comes early in their academic life. Through the *Posters-at-the-Capitol* program, our undergraduate students exchange their ideas and discoveries with the Commonwealth’s elected leaders. Instilling a passion for creativity and new knowledge among undergraduate students is vital to economic development and quality of life success. The *Posters-at-the-Capitol* program introduces undergraduate students to the importance of reporting scientific investigation and supporting crucial public investment in research and development.

This collaborative event among Kentucky’s public universities allows talented undergraduates to demonstrate their academic achievement and the effectiveness of Kentucky’s higher education system. The University of Louisville is proud of this program and its participants. We hope you will share our enthusiasm for the opportunities offered and visit with our students.



## Welcome from President Gary Ransdell of Western Kentucky University:

Western Kentucky University takes great pride in the fact that highly credentialed faculty from a wide array of academic disciplines involve undergraduate students in meaningful research activities. The comprehensive university in America has as its primary responsibility, the applied use of its intellectual capacity to identify and solve problems that exist in its region. At WKU, scholarly collaborations utilize the concepts learned in classrooms and laboratories to prepare students for the workforce and graduate/professional schools. WKU research projects also address issues important to constituents outside the University, thereby impacting the social and economic development of our community, counties, state, and nation.

As in previous years, it is gratifying to see the number and diversity of student scholars, along with their faculty mentors participating in this ninth annual *Posters-at-the-Capitol* project. It is vitally important that our legislators meet these students and witness the tangible benefits accruing from ongoing student research at our universities and its potential impact on an improved quality of life for all Kentuckians. WKU is proud to participate in the *Posters-at-the-Capitol* project.

## Welcome from the *Posters-at-the-Capitol* Organizing Committee



John Mateja  
Jody Cofer

[www.murraystate.edu](http://www.murraystate.edu)



Rose Perrine  
[www.eku.edu](http://www.eku.edu)



George Antonious  
[www.kysu.edu](http://www.kysu.edu)



Bruce Mattingly  
[www.morehead.edu](http://www.morehead.edu)



Dan Curtin  
[www.nku.edu](http://www.nku.edu)



Robert Tannenbaum  
Evie Russell  
[www.uky.edu](http://www.uky.edu)



Pamela Feldhoff  
[www.louisville.edu](http://www.louisville.edu)



Blaine Ferrell  
[www.wku.edu](http://www.wku.edu)



Mary Janssen  
[www.kctcs.edu](http://www.kctcs.edu)

# Schedule of Activities

9:00 a.m. to 11:00 a.m. .... Poster Setup

9:00 a.m. to 1:30 p.m. .... Legislative Visits

10:15 a.m. .... Group Photograph with Officials (Senate Staircase)

11:00 a.m. ....Welcome Remarks (Rotunda)

11:10 a.m. .... Remarks by Invited Guests

11:00 a.m. to 3:30 p.m. ....General Poster Session Viewing

1:30 p.m. to 3:00 p.m. .... Reception

3:30 p.m. .... Conclusion

All times listed are Eastern Standard Time.



**PLACE HOLDER**

Capitol Building Map

Inserted During Printing

<b>Eastern Kentucky University</b>						
<b>Poster No.</b>	<b>Student</b>		<b>Faculty Mentor(s)</b>	<b>Page No.</b>	<b>House No.</b>	<b>Senate No.</b>
7	Anzelon	Heather	James Wells	19	81	34
16	Burns	Deanna	Joyce Wolf	23	81	34
17 & 18	Burton	Kelly	Jonathan Gore & Richard Osbaldiston	23 & 24	36	34
27	Courtney	Matthew	Joyce Wolf	29	88	12
44	Fields	Matthew	Laurel Morton	38	89	21
47	Gilbreath	Emily	Stephen Richter	40	81	34
61	House	Angel	Jon McChesney	47	61	17
70	Lakin	Theresa	Robert Karolich	51	36	34
61	Lovelace	Victoria	Jon McChesney	47	81	34
84	Miller	Elizabeth	Doris Pierce	60	81	34
61	Mitchell	Ilena	Jon McChesney	47	81	34
92	Preston	Andrew	Nathan Tice	65	97	31
93	Ratliff	Sara	Darrin Smith	66	94	31
61	Robinson	Erin	Jon McChesney	47	81	34
114	Thompson	D. Lynn	Marta Miranda & Betsy Hopkins	77	81	34
118	Wheeler	Travis	Rebekah Waikel	79	70	18
92	Wieliczko	Marika	Nathan Tice	65	45	12

<b>Kentucky Community and Technical College System</b>						
<b>Poster No.</b>	<b>Student</b>		<b>Faculty Mentor(s)</b>	<b>Page No.</b>	<b>House No.</b>	<b>Senate No.</b>
1	Abuonk	Sarah	Timothy Dick	15	7	8
12	Bloodworth	Brandi	Terri Tillen	21	10	6
12	Esposito	Anthony	Terri Tillen	21	15	6
51	Green	Whitney	Mary Janssen	42	4	4
63	Hunter	Scott	Terri Tillen	48	10	6
66	Kessinger	Matthew	Micah Perkins	49	14	6
74	Lewis	Jonathan	Felix Akojie & Zhonghua Li	53	3	2
63	Martin	Roger	Terri Tillen	48	15	6
85	Morris	James	Norman Strobel	60	62	17
66	Myers	Jordan	Micah Perkins	49	14	8
12	Oliver	Lucas	Terri Tillen	21	15	6
1	Pettibone	Nancy	Timothy Dick	15	7	8
63	Shelton	Katie	Terri Tillen	48	15	6
1	Shouse	Angela	Timothy Dick	15	7	8

<b>Kentucky State University</b>						
<b>Poster No.</b>	<b>Student</b>		<b>Faculty Mentor(s)</b>	<b>Page No.</b>	<b>House No.</b>	<b>Senate No.</b>
13	Bowie	La'Quida	Kirk Pomper, Li Lu, Jeremiah Lowe, & Sheri Crabtree	21	57	7
15	Braxton	Dauida	Williard Mazhawidza & Narayanan Rajendran	22	8	1
30	Davis	Chaniece	Li Lu, Kirk Pomper, Jeremiah Lowe, & Sheri Crabtree	31	57	7
35	Durham	Jessica	Kirk Pomper, Li Lu, Jeremiah Lowe, & Sheri Crabtree	34	57	7
41	Elliott	Latoyah	Shawn Coyle, James Tidwell, & Leigh Anne Bright	37	26	2
57	Hayden	Rachel	George Antonious & Tejinder Kochhar	45	57	7
60	Hollins	Myesha	Li Lu, Kirk Pomper, Jeremiah Lowe, & Sheri Crabtree	46	57	7
67	Kincannon	Shanae	George Antonious & Tejinder Kochhar	50	57	7
77	Mack	Ashley	John Sedlacek, Karen Friley, Kirk Pomper, & Jeremiah Lowe	55	26	2
83	Miles	Shawntell	Williard Mazhawidza & Narayanan Rajendran	59	56	7
98	Robertson	De'Andra	Avinash Tope & Phyllis Rogers	69	57	7

<b>Kentucky State University Cont'd.</b>						
<b>Poster No.</b>	<b>Student</b>		<b>Faculty Mentor(s)</b>	<b>Page No.</b>	<b>House No.</b>	<b>Senate No.</b>
107	Smith	Tasia	Changzheng Wang, Cecil Butler, Lingyu Huang, & Steven Mims	73	57	7

<b>Morehead State University</b>						
<b>Poster No.</b>	<b>Student</b>		<b>Faculty Mentor(s)</b>	<b>Page No.</b>	<b>House No.</b>	<b>Senate No.</b>
2	Adkins	Ashley	Paul Steele	15	99	27
6	Anderson	Cayla	Kimberly Peterson	18	74	28
8	Appelman	Amy	Ahmad Hassan	19	70	18
45	Bedingfield	Blake	Christine McMichael	39	13	8
14	Brading	Abigail	Kira Campbell	22	74	28
23	Conklin	Chris	Gina Blunt & Jennifer Dearden	27	54	22
34	Druen	Joshua	Garry O'Dell	34	99	27
40	Elam	Tyler	Janelle Hare	36	71	27
43	Faust	Amanda	Rebecca Roach	38	71	27
49	Fite	Nathan	Benjamin Malphrus & James Lumpp	41	99	27
45	Fraley	Bonita	Christine McMichael	39	71	25
49	Graves	Daniel	Benjamin Malphrus & James Lumpp	41	70	18
2	Hurley	Dallas	Paul Steele	15	33	38
64	Ingram	Joshua	Alana Scott	48	99	27
65	Jackson	Rebekah	Kelly Collinsworth	49	99	27
45	May	Justin	Christine McMichael	39	99	27
45	Rosser	Trey	Christine McMichael	39	70	27
108	Smith	Tiffany	Sarah Hawkins	74	99	27
112	Teater	Stephanie	Steve Chen	76	71	27
115	Thornberry	Dakota	Layne Neeper	77	96	18
45	Yarawsky	Kyle	Christine McMichael	39	66	11

<b>Murray State University</b>						
<b>Poster No.</b>	<b>Student</b>		<b>Faculty Mentor(s)</b>	<b>Page No.</b>	<b>House No.</b>	<b>Senate No.</b>
96	Adair	Kristi	Bommanna Loganathan	68	6	2
4 & 5	Allard	Lauren	Martin Milkman & David Eaton	17 & 18	1	2
96	Anderson	Harry	Bommanna Loganathan	68	1	1
11	Benningfield	Dylan	Bommanna Loganathan	20	5	1
			David Ferguson, Robert Miller, Robert Hill, Whitney Peake, William Bailey, &			
89	Coleman	William	Iin Handayani	62 & 63	5	1
75	Creed	Michael	Alexey Arkov	54	29	36
96	Driver	Ashley	Bommanna Loganathan	68	2	2
37	Edwards	Wesley	Chris Trzepacz	35	5	1
86	Green	Amy	Chris Trzepacz	61	5	1
55	Hart	Steven	Chris Trzepacz	44	5	1
73	Hargis	Sarah	Terry Derting	53	5	1
75	Jackson	Christina	Alexey Arkov	54	32	36
73	Levesque	Renee	Terry Derting	53	5	1
11 & 75	Loganathan	Sudan	Bommanna Loganathan & Alexey Arkov	20 & 54	5	1
5	Long	Jeremy	David Eaton	17 & 18	5	1
			David Ferguson, Robert Miller, Robert Hill, Whitney Peake, William Bailey, &			
89	Miller	Josh	Iin Handayani	62 & 63	5	1
96	Morris	Emily	Bommanna Loganathan	68	6	2
			David Ferguson, Robert Miller, Robert Hill, Whitney Peake, William Bailey, &			
89	Murdock	Trent	Iin Handayani	62 & 63	5	1
86	Nance	Derek	Chris Trzepacz	61	5	1
97	Nguyen	Tin	Andrew Kellie	68	1	1

**Murray State University Cont'd.**

Poster No.	Student		Faculty Mentor(s)	Page No.	House No.	Senate No.
89	Overbey	Kyle	David Ferguson, Robert Miller, Robert Hill, Whitney Peake, William Bailey, & Iin Handayani	62 & 63	5	1
89	Parrish	Justin	David Ferguson, Robert Miller, Robert Hill, Whitney Peake, William Bailey, & Iin Handayani	62 & 63	5	1
91	Peddie	Sarah	Rachel Allenbaugh	64	5	1
96	Riley	Erica	Bommanna Loganathan	68	2	1
97	Robards	Chris	Andrew Kellie	68	1	1
91	Ruga	Kristen	Rachel Allenbaugh	64	5	1
89	Scott	Joshua	David Ferguson, Robert Miller, Robert Hill, Whitney Peake, William Bailey, & Iin Handayani	62 & 63	12	4
89	Steele	Wes	David Ferguson, Robert Miller, Robert Hill, Whitney Peake, William Bailey, & Iin Handayani	62 & 63	5	1
89	Stuard	Robert	David Ferguson, Robert Miller, Robert Hill, Whitney Peake, William Bailey, & Iin Handayani	62 & 63	5	1
50	Tanner-Gray	Lucas	David Eaton	42	5	1
116	Tinch	Kristen	Meagan Musselman	78	16	3
75	Varonin	Dan	Alexey Arkov	54	5	1
86	West	Justin	Chris Trzepacz	61	5	1
96	Winkler	Ashley	Bommanna Loganathan	68	5	1

**Northern Kentucky University**

Poster No.	Student		Faculty Mentor(s)	Page No.	House No.	Senate No.
10	Baumann	Jessica	Keith Walters	20	68	24
26	Cooper	Nicholas	Alina Campan & Traian Truta	29	67	24
29	Davies	Melanie	Grant Edwards & Keith Walters	31	60	11
36	Earl	Cierra	Rebecca Bailey	35	68	24
38 & 39	Elam	Chris	Stefan Paula	35 & 36	60	11
26	Elstun	Andrew	Alina Campan & Traian Truta	29	67	24
38	Estifanos	Choke	Stefan Paula	35	67	24
56	Haskamp	Anthony	Heather Bullen & Maureen Doyle	44	68	24
56	Hatcher	Kimberly	Heather Bullen & Maureen Doyle	44	68	24
80	Knue	Emilee	Isabelle Lagadic	57	64	23
71	Lanser	Keith	Caryn Connelly	52	68	24
38 & 39	Lape	Mike	Stefan Paula	35 & 36	65	23
80	McCallum	Adam	Isabelle Lagadic	57	26	10
39	Medlock	Rachel	Stefan Paula	36	60	25
87	Neace	Amanda	Timothy Murphy	61	69	17
39	Patel	Rahul	Stefan Paula	36	60	25
38	Ratliff	Robert	Stefan Paula	35	67	24
103	Shelley	Elizabeth	Hazel Barton	71	67	24
104	Shelton	Justin	Yi Hu, Alina Campan, & James Walden	72	68	24
105	Simmons	Kaira	Rebecca Bailey	72	52	15
104	Vorobyeva	Irina	Yi Hu, Alina Campan, & James Walden	72	67	24
117	Wheeler	Lori	Liza Benham & Sharlene Boltz	78	63	23

## University of Kentucky

Poster No.	Student		Faculty Mentor(s)	Page No.	House No.	Senate No.
82	Alvey	M. Erin	Patricia Burkhart	58	77	7
25	Baker	Michael	Robin Cooper & Sonya Bierbower Sarah McNabb, Megan Shaw, & Anthony	28	75	13
22	Clines	Margaret	Rocanova	26	75	13
24	Coombs	Curtis	Jeffrey Bewley	27	61	20
25	Cooper	Ann	Robin Cooper & Sonya Bierbower	28	75	13
28	Coy	Richard	Lynne Rieske-Kinney & Bruce Webb Michelle Stephens, Pete Huettl, Francois	30	75	13
31	Deel	M. Elizabeth	Pomerleau, & Greg Gerhardt	32	75	13
32	Domatov	Alexandra	Jonathan Golding	32 & 33	88	12
32	Dunn	Elizabeth	Jonathan Golding Sarah McNabb, Megan Shaw, & Anthony	32 & 33	8	1
22	Elza	Lindsey	Rocanova	26	85	21
119	Etheredge	Keith	L. Scott Stephens	79	35	35
32	Fields	Lauren	Jonathan Golding Don Helme, Carol Riker, Erin Lee, &	32 & 33	75	13
76	Fisher	Shelby	Ellen Hahn	54 & 55	45	12
46	Gamsky	Jacob	Philip Metzger & Alan Male	39 & 40	59	26
46	Gay	Amber	Philip Metzger & Alan Male Sarah McNabb, Megan Shaw, & Anthony	39 & 40	64	23
22	Giauque	Kelsey	Rocanova	26	75	13
79	Giorgis	Anne	Julie Marusich & Michael Bardo	56	41	35
53	Hammer	Ellen	Alissa Meyer	43	75	13
62	Houtz	Jessica	Karyn Esser & Kenneth Campbell	47	75	28
28	Houtz	Philp	Lynne Rieske-Kinney & Bruce Webb	30	73	28
82	Leech	Kelly	Patricia Burkhart Don Helme, Carol Riker, Erin Lee, &	58	77	7
76	Lowe	Andrea	Ellen Hahn	54 & 55	65	23
119	Mangu	Raghu	L. Scott Stephens	79	75	13
79	McCuddy	Travis	Julie Marusich & Michael Bardo	56	77	13
82	Mickley	Kristyn	Patricia Burkhart	58	75	13
119	Nicaise	Sam	L. Scott Stephens	79	75	13
119	Passafiume	Brian	L. Scott Stephens	79	33	36
119	Prayaga	Krishna	L. Scott Stephens	79	75	13
25	Robinson	Marty	Robin Cooper & Sonya Bierbower Sarah McNabb, Megan Shaw, & Anthony	28	75	13
22	Rowland	Molly	Rocanova Samantha Meenach, J. Zach Hilt, &	26	75	13
102	Shapiro	Jenna	Kimberly Anderson	71	56	7
32	Simcic	Theresa	Jonathan Golding	32 & 33	75	13
119	Stein	Kyle	L. Scott Stephens	79	63	23
113	Testa	Jamie	Suzanne Segerstrom	76	75	13
119	White	Brent	L. Scott Stephens	79	5	1



<b>University of Louisville</b>						
<b>Poster No.</b>	<b>Student</b>		<b>Faculty Mentor(s)</b>	<b>Page No.</b>	<b>House No.</b>	<b>Senate No.</b>
19	<b>Capps</b>	Joshua	Diane Chlebowy	24	6	2
52	<b>Hambley</b>	Jennifer	Rodger Payne	43	68	24
59	<b>Hockenberry</b>	Alyson	Carolyn Klinge & Celia Emberts	46	64	17
68	<b>Kollenberg</b>	Tara	Carolyn Klinge & Margarita Ivanova	50	2	2
69	<b>Kotwal</b>	Mihir	Carlos Rojas & Olfa Nasraoui	51	48	26
78	<b>Marschall</b>	Jeff	Cynthia Corbitt & Andrew Roberts	55	4	2
78	<b>McDonald</b>	Shane	Cynthia Corbitt & Andrew Roberts	55	40	35
81	<b>Mehta</b>	Aakriti	Susanna Remold	58	33	36
90	<b>Patel</b>	Trisha	Stanley D'Souza	64	13	8
78	<b>Phelps</b>	N. Cole	Cynthia Corbitt & Andrew Roberts	55	40	35
95	<b>Ridge</b>	Garett	Olfa Nasroui & Nurcan Durak	67	47	26
99	<b>Roy</b>	Eron	Thomas Mitchell	69	47	26
78	<b>Shariff</b>	Erin	Cynthia Corbitt & Andrew Roberts	55	40	35
			Ayman El-Baz, Tato Sokhadze, & Lonnie			
109	<b>Sokhadze</b>	Guela	Sears	74	48	26
110	<b>Song</b>	David Day	Claudio Maldonado	75	32	36
111	<b>Stallard</b>	Robert	Gamini Sumanasekera	75	31	19
120	<b>Wilkins</b>	Joseph	Benjamin MacCall	80	44	37

<b>Western Kentucky University</b>						
<b>Poster No.</b>	<b>Student</b>		<b>Faculty Mentor(s)</b>	<b>Page No.</b>	<b>House No.</b>	<b>Senate No.</b>
3	<b>Aldrich</b>	Courtney	Jay Gabbard	16	20	9
			Albert Meier, Danielle Racke, & Larry			
48	<b>Ayers</b>	Kati	Johnson	41	20	32
9	<b>Azimipour</b>	Alicia	Cecilia Watkins	20	29	38
58	<b>Buck</b>	Sasha	Barbara Bush	45	20	9
20	<b>Choate</b>	Thomas	Nancy Givens	25	20	32
21	<b>Clark</b>	Tyler	Tom Richmond	25	24	14
33	<b>Downen</b>	Matt	Andrew Wulff	33	51	15
42	<b>Esch</b>	Clarice	Martin Stone	37	85	15
			Albert Meier, Danielle Racke, & Larry			
48	<b>Gilkison</b>	Victoria	Johnson	41	20	32
54	<b>Hare</b>	Alexander	Claire Rinehart & Kinchel Doerner	44	71	27
58	<b>Heil</b>	Millicent	Barbara Bush	45	50	14
54	<b>Kasinski</b>	Paul	Claire Rinehart & Kinchel Doerner	44	66	11
72	<b>Lee</b>	Greg	James Navalta	52	22	9
54	<b>Lee</b>	Jae	Claire Rinehart & Kinchel Doerner	44	9	3
			Albert Meier, Danielle Racke, & Larry			
48	<b>Missik</b>	Justine	Johnson	41	54	22
100	<b>Mulholand</b>	Natosha	Cathleen Webb	70	20	32
54	<b>Neal</b>	Ben	Claire Rinehart & Kinchel Doerner	44	91	21
88	<b>Oakes</b>	Landon	Vladimir Dobrokhotoov	62	14	8
94	<b>Reetzke</b>	Rachel	Dana Bradley	66	22	9
94	<b>Roe</b>	Maggie	Dana Bradley	66	89	21
100	<b>Rucks</b>	Melinda	Cathleen Webb	70	23	9
101	<b>Rush</b>	Katherine	Priscilla Baker	70	56	7
106	<b>Smith</b>	Chelsey	Mary Moore	73	52	16
			Albert Meier, Danielle Racke, & Larry			
48	<b>Wigginton</b>	Sara	Johnson	41	20	32



The *Posters-at-the-Capitol* Organizing Committee asks all participants to work with our event photographer to ensure we capture a diverse record of our 2010 event. A photo album will be posted on the program's website shortly following the event.



## **1. Sarah Abuonk, Nancy Pettibone, and Angela Shouse**

**Owensboro Community and Technical College**

**Mentor: Timothy Dick**

### ***Development of a Survey Research Instrument to Analyze Lifestyle and Environmental Influences on Polycystic Kidney Disease Phenotype Variability***

Polycystic Kidney Disease (PKD) is an autosomal dominant genetic disease which results from a mutation in the PKD 1 gene on chromosome 16. The PKD 1 gene codes for a 4302-amino acid residue transmembrane protein which may be involved in cell-cell and cell-matrix interactions. Mutations in the PKD 1 gene cause cysts to form in the nephron and eventually lead to kidney failure. However, studies of the relationship between mutation and phenotype have been inconclusive. In fact, family members with identical mutations frequently show considerable variability with respect to disease severity. This variability is likely due to genetic, lifestyle, and environmental influences. This study conducted a literature review for lifestyle and environmental factors thought to effect disease progression. A survey instrument was designed to relate these factors to age of first dialysis. The survey instrument and statistical methods are presented.

## **2. Ashley Adkins and Dallas Hurley**

**Morehead State University**

**Mentor: Paul Steele**

### ***Legal and Administrative Reforms in the Justice System: Their Consequences for Criminal Offenders under Corrections Supervision***

As agencies comprising the criminal justice system attempt to fulfill their organizational roles, they are influenced by statutes enacted by legislative bodies, budgetary constraints, and by the administrative policies and the use of professional discretion. Since serious criminal cases generally pass in a linear fashion through several stages and agencies between reporting and punishment, the ultimate size and characteristics of the corrections population in Kentucky (and other State) is significantly influenced by legal and economic parameters and case decisions made at earlier points in the justice process, as well as by those legal and administrative policies directly evident within corrections agencies. Traditionally, criminal justice professionals focus on their immediate occupational roles and responsibilities, and seldom consider that systemic impact of their decisions. The first component of this research project examines the influence of legalistic and non-legalistic social factors on the use of professional discretion and decision-making throughout the criminal justice through the sentencing process. In this study, we consider the influence of legalistic influences such as legal definitions and legislatively mandated sentences, criminal situational descriptors, the offender's prior criminal history, the availability of criminal diversion, and the nature and strength of evidence. We also consider the influence of non-legalistic (extrinsic) influences such as social class and demographic characteristics (gender, age, race/ethnicity) of the suspect/defendant and victim and their relationship. One important consequence of system decision making has been the significant growth in prison populations in the United States. For example, in 2007-8, Kentucky experienced the greatest proportional growth in its prison population of any state in the U.S., and one of its greatest periods of growth in the Commonwealth's history. In the second component of this research project, we examine those factors that have influenced prison population trends in Kentucky and the United States in recent decades. In earlier research, we have concluded that state population growth, rates of reported crime, police arrest/clearance rates and conviction rates in state courts explain very little

*Adkins and Hurley Cont'd.*

of the variance in prison populations. We have therefore shifted our attention to the relative impact of legislatively mandated sentencing policies and structures, corrections administrative policies, changes in economic conditions and State revenues, and both public and legislative perceptions of the crime problem. Our research project is based on a thorough review of the criminal justice decision-making literature including that of police arrest policies, prosecutorial decision-making, disproportionate minority system contact, and legislative activity as it relates to justice policy and appropriations. The research employs descriptive, bivariate, time series, and multinomial regression quantitative statistical techniques to determine the simultaneous influence of diverse measures, and various time series methods to examine change in populations at each stage of the justice system and the relative influence of predictor variables over time. We conclude that a combination of policy influences and economic conditions have primarily influenced the growth and marginalization of prison populations, and provide recommendations to promote greater interagency coordination among justice agencies and improved for prison population management.

### **3. Courtney Aldrich**

**Western Kentucky University**

**Mentor: Jay Gabbard**

#### ***Assessing the Small Town Approach to Homelessness***

Currently, Bowling Green sits as the state's fourth largest city in Kentucky, although the local Chamber of Commerce hopes to soon surpass the state's current third largest city in the next few years. Just as the city grows, however, so does its homeless population. Unfortunately, the services to meet the needs of this population in Bowling Green have not grown. Today, the emerging city and its surrounding Barren River Area, located in south central Kentucky, relies heavily on a few services, such as the 54 beds of the local Salvation Army to serve this growing population of over 55,000. Through researching the municipal response to homelessness in Bowling Green and in nine other similar south eastern cities, I have evaluated the efficiency of Bowling Green homeless services and consequently propose program ideas that will improve Bowling Green homeless services in the future. Ten small cities, including two from Kentucky, were evaluated according to existing data of a city's homeless demographics and social service options. During this presentation, I will be discussing the implications of the research and assess the conclusion of the value of Bowling Green's homeless services.

## **4. Lauren Allard**

**Murray State University**

**Mentor: Martin Milkman**

*An Analysis of Employer Provided Health Benefits and Gender Discrimination in the Labor Force*

Health care is a rapidly growing hot topic of debate in the United States. Employer provided health care benefits have been on the decline in recent years, much to the alarm of individuals who rely on employer provided health insurance coverage. An extensive evaluation of the impact of employer provided health care on the labor market provides valuable insight into this important facet of the labor economy. Furthermore, numerous researchers have contributed to the literature and understanding of families and, more specifically, women's choices regarding employer provided insurance. The analysis examined the four main sources of health coverage offered to women, and what economic and social factors have significantly altered each source type. This examination utilized economic theory to explain the impact of employer provided health care on the labor market and aims to investigate the impact, if any, of gender on the quality of received employer health care benefits packages. This research was conducted through the interpretation of data supplied by the National Longitudinal Survey of Mature and Young Women acquired through the Bureau of Labor Statistics.

## **5. Lauren Allard and Jeremy Long**

**Murray State University**

**Mentor: David Eaton**

*Economics of Food and Policy*

### **Study 1: *Evaluating Public Policy towards the Obesity Epidemic***

Across the globe scientists and economists alike have been examining the fact that while the amount of calories ingested by consumers has increased over time, intake has not been balanced by a proportional increase in physical activity. As a result, consumers worldwide are rapidly gaining weight. This trend has led many nations to begin examining the obesity epidemic and its effect on the private and public costs of maintaining a healthy lifestyle. Also under consideration by these countries are regulatory actions to encourage weight loss and healthier lifestyles. The impact of regulatory actions on consumption decisions has been well studied in the areas of smoking and alcohol abuse. This research uses the methodological frameworks developed in these areas to assess the newer health issue of obesity and to evaluate potential public responses to this health issue. To determine the impact of information requirements and regulatory actions on consumers' health related consumption decisions, this paper examines the impact of the 1990 Nutrition Labeling and Education Act, and the 2004 policy implemented in Denmark banning food products containing more than 2% industrially produced trans-fat. This research hopes to not only understand what public strategies may be successful in creating policies to assist in fighting the obesity epidemic but also to propose suggestions on how to combat this "rapidly expanding" problem.



*Allard and Long Cont'd.*

**Study 2: *Organic vs. Inorganic Food Relative to Production and Health Trade Offs***

Over the last few years consumer tastes have shifted towards organic foods. While organic foods are an important and growing part of the food market, questions remain as to whether the cost/quality trade off favors organic food production. In addition, there are questions whether organic food could be produced in sufficient quantity and at a low enough cost to serve as a primary food source. Organic foods are produced without the use of pesticides or additives to enrich the land that they are grown in. They are typically produced in lower quantities relative to technologically enhanced foods and are sold for higher prices than non-organic foods. Organic foods have been identified as a new source of food supply that experiences little to no adverse health effects due to their production without chemical additives. This paper compares organic foods to inorganic foods in the categories of total production efficiency and overall health benefits related to organic food consumption and increases in costs with respect to the adverse health effects or inorganic foods. This research compares production returns from technologically advanced acreage as to the acreage devoted to organic food production. Additionally, this project compares the prices of organic and conventionally grown food products to determine whether the higher priced organic foods provide superior health returns per dollar relative to traditionally produced food products.

**6. Cayla Anderson**

**Morehead State University**

**Mentor: Kimberly Peterson**

***Racing Towards the Finish: Youth and Greyhounds Learn Together, a Juvenile Justice Model for Success***

Learning models in juvenile justice are traditionally difficult to evaluate. More specifically, the effects of the presence of animals on learning are not well documented. In this regional engagement project between a state university, a state department of juvenile justice and a greyhound adoption agency, female youth in a residential juvenile justice center learn vocational and technical skills while training retired racing greyhounds to become family pets. Through an ongoing series of 12 week learning cycles, greyhounds learn home and obedience skills that may enhance adoption success. In addition to training activities, youth explore animal careers and learn important job skills through classroom and laboratory activities. A daily journal of youth experiences with their greyhounds is utilized to prepare publications of original works. Veterinary Technology students gain proficiency through a service learning curriculum which provides wellness care for the greyhounds and career modeling for the youth. Current findings suggest: improved academic success, increased self-efficacy; 53% decrease in reportable incidents; a decrease in adoption failure and euthanasia of dogs. This study suggests sustainability as a model for other youth facilities.

## **7. Heather Anzelon**

**Eastern Kentucky University**

**Mentor: James Wells**

### ***Predicting Perceptions of Inmate Sexual Violence in Female Correctional Institutions: Individual Factors Versus Social Climate Factors***

Although there has been a lot of research conducted on inmate sexual violence in male correctional institutions, there is a scarcity of published literature on perceptions of inmate sexual violence in female institutions, and in recognizing the differences between individual-related factors and social climate related factors. In this study, survey data from a recent National Institute of Justice funded PREA study were used in classifying several independent variables into two predictive models that were representative of both individual-related factors, such as race, gender, criminal history, etc., as well as a social climate-related factors, such as verbal conflict, economic conflict, staff sexual misconduct, etc. We then examined the predictive abilities of both models on female inmate perceptions of inmate sexual violence in both prison and jail housing units. Results showed social climate factors to be a much better predictor of inmate perceptions of sexual violence. These results suggest that all of the expense and effort to profile and classify inmates is not as critical as attempts to improve the social climate or environment of the institution.

## **8. Amy Appelman**

**Morehead State University**

**Mentor: Ahmad Hassan**

### ***How Family Controlled Firms Differ from Nonfamily Firms in Competitive Aggressiveness***

In recent years, strategy researchers have paid increasing attention to understanding the competitive actions taken by firms (Chen, 1996; Ferrier, 2001). However, significant gaps in our understanding of competitive behavior persist. One particularly prominent gap is the competitive behavior of family firms and how it differs from the competitive behaviors of their nonfamily counterparts. This research explores the basic, yet unanswered, question of how relatively family firms within a given industry should act and react to prosper in a competitive arena. Specifically, we explore two related questions: How do family firms differ from their nonfamily rivals in their competitive behaviors? Do the competitive behaviors associated with good business performance differ for family and nonfamily firms? There is a growing recognition of family firms' contribution to the global economy and interest in what they can teach the rest of the business world (Nicholson, 2008). Family businesses dominate the economies in most nations in terms of the number of enterprises (La Porta, et al., 1999; Weber et al., 2003). Although researchers concerned with family businesses have noted that what applies to family firms may not apply to nonfamily ones (Chrisman, Chua, and Sharma, 2005), they have generally stopped short of investigating family and nonfamily firms engaged in intraindustry competition. Consequently, the behavioral differences between family and nonfamily firms competing in an industry and the means by which they build competitive advantage via day-to-day competition have been left unexplored.

## **9. Alicia Azimipour**

**Western Kentucky University**

**Mentor: Cecilia Watkins**

### ***Toothlessness in Kentucky: The Causes and the Remedies***

As a student in the Department of Public Health at Western Kentucky University my courses have exposed me to the poor health status that Kentuckians hold in many rankings of health in the nation. Dental health is no exception. Kentucky has one of the highest rates of tooth loss in the nation. The current statistics of toothlessness in the state compared with other states, and trends for the nation during the last two decades are presented. This project looked at the influencing factors that contribute to these staggering statistics, barriers that have kept Kentucky from properly advancing in dental health and potential solutions to this challenge are recommended.

## **10. Jessica Baumann**

**Northern Kentucky University**

**Mentor: Keith Walters**

### ***Modified Strategy for Transition Metal / $\pi$ -Conjugated Polymer "Molecular Wire" Synthesis***

Supramolecular photochemistry has become very popular in the past few years, particularly in response to the growing concern for conserving energy. Research into photochemistry, the study of how molecules react to light, may well play a role in future techniques for energy conservation. The objective of this research was to create a supramolecule with a  $\pi$ -conjugated polymer backbone incorporating transition metals able to efficiently transfer a charge following excitation by light. Fullerene "end caps" added to the ends serve as energy dumps. The final product has the possibility to be used in applications such as solar panels, photonic computers, and non-linear optical devices.

## **11. Dylan Benningfield and Sudan Loganathan**

**Murray State University**

**Mentor: Bommanna Loganathan**

### ***Triclosan Concentrations in Western Kentucky Watershed***

Triclosan (2, 4, 4'-trichloro-2'-hydroxyphenyl ether) is considered as one of the emerging new pollutants in the environment. In this study, triclosan contamination levels were measured in water samples collected from Murray Wastewater Treatment Plant (WWTP), Bee Creek, Clarks River and Kentucky Lake. Enzyme-linked immunosorbent assay (ELISA) method was used to determine triclosan concentrations in the samples. The results revealed that detectable concentrations of triclosan were found in all samples analyzed. The concentrations of triclosan exhibited the following trend: Influent > Effluent > Downstream Bee Creek > Upstream Bee Creek  $\geq$  Clarks River > Kentucky Lake (HBS site). Removal efficiency calculations revealed that about 40% of triclosan enter the receiving waters (Bee Creek). Clarks River and Kentucky Lake water samples contained relatively lower levels of triclosan than WWTP samples.

## **12. Brandi Bloodworth, Anthony Esposito, and Lucas Oliver**

**Madisonville Community College**

**Mentor: Terri Tillen**

***A Chemical Comparison of the Soils of White City Wildlife Management Area, a Coal Mine Reclamation Site, and Madisonville Community College Natural Area***

Evaluation of habitat quality is critical to assess ecological integrity. One way to assess the habitat can be to determine the chemical composition of the soil. Lack of necessary micro- or macro-nutrients have been shown to have a severe effect on the overall health of a habitat. The hypothesis was that the nutrients in the soil from the reclaimed surface coal mined land would be different from of the control site nutrients. Samples were taken from three different locations at the White City Wildlife Management Area, the coal mine reclamation site, near Morton's Gap, Kentucky. The sample sites were chosen to represent a synopsis of the wildlife management area. S1 was from the soil next to the road, S2 was soil found in the woods, S3 was soil from the stream and S4 was soil from the control site. All soil samples were subjected to chemical analysis.

## **13. La'Quida Bowie**

**Kentucky State University**

**Mentors: Kirk Pomper, Li Lu, Jeremiah Lowe, and Sheri Crabtree**

***Evaluation of Genetic Variation Among Native Pawpaw Patches in Henry County, Kentucky***

Pawpaw [*Asimina triloba* (L.) Dunal] is a tree-fruit that is a native understory tree in Kentucky and the eastern region of the United States. How pawpaw patches have spread in this region is poorly understood. Native Americans may have spread seed to promote fruit production. Animals may consume fruit and spread seed in scat. Viable pawpaw seeds are buoyant and can float down streams to form new patches. Clonal patches can develop through root suckering. The objective of this study was to determine if DNA fingerprinting of patches at the KSU Environmental Education Center in Henry County, Kentucky near a stream would suggest if root suckering (clonal patches) or water transport of seeds (many genotypes) were mechanisms of patch establishment. DNA was extracted using the DNAMITE Plant Kit from leaf samples collected from 20 trees per patch on a transect line in three native patches at the EEC. Patch 1 was located on a hill, while patches 2 (downstream) and 3 (upstream) were located on a stream about 100 feet apart. Primers B3, B103, B129, C104, and G119 were used to amplify SSR products, and products were separated with a 3130 Applied Biosystems capillary electrophoresis system. All three patches were genetically distinct, with patches 2 and 3 being more similar. Patch 3 was clonal with only one genotype. The high genetic variation in patch 2 supports involvement of water transport of seed from patch 3 in the establishment of the patch; however, animal transport of seed could also have led to patch establishment.

## **14. Abigail Brading**

**Morehead State University**

**Mentor: Kira Campbell**

***Developing Ceramic Form Through Technology: Exploring AutoCad as a Means of Production in the Ceramic Arts***

The purpose of this project was to investigate and implement the use of AutoCad and rapid-prototyping technology in the production of ceramic forms. We began by developing a series of functional forms using hand building methods. Those forms were then refined using the AutoCad software. We then output the forms using rapid-prototyping technology. These 'masters' were used to create molds for slip-casting the forms, which were then kiln fired. Our goal was to determine whether the use of AutoCad provides the ceramic artist/technician with a sufficiently flexible platform on which to design work that is aesthetically and functionally sound. Our secondary goal was to determine if work produced in this way is qualitatively different than the same work produced by hand.

## **15. Davida Braxton**

**Kentucky State University**

**Mentors: Williard Mazhawidza and Narayanan Rajendran**

***Sequence Identification of Ribonucleotide Reductase from *Exiguobacterium acetylicum* Strain SN***

The mechanism to biosynthesize elements of the cell membrane is essential to cell survival especially for prokaryotic cells. Such mechanisms are catalyzed by biosynthetic enzymes. To identify such a biosynthetase enzyme, we employed polymerase chain reaction (PCR) using a set of synthetase primers to probe genomic DNA of a soil isolate *Exiguobacterium acetylicum* strain SN. The amplified PCR products were profiled by agarose gel electrophoresis. Selected product was cloned in our microbiology lab and sequenced at the University of Louisville DNA Core facility. The free software, MEGA 4.1, was employed in searching NCBI linked protein database and the DNA sequence analysis, which putatively, identified our DNA amplicon as ribonucleotide reductase(RNR). Multiple DNA sequence alignments revealed the conserved amino acids which is specific to this group of enzymes. Based on the Cn3D software a three dimensional modeling was made, which revealed that our cloned sequence fits with the established model of other ribonucleotide reductase. Phylogenetic analysis is underway to match the bacteria based on the matching sequences of *Exiguobacterium acetylicum* strain SN.



## **16. Deanna Burns**

**Eastern Kentucky University**

**Mentor: Joyce Hall Wolf**

### ***Breathing New Life into Choral Breath Management***

The anatomy and physiology of the singer's body is, obviously, the same in a choral performance as it is in a solo performance. Yet, the solo singer receives much technical training while repertoire and choral-blend issues often overshadow technical training of the choral singer. This study by a vocal pedagogy student explored the use of systematic exercises for improved vocal technique in choral singing. Exercises originally intended for individual lessons with solo singers were applied and used for choral warm-ups/technique with a non-auditioned SATB college choir. This poster presenter spent rehearsal time with a resident college choir focusing on greater understanding of the physiology of breathing and employing specific vocal exercises. The exercises employ the Bel Canto Method of appoggio in singing. This technique stresses breath management through lateral rib movement with diaphragmatic descent, lung expansion, and stability of the body. The benefits for the choral ensemble include stable breath management and stamina for long phrases, evenness of the rate of vibrato (slight pitch fluctuation which is found in freely-produced, healthy singing), clearer diction (leading to more expressive performance), and greater ease in singing through the changing points or passaggi of the voice (commonly and erroneously called "breaks"). The improvement in sound is obvious to the trained ear and the layperson alike. Additionally, choral students participated in self-adjudication that also indicated the success of the application of these breath techniques. The resulting improved singing by the ensemble showed that correct breath techniques enhanced all technical warm-ups and improved performance of repertoire.

## **17. Kelly Burton**

**Eastern Kentucky University**

**Mentor: Jonathan Gore**

### ***Relational Self-Construal and Charity Advertisements***

A person who describes themselves based on their close relationships has a high relational self-construal, whereas a person with a low relational self-construal describes themselves in terms of individual traits. For example, a highly relational person might give a self-description of, "I am a brother" or "I am a mother", and a person with a low relational self-construal may say, "I am outgoing" or "I am funny". This study investigated the relationship between relational self-construal and charity advertisements. We hypothesized that highly relational people would respond more favorably to ads that emphasize the effects on close others. Participants were assigned to one of three conditions, the communal appeal (e.g., "We share the sky, we share the future"), the personal appeal (e.g., "Share the future, share the sky"), and the relational appeal (e.g., "Share the future with your friends, share the sky with your children"). Results revealed that those with a highly relational self-construal rated the relational advertisements the best. This is important because it demonstrates the need for charity organizations to research their audience's self-construal type, in order to maximize donations. In addition, this study expands upon the literature on relational self-construal, showing that a person's self-definition influences decisions beyond those within a close relationship.

## **18. Kelly Burton**

**Eastern Kentucky University**

**Mentor: Richard Osbaldiston**

### ***What is Motivating About Motivational Speakers?***

There is an entire industry of professional speakers whose sole purpose is to inspire and motivate audiences. Audiences leaving such presentations are aglow with enthusiasm; they often describe the experience as “awesome, inspiring, energizing, revolutionary, and incredible.” What exactly do motivational speakers say that has such powerful effects? This study is a systematic analysis of over 50 motivational programs (DVD’s and CD’s) that concern success in life, be that defined as happiness, self-improvement, fulfillment, or personal development. An abridged transcript was developed for each program, and each transcript was then coded for the major themes or points that the speakers made. Two independent coders evaluated each transcript for the extent to which it used each of 80 themes, and high levels of reliability were obtained (Cronbach’s alpha > .70). The most commonly presented themes were self-efficacy (you can do it if you believe you can), positive perspective (find the good in every situation), and introspection (look inside yourself for the answers to life’s questions). Further, the coders also evaluated the extent to which the 10 leading scientific theories of motivation were used by the speakers. Interestingly, the speakers relied on scientific research very little; Bem’s theory of self-perception and Bandura’s theory of self-efficacy were the two most commonly utilized theories, but they were only used by about half of the speakers.

## **19. Joshua Capps**

**University of Louisville**

**Mentor: Diane Chlebowy**

### ***The Effects of Motivational Interviewing on African Americans with Type 2 Diabetes Mellitus***

According to the Centers for Disease Control and Prevention (2008), 17% of African Americans in the state of Kentucky have type 2 diabetes mellitus (T2DM) in comparison to 11% of European Americans. Inadequate self-management measures (infrequent blood glucose monitoring, physical inactivity, lack of adherence to prescribed medications, poor attendance at scheduled healthcare visits) are often primary contributors to the increased prevalence of T2DM in African Americans. The purpose of this study was to determine the effect of a motivational interviewing (MI) intervention on adherence to prescribed treatment regimens, diabetes markers and number of unscheduled health care visits among African Americans with T2DM. A randomized clinical trial was conducted with a convenience sample of 60 participants recruited from an outpatient clinic in Louisville. Participants randomly assigned to the control group received the usual care provided from the clinic, while those in the intervention group participated in 8 MI behavioral counseling sessions over a 6 month period. The MI intervention addressed medication usage, blood glucose monitoring and physical activity and strategies were tailored based upon the participant’s identified stage of change (according to the Transtheoretical Model). Data collection occurred at baseline and then at 3 months and 6 months post baseline. Outcome measures obtained included adherence to prescribed regimens (blood glucose monitoring, physical activity, medication use), diabetes markers (random serum glucose, glycosylated hemoglobin levels) and measurements of body composition (body mass indices). Monthly follow-up calls were conducted to record number of unscheduled healthcare visits (clinic, emergency department, hospitalizations) for each participant. Demographic data and other health data regarding current medications and chronic illnesses were collected at baseline.

*Capps Cont'd.*

Data collection and recruitment for this study are still in progress with an anticipated data analysis completion date of April 2010.

## **20. Thomas Choate**

**Western Kentucky University**

**Mentor: Nancy Givens**

### ***Using Sustainability Indicators to Guide Local City Growth***

Cities everywhere are grappling with limited resources, high demands for services, and budget cuts. Forward thinking cities are using sustainability indicators to help secure a healthy and sustainable future for residents. Sustainability relates to the complex interconnections that comprise quality of life in a community, i.e., whether the economic, social and environmental systems that make up the community are providing a healthy, productive, and meaningful life for all community residents, present and future. Sustainable development is meeting the needs of the present without compromising the ability of future generations to meet their own needs. Sustainability indicators recognize the essential links between the economic, social, and environmental aspects of a community, and are used to identify problem areas and develop solutions that impact all areas. For example, poor air quality (environmental) may affect asthma rates (social) and worker productivity (economic). By improving air quality, cities can positively impact social and economic factors in the community as well. This research project looked at what sustainable development is, what sustainability indicators are, and how cities are using sustainability indicators to guide future growth. The research became the basis of a presentation made to the Bowling Green City Commission on October 20, 2009. Its intent was to encourage the City to adopt sustainability indicators to guide growth locally. A literature search was conducted.

## **21. Tyler Clark**

**Western Kentucky University**

**Mentor: Tom Richmond**

### ***Fibonacci Numbers and Collections of Mutually Disjoint Convex Subsets of a Totally Ordered Set***

We present a combinatorial proof of an identity for the odd Fibonacci numbers  $F(2n+1)$  by counting the number of collections of mutually disjoint convex subsets of a totally ordered set of  $n$  points. We discuss how the problem is motivated by counting certain topologies on finite sets, and relate it to Pascal's triangle.

## **22. Margaret Clines, Molly Rowland, Kelsey Giauque, and Lindsey Elza**

**University of Kentucky**

**Mentors: Sarah McNabb, Megan Shaw, and Anthony Rocanova**

*Studies in Architecture*

### **Study 1: *Simple Nature***

Students were given the opportunity to re-vision and re-design the Cumberland Falls State Park Gift Shop. The project included research, program development outlining user needs, schematic design of the project solution, design of various individual components, adherence to universal design concepts, code compliance, and a technically sophisticated presentation. The project was developed utilizing a team approach, requiring both individual and group participation. Built around the mission of creating a space that would not only increase gift shop revenue, but also take advantage of the natural setting, three goals were established. These goals, increasing revenue, creating a unique and memorable experience, and promoting the spirit of Kentucky defined the design of the interior. Breaking the surrounding landscape into its simplest forms, analyzing them, and reconfiguring and reorganizing them into a visually interesting and stimulating interior space, created a final solution that was both practical and creative.

### **Study 2: *Living in the Past: The Effects of Found Materials in Architecture***

In architecture, there is a satisfying quality to the use of found materials — those salvaged or recycled rather than bought new. Is it the satisfaction of saving the world one landfill at a time? Or is there some spiritual quality behind materials of the past being created into something of the present? As environmental concerns awaken a need to “go green,” architecture and other forms of art are recreating themselves to please a concerned people and save a dying planet. However, there is a moment when the work becomes less about ecology and more aesthetic and comfort based. The work of Dan Phillips, who constructs low-income housing from donated “scraps,” demonstrates this. His success derives from charity as well as the beauty of his constructions. To laymen, artists seem to transform the mundane into extraordinary. Kentucky artist Paul Busse creates miniature wonderlands out of objects he finds in nature. At the start of each artist’s process, a spark of inspiration ignites the creation of work. The theory is that this spark is sometimes a result of chance occurrence. Chance occurrence questions the ability of the artist to identify the perfect piece of inspiration and says that the ideal materials are often the products of coincidence. This project explored the use of found materials in architecture and analyzed the materials’ physical and spiritual properties. It contains an investigation of ideas that are formed in the individual phenomena of the human consciousness. Self-exploration was coupled with research on artists and architects.

## **23. Chris Conklin**

**Morehead State University**

**Mentors: Gina Blunt and Jennifer Dearden**

### ***Use of the Body Media SenseWear Pro in Promoting Physical Activity in an Adult Population***

Physical inactivity (PI) is a major problem in the US and Kentucky. PI has been linked to a variety of chronic diseases, including diabetes mellitus, coronary artery disease, hypertension, and dyslipidemia (Martinson, O'Connor, & Pronk, 2001). In order to increase physical activity, behavioral theory suggests changing key constructs such as self-regulation, self-efficacy and decisional balance. A variety of activity monitoring devices are available to promote self-regulation such as accelerometers and pedometers, however, it is unclear if simply using these devices without specific intervention leads to behavior change. Subjects included employees and students (n=30) from a regional state university in KY who were asked to wear an activity monitoring device called the Body Media SenseWear Pro3 Armband (BMSPA) for 14 days. The BMSPA is worn over the triceps muscle and measures a variety of physiological data including step counts, activity intensity, and energy expenditure. Data was collected on the following areas: step counts, energy expenditure, and pre and post-test questionnaires on activity frequency, level, and mode as well as in the following behavioral constructs: self-efficacy, decisional balance, expectations, and social support. While subjects averaged 8977 steps and 2500 calories per day, they also anticipated working out more often while wearing the BMSPA, however, there was no change in exercise frequency. Results showed that simply wearing an activity monitoring device did not significantly change key behavioral constructs or overall physical activity.

## **24. Curtis Coombs**

**University of Kentucky**

**Mentor: Jeffrey Bewley**

### ***Management Practices Employed by the Top Dairy Farms in Kentucky***

Kentucky consistently ranks at the bottom among the 50 states for milk production per cow, despite the economic benefits of higher milk production. Though best management practices are continuously communicated to dairy farmers through the Cooperative Extension Service, trade magazines, and internet resources, dairy producers often make their decisions based on what other producers are doing. Thus, the objective of this research project was to determine what management practices were employed by Kentucky herds with average milk production greater than 22,000 pounds per cow (N=26) based on records obtained from the Dairy Herd Improvement Association. Compiled results were then distributed to other Kentucky dairy farmers with the hope of encouraging other most recommended best management practices. For example, most producers utilize a nutritionist to balance their rations, regularly test their forages for nutrient content, implement a dry cow treatment protocol, utilize artificial insemination for genetic improvement, and regularly utilize veterinary services for reproductive management. Hopefully, these results will provide motivation to other Kentucky dairy farmers to alter management practices toward the goal of achieving higher milk production per cow, and all farmers to adopt some of these practices. A questionnaire was developed to gain insight into each dairy's practices in the following areas: nutrition, forage and crop management, facilities, equipment, herd health, reproduction, milk quality, and genetics. Interviews were conducted on-farm and over the phone. Interestingly, most dairy producers with high milk production seem to have adopted these best practices.

## **25. Ann Cooper, Marti Robinson, and Michael Baker**

**University of Kentucky**

**Mentors: Robin Cooper and Sonya Bierbower**

*Studies in Neurobiology*

### ***Study 1: The Effects of Serotonin on Circadian Pattern and Behaviors in Drosophila***

It has been established that adult *Drosophila* show circadian patterns that are regulated by gene expression. Circadian cycles in adults can be induced and set by exposure to light as early as the embryo stage without any circadian patterns evident throughout the larval stages. I hypothesized that the maintenance of the circadian pattern throughout the larval stages can be modulated by altering the serotonin expression levels in the larvae. This in turn will then affect the adult circadian pattern. To approach this, I exposed larvae, at various stages, to a drug (p-CPA, 10mg/ml of food) that blocks the synthesis of serotonin and then examined circadian patterns in adults. Adults were tested on 12:12 light:dark cycle and in continuous darkness. I also assayed whole animal adult behaviors (i.e., response to light and righting reflex) in controls and larvae that were fed p-CPA. In order to measure circadian patterns, I built a device to measure activity of adults as individuals and groups. The fundamentals of the device were an IR light source with a detector monitored by an online program. The results of feeding larvae p-CPA led to a more distinctive circadian pattern, which was contrary to my hypothesis. As adults, the p-CPA fed larvae showed a slower climbing response to light ( $p < 0.05$ ,  $n = 15$ , t-test). Associative learning assays showed that the p-CPA fed larvae showed a more pronounced learning. The p-CPA fed larvae had a compromised immune system. In summary, p-CPA fed larvae had altered circadian patterns and behaviors as adults.

### ***Study 2: Using Heart Rate as a Bioindex to Assess Various Sensory Perceptions in Sighted and Non-sighted Crayfish***

Most organisms show diversity in the type and amount of peripheral sensors that enable detection of different sensory stimuli within and across multiple sensory modalities. Variation in sensory pathways allows organisms to monitor their environment, integrate sensory information from multiple sources, and respond accordingly, due to refined integration of information. Most invertebrates possess chemosensory neurons that permit identification of environmental chemicals and are able to behave differentially between chemical compounds based upon the sensory pathway stimulated (i.e., attractive and/or repellent). Current literature shows this is particularly true for decapod crustaceans in detecting chemical signals, especially in the cephalic and thoracic appendages. Crayfish are decapod crustaceans that rely on visual and chemical cues in the environment. Behavior studies alone often exclude “fight or flight” internal readiness changes and may conclude a lack of environmental awareness. Therefore, a “sympathetic-like” autonomic response (i.e., HR, heart rate and VR, ventilation rate) in crayfish, (surface) *Procambarus clarkii* and (cave) *Orconectes australis packardii*, during chemical introduction establishes chemical and/or modality sensitivities that may be species-specific. Preliminary findings suggest crayfish that show no behavioral response display an internal response through changes in HR/VR. Specifically, crayfish show an increase in HR with attractant chemical introductions (i.e., cysteine) suggesting a natural response to potential food sources, while showing more pronounced responses to toxic/warning compounds. Future research will include using chemical stimuli identified as significant to induce electrical impulses to be recorded

*Cooper, Robinson, and Baker Cont'd.*

within antennular olfaction neurons. Supplemental experimentation will entail investigating the structure of antennular sensillae and associated nerve clusters.

## **26. Nicholas Cooper and Andrew Elstun**

**Northern Kentucky University**

**Mentors: Alina Campan and Traian Marius Truta**

***User-Controlled Generalization Boundaries for p-Sensitive k-Anonymity***

Numerous privacy models based on the k-anonymity property and extending the k-anonymity model have been introduced in the last few years in the data privacy research: l-diversity, p-sensitive k-anonymity, t-closeness, etc. While differing in their methods and the quality of their results, they all focus on first masking the data, then protecting the quality of the data as a whole. We considered a new approach, imposing requirements on the amount of distortion allowed on the initial data in order to preserve its usefulness. Specifying quasi-identifier generalization boundaries, we achieved p-sensitive k-anonymity within the imposed boundaries. Limiting the amount of generalization when masking microdata is indispensable for real-life datasets and applications. We defined the constrained p-sensitive k-anonymity model and presented an algorithm for generating constrained p-sensitive k-anonymous microdata. Our experiments showed that the proposed algorithm is comparable with existing algorithms used for generating p-sensitive k-anonymity with respect to the results' quality, while the obtained masked microdata obviously complies with the user's generalization boundaries.

## **27. Matthew Courtney**

**Eastern Kentucky University**

**Mentor: Joyce Hall Wolf**

***Merry + Casey 4 Ever: An Exploration of the Unilateral Relationship Featured in William Schuman's Opera, The Mighty Casey***

William Schuman's opera, *The Mighty Casey*, was inspired by the popular children's poem, *Casey at the Bat*. In this poem, the god-like Casey strikes out in the third inning, causing his team to lose the state championship. Inspired by his love of baseball, Schuman expanded this poem into a three scene opera, with a plethora of new characters, events, and sub-plots. In this research we explored one of the primary sub-plots; the blossoming relationship between Merry – a hometown girl, who drastically changes her personality for the sake of her love – and Casey – the seraphic star of the show, who is mute throughout the performance. What can we learn about their relationship if Casey never speaks? Utilizing numerous psychological scales, such as the Psychovector Love Scale, we traced the evolution of their relationship through Merry's arias, third party accounts, and unspoken stage direction. Results show how Merry naively follows Casey through his success, selfishly expects him to remain with her instead of following his dreams, and finally stands in support of him when nobody else will. It shows how Casey abuses Merry and takes advantage of her, disregards her feelings, then gains a mature perspective after losing the big game. Furthermore, this project allows exploration of our own humanity as reflected through the operatic form.

## **28. Richard Coy and Philip Houtz**

**University of Kentucky**

**Mentors: Lynne Rieske-Kinney and Bruce Webb**

*Studies in Entomology*

### **Study 1: *Arthropod Abundance and Diversity in a Bluegrass Savanna Remnant***

Human population pressures over the past centuries, including fragmentation and intensive land utilization, have placed increasing pressures on the unique and sensitive ecosystem of the Inner Bluegrass region. Pre-European settlement vegetation in the region consisted of open canopied, savanna-like forests characterized by oaks and ash that differed considerably from surrounding forests. Bur oak and blue ash are “signature trees” of the Inner Bluegrass, but the region also sustains chinquapin and shumard oaks, white ash, hickories, and Kentucky coffee trees. Recent recognition of the value and rarity of this ecosystem led to significant steps toward its preservation, including establishment of Griffith Woods Research Farm. The property has been intensively farmed since the 1820’s, including crop cultivation and livestock grazing. This intense land utilization has resulted in a present day patchwork of vegetation types and successional stages, including agricultural, old savanna, and post savanna woodlands. Griffith Woods contains some of the most valuable remnants of true oak-ash savanna and associated communities remaining. The unique nature of these community associates was the focus of our study. Our objectives were to characterize the arthropod community associated with Griffith Woods. We chose to evaluate this in the context of habitat (savanna versus agricultural) and dominant tree species (oak versus ash). Specifically, our objectives were to 1) characterize the ground-dwelling arthropod community with respect to abundance, diversity, and seasonal distribution, 2) compare abundance and diversity of savanna-associated arthropods to agricultural arthropod associates, and 3) evaluate the extent to which dominant tree species might affect arthropod community composition.

### **Study 2: *In Vivo Integration of Campoletis sonorensis Ichnovirus Genome Segments Into Heliothis virescens DNA***

Polydnnaviruses (PDVs) are a group of insect viruses that reside within certain parasitoid wasps. When parasitizing, these wasps inject an egg as well as PDV into caterpillar hosts. The PDV suppresses the caterpillar's immune system, thus allowing the wasp egg to develop. PDVs share an intimate relationship with their wasp host; they do not replicate outside of the wasp body and their genome is stably integrated into that of the wasp. The PDV relationship with their caterpillar host, however, is supposedly transient, and the genome persists only as circular segments. This view was challenged when certain polydnnavirus segments were found to persist in PDV-exposed lepidopteran cells, stably integrating into their cell genome. To explore this phenomenon in vivo, we injected a sample of fourth instar *Heliothis virescens* moth larvae with the *Campoletis sonorensis* ichnovirus (CsIV), raised them to adulthood, extracted DNA, and screened for the presence of 11 CsIV segments, using PCR (Polymerase Chain Reaction). Ten out of eleven segments were detected in at least one adult. One persisting segment, G2, was further analyzed in order to find its integration site in the wasp genome (which may be related to integration sites in the lepidopteran genome) using Thermal Asymmetrical Interlaced (TAIL) PCR, a method that requires very little starting material. We seek to completely describe the segments of CsIV that persist in whole organisms, and to show whether or not integration is



*Coy and Houtz Cont'd.*

occurring. This research may be applicable to the development of new gene therapy and P element techniques.

## **29. Melanie Davies**

**Northern Kentucky University**

**Mentors: Grant Edwards and Keith Walters**

### ***Investigation into the Environmental Causes of Exercise Induced Pulmonary Hemorrhaging in Thoroughbred Racehorses***

Thoroughbred racehorses stabled and raced in the Commonwealth of Kentucky often exhibit a debilitating disease called exercise induced pulmonary hemorrhaging (EIPH). As many as 95% of running racehorses show signs of EIPH upon endoscopy. EIPH is also known as “bleeding” in equine athletes, where speed and endurance are required. It occurs when blood escapes the capillaries and enters the lungs and trachea, compromising the airway and oxygen intake of the running horse. Despite much research into EIPH, its cause is not understood. The suggestion that EIPH is more frequent in metropolitan stables implicates heavy metal environmental contaminants as a possible cause. We examined cadmium, a known irritant of the lungs in animal subjects, as a first cause. Because cadmium tends to bioaccumulate in tissues and the cortex of hair, we used a previously developed method of analysis to compare cadmium levels in hair samples from horses stabled near and far from metropolitan areas.

## **30. Chaniece Davis**

**Kentucky State University**

**Mentors: Li Lu, Kirk Pomper, Jeremiah Lowe, and Sheri Crabtree**

### ***Evaluation of New Simple Sequence Repeat Markers for Assessing Pawpaw Genetic Diversity***

The North American Pawpaw [*Asimina triloba* (L.) Dunal] is a tree-fruit native to Kentucky and the southeastern region of the United States. The tree can grow up to 12 meters in height, and bear nutritious fruits which are rich in amino acids. Kentucky State University serves as the USDA National Clonal Germplasm Repository for pawpaw. Research concerning pawpaw genetic diversity and DNA fingerprinting are priorities, and an efficient DNA marker system is essential for conducting the research. The objective of this study was to test if newly developed Simple Sequence Repeat (SSR) DNA markers are polymorphic or monomorphic. The SSR markers were developed based on pawpaw genomic libraries for the di-nucleotide repeat GA, and for tri-nucleotide repeats ATG and AAT. After primary selection with agarose gel electrophoresis system, thirty-three pairs of SSR markers were selected for further Polymerase Chain Reaction (PCR) with DNA extracted from different pawpaw cultivars. Twenty SSR primers were labeled with FAM or HEX for further study and used to amplify 10 pawpaw varieties. The SSR-PCR products were separated using a 3130 Applied Biosystems capillary electrophoresis system. The observed number of alleles at each locus, sizes of the alleles, number of genotypes, and allele scoring quality of the markers will be reported.

### **31. M. Elizabeth Deel**

**University of Kentucky**

**Mentors: Michelle Stephens, Pete Huettl, Francois Pomerleau, and Greg Gerhardt**

***Understanding Glutamate Neurotransmission Before, During, and After Status Epilepticus in Young and Aging Rats***

Temporal lobe epilepsy results from uncontrolled excitability of neurons, often in the hippocampus. The primary neurotransmitter affecting neuronal excitability in the adult hippocampus is glutamate, which is known to be altered during aging, manifesting as a loss of learning and memory capabilities. We believe that age-associated dysregulation of glutamate could also be a contributing factor to the increased onset and severity of seizure disorders in the elderly population. Our objective was to gain a better understanding of changes in glutamate regulation during aging, and how this may affect seizure severity in an animal model of human aging. We implanted novel microelectrode arrays into the hippocampus of young, late-middle aged and aged rats to measure real-time glutamate neurotransmission in awake rats. The aged hippocampus had significantly elevated basal glutamate compared to young rats ( $n = 30$ ,  $p < 0.05$ ). Increased glutamate is known to be toxic to neurons. We also measured glutamate before, during, and after experimentally induced seizures. Based on our preliminary observations, the intensity of the seizure behavior correlates with age, showing that aged rats experience prolonged and more intense seizures. Additionally, during the seizures, we have repeatedly observed rapid and periodic glutamate oscillations indicating that glutamate is playing a critical role in seizure pathology. In the future, we will continue to examine the role of glutamate in a kindled model of epilepsy. This research will provide valuable insight into the potential role that glutamate plays in human epilepsy, especially in the elderly population, and may lead to the development of improved diagnostics and therapeutics.

### **32. Alexandra Domatov, Elizabeth Dunn, Lauren Fields, and Theresa Simcic**

**University of Kentucky**

**Mentor: Jonathan Golding**

***Juries in the Courtroom***

#### **Study 1: *Elder Financial Exploitation in Kentucky***

Under the guidance of Dr. Golding, Professor of Psychology at the University of Kentucky, I conducted research on the victimization of elders. This is a particularly relevant research topic because "baby boomers" are approaching the age of greater vulnerability. We were interested in the variables that effect jury verdicts in elder financial abuse cases. For this purpose, we used a pool of Psychology 100 students as our jurors to learn what factors influence their verdicts. Two particular variable of interest are the statute under which the defendant will be prosecuted and the age of the exploited elder. With regard to the former, under Kentucky statutes a defendant can either be prosecuted under KRS 517 (deceptive business practices) or KRS 209 (elder abuse — a more severe felony). Each juror was provided with an elder financial abuse case summary followed by questions. Our independent variables consisted of the gender of the mock jurors, the statute under which the case was being prosecuted, and the age of the victim (65 or 85 years old). For a control group, the jurors were presented with a 35-year old victim with a case only addressing KRS 517, because the victim did not qualify for KRS 209. We hypothesized that our

*Domatov, Dunn, Fields, and Simcic Cont'd.*

results will find that there will be more pro-victim judgments (e.g., guilty verdicts) for women mock jurors compared to men mock jurors, for the elder abuse statute compared to deceptive business practices, and for older (85 year old) than younger (65 year old) elders. We utilized analysis of variance to analyze our data.

### ***Study 2: The Eyes Have It: Research Regarding the Effect of the Defendant's Direction of Gaze in Court***

This research project seeks to understand the effect of a defendant's demeanor on the verdict returned by the jury. Specifically, our research manipulates the defendant's demeanor as he sits at the defense table and the judge's instructions to either use or not the demeanor of the defendant in determining a verdict. Our hypothesis states that participants will make more pro-victim judgments (e.g., more guilty verdicts) when the defendant's head is turned down as opposed to turned forward and more pro-victim judgments when the participants are instructed to consider demeanor as opposed to eliminating demeanor. To perform this experiment, four versions of one survey, each using a different combination of the independent variables (head up/head down with instructions/no instructions) were posted online. Volunteer Psychology 100 students were randomly assigned to complete one version of the survey. The survey presented the narrative of a trial concerning a child sexual abuse case, accompanied by paired photographs of each witness and the defendant sitting at the defense table. Participants were asked to determine a verdict and make other judgments about the trial. The results of this study could highlight previously unknown factors that affect the jury's verdict in child sexual abuse cases.

## **33. Matt Downen**

**Western Kentucky University**

**Mentor: Andrew Wulff**

### ***Petrogenetic History of Lavas from the Casitas Shield***

The Descabezado Grande Cerro Azul Volcanic Complex is located in the Southern Volcanic Zone (SVZ) of the Chilean Andes. It is characterized by the glacially incised Casitas Shield, a plateau comprised of multiple stacks of lava flows, and two major volcanic edifices, Descabezado Grande and Cerro Azul. Samples were collected in stratigraphic order from eight vertical sections from the southern flank of the Casitas Shield and analyzed for complete major and trace element concentrations. This study focused on samples from three eruptive episodes exposed in the CDCS section in order to determine the petrogenetic processes responsible for modifying the magma composition from the original source. These flows are predominantly basalts to basaltic andesites with low abundances of most incompatible elements (e.g. Ba, La, Ce, Rb, Zr) relative to other SVZ lavas. Three eruptive episodes were identified and follow the trends of the entire complex as they increase in compatible elements, like Ca and Mg, and decrease in incompatible elements such as K, Zr, and Sr. They are also more primitive compared to the rest of the complex as shown by low Ba/La ratios and generally low concentrations of LILE. PLM and SEM analysis revealed sieve-textures and zoning in feldspar to support magma mixing. Using the geochemical analyses and chemostratigraphy strong evidence is provided for magma mixing as the dominant petrogenetic process affecting the compositions of the lavas.

### **34. Joshua Druen**

**Morehead State University**

**Mentor: Gary O'Dell**

***Investigation of the Tar Kiln Cave Conduit System Elliot County, KY***

This study investigates groundwater flow and conduit networks associated with the Tar Kiln Creek valley. The Tar Kiln valley is situated between two limestone ridges capped with sandstone rock formations. This is a karst valley through which drainage is primarily underground with very little surface water flowing along the valley floor; within and on the perimeter of the valley are numerous sink points. Tar Kiln Cave, one of the largest caves in Eastern Kentucky with over 10,000 feet of surveyed passage, is located in the ridge that forms the northeastern wall of the valley. In the lower end of the valley, two significant springs discharge from opposite sides of the valley, near the contact zone of the Carter Cave Sandstone and the Newman Limestone formations. Dye tracing was used to determine if the springs are hydrologically linked and to map possible cross-connections between the two systems. The traces revealed that the two springs are hydrologically separate during low-flow conditions, with cross-connections occurring through surface overflow during higher flow conditions. This indicates a separate, presently inaccessible, conduit system developed along the southwestern valley wall, paralleling the Tar Kiln Cave system. The presence of parallel conduit systems provides support for the stress-relief hypothesis of karst conduit formation, which suggests that such conduits form in valleys along fracture patterns resulting from erosive removal of bedrock.

### **35. Jessica Durham**

**Kentucky State University**

**Mentors: Kirk Pomper, Li Lu, Jeremiah Lowe, and Sheri Crabtree**

***Using DNA Markers to Evaluate Genetic Diversity Among Native Pawpaw Patches in Iowa and Kentucky***

The pawpaw [*Asimina triloba* (L.) Dunal] is in the early stages of domestication and wild collected plant material is still important in the commercial production of pawpaw. Native pawpaw patches can be found in hardwood forests growing in large patches as understory trees and can be found in 26 states in the eastern United States, ranging from northern Florida to southern Ontario (Canada) and as far west as eastern Nebraska. Kentucky State University serves as the USDA-National Clonal Germplasm Repository for pawpaw, therefore assessing genetic diversity across the pawpaw's native range is a high priority. The objective of this study was to determine whether pawpaw trees from native patches in Iowa and Kentucky display genetic differences using the simple sequence repeat (SSR) marker system. DNA was extracted using the DNAMITE Plant Kit from leaf samples collected from 20 individual trees per patch from two native patches near Lake Cumberland in Kentucky, and in two native patches eastern Iowa. Primers B3, B103, B129, C104, and G119 were labeled with FAM and used to amplify SSR products. These products were then separated using a 3130 Applied Biosystems capillary electrophoresis system. The SSR primers yielded markers in the pawpaw selections examined that were useful in separating the pawpaw genotypes. The Iowa and Kentucky patches had at least two pawpaw genotypes in each patch but were mainly clonal in structure. The Iowa and Kentucky patches were separated easily based on high genetic variation in the marker alleles.

### **36. Cierra Earl**

**Northern Kentucky University**

**Mentor: Rebecca Bailey**

*Historians as Administrators: The NKU Public History Internship*

As the intern for the NKU Public History Program, I documented my experiences in helping to develop the program's administrative infrastructure and its communication and advertising systems. This included the development of a student-run blog about public history at NKU and a student internship classified system for use by local historical societies and museums.

### **37. Wesley Edwards**

**Murray State University**

**Mentor: Chris Trzepacz**

*Where's the Beef? An Examination of Novel Chemotactic Pathways in C. Elegans*

Homozygous mutations in a conserved aminopeptidase, *pam-1*, result in reduced adult fertility and a high incidence of embryonic lethality in the model nematode *C. elegans*. We have also casually observed that in contrast to wild-type N2 worms, which restrict their movements to the area occupied by their bacterial food source, *pam-1* worms tend to wander from the bacterial lawn and occasionally leave their culture plates altogether and perish. The current investigation seeks to quantify this behavior. Two different assays were employed to investigate this behavior. The first assay utilized populations of N2 and homozygous *pam-1* strains localized on culture plates at a defined position adjacent to the food source; the second assay employed mutant *C. elegans* strains compared to N2 strains placed directly on the food source and assayed at varying time intervals for the 1) number of worms remaining on each plate; 2) number of worms localized to the food source; and 3) total number of worms not localized to the food source. When compared to N2 worms, mutant *pam-1* worms show significantly reduced ability to remain localized not only to the food source but to the culture plate as well. These differences may be indicative of a compromised *pam-1* dependent chemotaxis response.

### **38. Chris Elam, Robert Ratliff, Choke Estifanos, and Mike Lape**

**Northern Kentucky University**

**Mentor: Stefan Paula**

*Comparison of Two Virtual Screening Techniques for the Discovery of Novel SERCA Inhibitors*

Inhibitors of the enzyme sarco/endoplasmic reticulum calcium ATPase (SERCA) are valuable tools for the study of the enzyme's physiological role. They also bear the potential of being developed into a promising new class of anti-cancer agents. Here, we describe the use of two different computational methods to virtually screen a large compound library for novel SERCA inhibitors. Using a docking-based protocol and an approach using recursive partitioning, we screened the same compound library. To test the performance of both screening methods, we took the top-ranked candidates from each screen and measured their inhibitory potencies for SERCA, using bioassays.

### **39. Chris Elam, Rachel Medlock, Rahul Patel, and Mike Lape**

**Northern Kentucky University**

**Mentor: Stefan Paula**

#### ***Evaluation of Potential Xanthine Oxidase Inhibitors by Molecular Docking and Bioassays***

For decades, the inhibition of the enzyme xanthine oxidase (XO) by compounds such as allopurinol has been used as an effective treatment of gout. More recently, XO has been implicated in ischemia-reperfusion injury and has emerged as a target for drugs against hyperuricemia and cancer. For the structure-based design of novel XO inhibitors, a validated docking protocol and a reliable bioassay are needed. We successfully docked the structure of the XO inhibitors lumazine and febuxostat into the X-ray crystal structure of XO. Furthermore, we established a bioassay that monitors XO's activity by measuring the rate of urate production at 290 nm. The assay was performed on a 96-well microplate that permitted the simultaneous testing of eight compounds at twelve different inhibitor concentrations. In order to develop structure-activity relationships, analogues of known inhibitors were identified for experimental testing via similarity and substructure searches of several compound libraries.

### **40. Tyler Elam**

**Morehead State University**

**Mentor: Janelle Hare**

#### ***Diverse Capacities for DNA Damage Survival Across the Genus Acinetobacter***

Many bacteria use an inducible SOS response system to respond to DNA damage in which the umuDC operon is required for trans-lesion DNA synthesis after DNA damage. In the naturally competent Gram-negative bacterium, *Acinetobacter baylyi* strain ADP1, the umuD gene possesses an extended 5' region, and a fragmented umuC gene. We surveyed diverse *Acinetobacter* species for their umuDC operon presence and configuration and survival after UV exposure. Surprisingly, conservation of these DNA damage-related properties along phylogenetic lines was present as measured by multiple assays. Cloning of the umuDC operon from diverse *Acinetobacter* strains revealed that all twenty *Acinetobacter* strains analyzed had a umuDA<sub>b</sub>-like gene with 79-100% nucleotide identity over ~500 bp to the umuD of ADP1, including its extended 5' region. However, two forms of the extra-long umuD allele were present in *Acinetobacter* strains: one form in the closely related Acb complex strains, with the other form present in all other strains. Like ADP1, no strain contained an intact umuC gene, consistent with the inability of these strains to conduct SOS mutagenesis after UV-C exposure. Survival of seventeen *Acinetobacter* strains after UV-C exposure ranged from five orders of magnitude less than ADP1 to 150% of the survival levels seen in ADP1 (the aptly named *A. radioresistens*), with this variation also clustered along phylogenetic groups within the genus. The Acb complex strains and the hemolytic strains had a lower survival than non-Acb or non-hemolytic strains, as did strains of human origin vs. strains originally isolated from environmental sources.

## **41. Latoyah Elliott**

**Kentucky State University**

**Mentors: Shawn Coyle, James Tidwell, and Leigh Anne Bright**

### ***Comparison of Morphotype Percentages of Three Different Genetic Strains of the Freshwater Prawn (*Macrobrachium rosenbergii*) Raised in Ponds in Kentucky***

We compared morphotype percentages of the total population for three different genetic strains of freshwater prawns reared under practical pond grow-out conditions in Kentucky. A random sample of >300 individuals per pond were classified into either one of three male morphotypes or one of two female morphotypes and individually weighed. The only significant difference ( $P < 0.05$ ) among average weights was in virgin females, with the Texas and Hawaii strains (32g and 31g, respectively) larger than the Myanmar strain (23g). A greater percentage of blue claws were found in the Texas strain (1.7%) than in the Hawaii strain (1.1%) and no blue claws were recorded for the Myanmar strain. The percentage of orange claw males (>20 g) was statistically similar for Texas and Hawaii (36%) and both were greater than the Myanmar strain (12%). The percentage of the small male morphotype (<20g) was statistically similar between treatments and averaged 17.2% overall. The percentage of reproductive females was similar between strain treatments and averaged 3.6%. The percentage of virgin females was greater for the Myanmar strain (62.4%) than for either the Texas or Hawaii strains, which were not different from each other and averaged 42.4% overall. The greater number of large morphotypes (i.e., blue claws, orange claws and reproductive females) in Texas and Hawaii strains largely accounts for production differences (total kg/ha) which were 183% and 161% greater, respectively than Myanmar prawns.

## **42. Clarice Esch**

**Western Kentucky University**

**Mentor: Martin Stone**

### ***Is *Collema* sp., a Gelatinous Lichen, a Sustainable Source of Nitrogen for Greenhouse and Nursery Crop Production?***

Atmospheric fixation of nitrogen by terrestrial cyanobacteria is important in ‘soil crusts’ of arid land ecosystems worldwide. In the absence of soil organic matter and nitrogen-fixing legumes or other higher plants, they are the primary vehicle for the introduction of nitrogen in these habitats. While some cyanobacteria dwell in soil crust matrices, others are symbionts with a fungus forming a lichen, which live above the soil line. The gelatinous lichen, *Collema* sp., is native to Warren County, Kentucky inhabiting bare soil. During periods of sufficient soil moisture, it fixes nitrogen and photosynthesizes and its appearance is altered from a dry, hard flake to hydrated, swollen, and jelly-like. Our hypothesis suggests that *Collema* sp. could be utilized as a partial replacement for nitrogen fertilizer in greenhouse and nursery crops where it would inhabit the surface of the potting media and contribute nitrogen continuously at each watering event. The results of greenhouse studies will be presented and implications discussed.

### **43. Amanda Faust**

**Morehead State University**

**Mentor: Rebecca Roach**

#### ***Teachers and Computers in Eastern Kentucky Schools: What Makes a Techno-Teacher?***

In order to create an internationally competitive workforce, our students must be virtually literate (National Science Foundation, 2007). However, the most important factor in whether or not technology is integrated into the classroom may be a teacher's willingness and ability to utilize this powerful tool and continue to acquire new skills in technology. This study focused on the indicators that may predict a teacher's willingness and ability to utilize technology in classroom instruction. Data was collected through surveys and interviews among K-12 public school teachers. The schools selected for this study were recipients of grants from the DataSeam Initiative, a not for profit organization dedicated to advancing research and promoting education to support economic growth throughout the Commonwealth. These schools have all received Apple desktop computers, iMacs, for their students as part of this initiative.

### **44. Matthew Fields**

**Eastern Kentucky University**

**Mentor: Laurel Morton**

#### ***Novel Catalysts and Solvents for Biofuels Production***

A significant amount of public attention has recently been focused on the production and use of renewable energy resources. The development of efficient methods for producing petroleum replacement fuels has fostered the hope that biomass derived fuels (such as ethanol) can offset the serious concerns related to the long term environmental damage and inherently non-sustainable nature of petroleum. Additionally, the process conditions (high temperatures and acidic solutions) required to efficiently convert cellulose to simple fermentable sugars are problematic. Ionic liquids have shown promise as solvents for the dissolution of cellulose and lignin and therefore have the potential to assist these catalysts as they breakdown the biomass. Combining the ability of the ionic liquid solvent to dissolve lignin with the reactivity of metalloporphyrins could overcome many of the challenges in the full utilization of biomass. Our research has focused on the synthesis of novel porphyrin catalysts and the determination of their catalytic activity towards biomass samples. Our efforts on the synthesis and characterization of several novel porphyrin ligands containing ionic liquid functionalization will be presented. These novel metalloporphyrin/ionic liquid complexes would function as both catalyst and solvent and therefore have the potential to significantly improve the efficient production of valuable bioproducts from lignin.



## **45. Bonita Fraley, Trey Rosser, Justin May, Blake Bedingfield, and Kyle Yarawsky**

**Morehead State University**

**Mentor: Christine McMichael**

### ***Understanding Economic Distress in Eastern Kentucky***

Since 1970 the communities of eastern Kentucky have comprised the largest contiguous area of perennially distressed counties in Kentucky and Appalachia. A better understanding of the reasons underlying this continuing disparity is needed in order to enhance the development and implementation of policies and procedures aimed at creating more economically and socially sustainable communities in this region. Towards this end, we conducted a historical case study of 'economic progress' in the Commonwealth of Kentucky, with a particular focus on eastern Kentucky, in an attempt to better understand the region's past development, as well as current and future prospects for creating more sustainable and prosperous communities. Geographic patterns and trends were examined from 1970-2000 for a variety of variables including poverty, employment, income, population, and educational attainment. It is hoped that the results of this study will enhance the capacity of local and regional leaders to vision and achieve a better future for the citizens of eastern Kentucky.

## **46. Jacob Gamsky and Amber Gay**

**University of Kentucky**

**Mentors: Philip Metzger and Alan Male**

### ***Studies in Engineering and Physics***

#### ***Study 1: The Physical State of Lunar Soil in the Permanently Shadowed Craters of the Moon***

The physical state of the lunar soil in the permanently shadowed craters of the moon is inferred from experimental investigation. The surface density of lunar soil is predicted to significantly affect the erosion rate under a rocket exhaust plume due to the interaction of particle forces. The surface density of the regolith in these craters may be significantly less compacted when compared with unshadowed areas of the moon. The theory behind that statement deals with the thermal cycling of granular materials (which is known to be a very efficient compactor of soil). The angle of the sun on these craters prohibits any light (and thus heat) from entering. As a result the lunar regolith particles in the craters do not undergo the extreme temperature cycles that are experienced by the regolith in the other areas of the moon. With this said, the permanently shadowed craters of the moon must be studied because future missions plan to land in or around these craters. It is vital to know the density of the regolith in these regions so excavating, roving, and landing interactions, along with the energy budgets and employment schedules for related technology, can be scaled and calculated properly. Soil compaction was tested as a function of depth for the two main forces of compaction on the lunar surface: thermal cycling and vibration (moonquakes). As a result of this study it is now understood that the change in relative density due to thermal cycling lunar simulant JSC-1A is a function of depth. In addition, the relative density as a result of vibrational compaction is a function of amplitude, but normally not a function of depth.

**Study 2: Friction Stir Welding: Green Manufacturing Technology**

Friction stir welding is an approximately ten-year old technology initially developed by The Welding Institute of Cambridge, England. Unlike conventional welding, it does not involve melting of the component materials, thus requiring lower temperatures with no noxious fumes emitted. It has been demonstrated to require less total energy and be a more inexpensive process than fusion welding; the resulting welds have generally superior properties. In Friction Stir Welding, a rotating tool with either a slightly angled shoulder and pin or a self-reacting pin (developed by NASA) is pushed along the joint between two adjacent metals. The friction between the shoulder and the material heats the material sufficiently to allow the tool to mix the materials together, thus creating a weld. The process is energy efficient and doesn't require a skilled welder for operation, thus reducing cost to industry while providing the possibility for more jobs. Until recently, the process has been developed primarily for high performance and aerospace applications. However, the potential benefits make it advantageous to search for wider applications in manufacturing operations. This study was conducted in collaboration with a Kentucky company to apply the process to join thin lead sheets in a near perfect manner so that the seam of the weld is smooth enough to be used in the making of x-ray machine shields. Ultimately, it is anticipated that a portable, hand-held device will be developed to allow roofers to use it to join lead or copper sheets together safely without the potential of fire.

**47. Emily Gilbreath**

**Eastern Kentucky University**

**Mentor: Stephen Richter**

***Factors Affecting Amphibian Community Composition in Ponds Across an Altered Landscape***

In the last half-century, worldwide amphibian communities have undergone epidemic and often enigmatic declines. These are related to an array of factors including disease, global climate change, invasive exotics, chemical pollutants, and commercial trade, but local habitat destruction, alteration, and fragmentation are the most detrimental. This is due to the fact that terrestrial habitats, where many amphibians spend most of their lives, constitute foraging and overwintering grounds, and form critical corridors between breeding ponds. What's more, some studies suggest that amphibians may travel farther in upland habitats than traditionally accepted. Recent studies depict amphibian populations characterized not by static pond units occasionally colonized or extirpated, but by dynamic interaction between upland and wetland factors, where landscape trends are just as immediate as pond attributes. Miller-Welch Central Kentucky Wildlife Management Area (MWCKMWA) near Richmond, KY is comprised of a collage of ponds, fields, shooting ranges, hardwood forest plots, roads, and encroaching suburbs. This study established amphibian community composition as well as dissolved oxygen, pH, conductivity, and depth of four ponds in MWCKMWA. A GIS model was also developed to analyze the four ponds based on the previously mentioned landscape factors. Ponds were ranked against each other in order of predicted species richness according to local pond factors as well as landscape factors. This analysis sought to determine if either landscape factors or pond attributes are a useful predictor of pond breeding amphibian richness in MWCKWMA, but also to seek patterns within the interaction of upland and wetland factors on amphibian richness.

## **48. Victoria Gilkison, Sara Wigginton, Justine Missik, and Kati Ayers**

**Western Kentucky University**

**Mentors: Albert Meier, Danielle Racke, and Larry Johnson**

***Conserving Ecological Systems***

### ***Study 1: Ecology of American Ginseng (*Panax quinquefolius*) at Mammoth Cave National Park***

Wild ginseng (*Panax* spp.) is a highly sought herb, containing proteins that have been shown to improve psychological, physical, and immune performance. The plants take 4-6 years to reach maturity and are then harvested for their roots. In North America, wild populations of *Panax quinquefolius* are rapidly declining due to overharvesting, poaching, over-grazing, canopy manipulation, and too-frequent fire activity. Given the wide array of medicinal uses, it is critical to locate and conserve remaining wild populations. Our goals in this collaboration are to 1) describe population dynamics of ginseng at Mammoth Cave National Park, 2) identify characters that predict reproductive output, 3) characterize those individuals most crucial to population growth, and 4) develop a predictive model of habitats where *P. quinquefolius* may either be found or successfully reintroduced to the Park. To this end, we monitored two populations of *P. quinquefolius* at Mammoth Cave National Park from 2001-2005. In 2009, we began an exhaustive field search at MCNP to locate additional independent viable populations of American ginseng. Here we present analyses of our monitoring data as well as a preliminary analysis of favorable habitat in the Park.

### ***Study 2: Microbial Networks Create Pathway Proliferation in Marine Food Webs***

The role of the microbial food web is little studied, but it often comprises the majority of the biomass in many ecosystems. We explored the effects of experimentally adding microbial loops and microbial webs to existing published food webs and modeled their effects on network properties. Addition of microbial loops dramatically increased indirect paths and greatly modified ecosystem behavior. Eigenvalue analyses were performed, and demonstrated high degrees of pathway proliferation resulting from microbial networks.

## **49. Daniel Graves and Nathan Fite**

**Morehead State University**

**Mentors: Benjamin Malphrus and James Lump**

***Kentucky Space: Establishing a Spaceflight Heritage for the Commonwealth***

Kentucky Space is a multi-university collaboration whose ultimate goal to establish a presence in space for the commonwealth of Kentucky. In a combined effort led by the Kentucky Science and Technology Corporation six universities: the University of Kentucky, Morehead State University, University of Louisville, Western Kentucky University, Murray State University and the Kentucky Technical and Community College System as well as corporate partners Belcan, and NanoRacks LLC., have established a space program (Kentucky Space), whose goal is to promote workforce development and the establishment of a space economy in the

commonwealth. Kentucky Space undertakes mission-based student team experiences requiring integration of interdisciplinary expertise, learning to work in teams to achieve shared goals, incorporating NASA resources, facilities and expertise to reach the goals. The programs operate in four spatial regimes: edge of space (high altitude balloons), suborbital space (on sounding rockets), low earth orbit (LEO), and deep space. Since inception in 2006, Kentucky Space has moved from an initial concept to its first sub-orbital space mission, Space Express launched in 2007, and has two suborbital missions planned in 2010. Also in 2010 Kentucky Space will launch its first orbital satellite, KySat-1, developed by students and faculty in Kentucky. Facilities have been created at the partner institutions that are dedicated to space systems development, testing, and operation. Included are a 21M Earth station, a mission control center, vibration, thermal and vacuum testing facilities, a clean room, and an anechoic chamber. Here we provide an overview the major Kentucky Space initiatives.

## **50. Lucas Tanner-Gray**

**Murray State University**

**Mentor: David Eaton**

*Using MMORPGs as an Economic Laboratory*

Understanding the impact of policy changes on the economy has always been difficult, but there is a possibility that policy analysis could have another tool in massively multiplayer online role playing games (MMORPGs) such as World of Warcraft. While MMORPGs are not exactly new, they have recently gained great popularity. These games are played in a virtual world where each player has a character and can interact freely with the other players in the game. Because players can interact and trade items with each other, there is a market system in place that forms the foundation for an in-game economy. While there is very little research that has been done exploring the possibility of using MMORPGs for policy analysis, research is expanding in the area of virtual economies. This research is intended to explore the similarities and differences between online economies as they exist in MMORPGs and real world economies. If the virtual economies display a strong relationship to actual economies, there is a possibility that, policy makers would have a new arena in which to implement and gauge the effects of economic policy before it is implemented in the real world.

## **51. Whitney Green**

**Madisonville Community College**

**Mentor: Mary Janssen**

*Peer Evaluations and Expectancies in the Classroom: Results of Self-Evaluation on a Math Test*

In experimental Phase 1 fourth- and fifth-grade children were asked to rate their classmates on their ability in math. In Phase 2, on the following day, the children were randomly assigned to one of two groups and given a math test. Children in the High Peer Expectancy (HP) Condition were told their classmates believed them to be very good in math. Children in the No Peer Expectancy (NP) Condition were told nothing. Children were then asked to rate their own performance on the math test just completed. The hypothesis that a higher average self-rating would come from children told their peers rated their math skills highly than from children told nothing was disconfirmed. As expected, no differences were observed in average performance of

*Green Cont'd.*

the two groups on the math test. Results suggest a discrepancy between self-ratings and ratings by classmates, and were interpreted in light of research on “self-esteem.”

## **52. Jennifer Hambley**

**University of Louisville**

**Mentor: Rodger Payne**

### ***U.S. Involvement in Multilateral Treaties***

The United States has not ratified a significant number of important multilateral treaties. Many of these treaties enumerate international norms. US actions relating to this set of treaties cannot be explained by looking at states with similar styles of government and economic wealth. In fact, the majority of the states that have not ratified these treaties are small, poor, states found in the global south that lack any observable commonalities with the United States. My research centered around the question of what treaties fall into this category, and why the US has not ratified these treaties. My results point to the conclusion that international norms did not affect US behavior towards these multilateral treaties, because of Senate procedures, or lack of administrative support.

## **53. Ellen Hammer**

**University of Kentucky**

**Mentor: Alissa Meyer**

### ***The Vital Role of Education on the "Human Factor" for Refugees***

The "human factor" refers to aspects of someone's personality and performance abilities that enable him or her to function successfully in all realms of life, whether it be spiritually, physically, mentally, economically, or politically (Adjibolosoo, 1994). Unfortunately, due to circumstances beyond their control, the ever-increasing number of refugees in the world are unable to adequately develop these skills — education is especially important and especially lacking. Many of the refugee camps have limited resources for children to continue their education, creating the possibility of a lost generation of properly educated children. Without an educated population any country cannot hope to thrive and prosper. The goal of this study was to examine how education in the home and host countries affects the human factor and how a refugee resettles. I conducted direct interviews and focus groups with new refugees in a Central Kentucky high school, as well as carried out participant-observation at a refugee resettlement NGO, in an effort to learn more about access to and interest in education among my study sample. A key component of this project was the distribution of my results among community members, including school administrators, social workers, and others involved with refugee aid and resettlement in Central Kentucky. Although data collection is still in progress, I expect to find that refugees who have access to a quality education both in the host and home countries will resettle more smoothly and maintain key aspects of the “human factor.”

## **54. Alexander Hare, Ben Neal, Jae Lee, and Paul Kasinski**

**Western Kentucky University**

**Mentors: Claire Rinehart and Kinchel Doerner**

### ***Genomic Comparison of C. scatologenes to M. thermoacetica***

The genome of *C. scatologenes* was sequenced by high-throughput short read sequencing, and 10,096 contigs were returned. In order to determine the function of individual genes and the proteins produced, all of the contigs of *C. scatologenes* were aligned to a closely related reference genome, *M. thermoacetica* (NC\_007644) using BLASTn. BLAST alignments with an E-value less than  $e^{-50}$  were considered significant matches. Contigs that were found to overlap protein coding genes were also compared at the amino acid level. Summary statistics on the number matching and non-matching contigs and reference genes are reported.

## **55. Steven Hart**

**Murray State University**

**Mentor: Chris Trzepacz**

### ***Making Babies with PAM and RAB: Investigating New Paradigms in Vesicular-Mediated Signaling Pathways***

The nematode *Caenorhabditis elegans* is an excellent model organism for the study of signaling pathways in eukaryotes. These organisms, while comparatively simple, accurately exhibit many similar modes of cellular communication that our own cells utilize. We are investigating the role of PAM-1, an aminopeptidase, in a signaling pathway that governs gametogenesis. Adult worms homozygous for *pam-1* mutations only produce a small number of progeny the majority of which are inviable. Expression of a transgenic PAM-1:GFP fusion protein reveals that PAM-1 functions in the somatic sheath cells of the gonad and stimulates maturation of oocytes in the germ line. Electron micrograph analysis of the sheath cells reveals a tissue enriched with large numbers of vesicles. This suggests that the signaling pathway through which PAM-1 affects the maturation of the oocytes within the gonad may be facilitated through vesicular transport of signal molecules from the sheath cells to the germline. The RAB family of small GTPases are integral to vesicular functioning in all eukaryotes; the *C. elegans* genome harbors 22 *rab* genes. We hypothesize that by shutting down specific *rab* genes by RNA interference (RNAi) in the compromised *pam-1* background we will observe a synergistic effect on fecundity, establishing a novel relationship between PAM-1, RAB proteins, and a vesicular-mediated signaling pathway.

## **56. Kimberly Hatcher and Anthony Haskamp**

**Northern Kentucky University**

**Mentors: Heather Bullen and Maureen Doyle**

### ***Mass Spectrometry in a Flash: Animations for Online Tutorials in Analytical Science***

Using the latest in animation technology we have created a fun and interactive visualization of a mass spectrometer to support student understanding of how this instrument works. This visualization can be used to enhance tutoring and teaching as part of a Web-based collection of resources for undergraduate STEM education in the analytical sciences. The visualization is implemented in Adobe Flash and can easily be embedded in an instructor's Web page.

## **57. Rachel Hayden**

**Kentucky State University**

**Mentors: George Antonious and Tejinder Kochhar**

### ***Dimethazone, Napropamide, and Trifluralin Residues in Agricultural Soil***

Recycling sewage sludge as a soil amendment would reduce the need for sludge landfill disposal and the impact of disposal on environmental quality. A field study was conducted at Kentucky State University Research Farm. Eighteen plots were separated using metal borders and the soil in six plots was mixed with sewage sludge, six plots were mixed with yard waste compost, and six unamended plots were used for comparison purposes. The soil was sprayed with dimethazone, napropamide, and trifluralin herbicides. Runoff and infiltration water were collected following natural rainfall events and herbicide residues were quantified. The objectives of this investigation were to study 1) the impact of soil amendments on the amount of runoff water and infiltration water in the vadose zone and 2) the impact of soil amendments on herbicide mobility under field conditions. Significant concentrations of dimethazone residues were detected down the land slope following natural rainfall. Residues of trifluralin were significantly higher in sewage sludge treatments compared to yard waste and unamended soil. Napropamide residues in the vadose zone were 0.3 mg acre<sup>-1</sup> in the NM treatment compared to 1.4 mg acre<sup>-1</sup> in yard waste treatment. Addition of sewage sludge increased soil retention of trifluralin and napropamide residues, lowering their transport into rivers.

## **58. Millicent Heil and Sasha Buck**

**Western Kentucky University**

**Mentor: Barbara Bush**

### ***Eco Friendly Dentistry***

The impact of trash accumulation generated by the United States commerce is staggering. Dental offices contribute to the accumulation through the use of disposable items and toxic chemicals. It is estimated that 680 million plastic chair barriers and 1.7 billion instrument and sterilization pouches are disposed into landfills annually. Additionally, two million tons of toxic x-ray fixer are poured into the sewer systems and 4.8 million lead foils from the film packages are tossed and eventually end up in landfills. This presentation introduces eco-friendly dentistry products and habits that can reduce this contamination of the environment. Reusable cloth products that can be sterilized, nitrile-based gloves and masks, recyclable product packaging and biocompatible cleaning solutions are just a few of the suggestions for becoming more environmentally conscious. More energy efficient appliances and lights, motion sensor faucets and natural construction products are necessary to accomplishing an eco-friendly office. Using technology to convert to paperless record-keeping systems and digital radiographic imaging further reduces the consumption of our natural environment. Something as simple as turning off all equipment when not in use reduces waste. Adopting an eco-friendly dental practice promotes environmental awareness and sustainability while reducing the industry's detrimental impact on the environment. Eco-friendly dentistry is more than just a trend. It is the progression of dentistry down the road of modern development and success.

## **59. Alyson Hockenberry**

**University of Louisville**

**Mentors: Carolyn Klinge and Celia Emberts**

### ***Nucleolin Acts as a Coactivator for COUP-TFII Regulation of Retinoic Acid Receptor $\beta$ Transcription in T47D Human Breast Cancer Cells***

Tamoxifen (TAM) is an antiestrogen widely used in the treatment of patients whose breast tumors express estrogen receptor alpha ( $ER\alpha$ ). Of the patients initially responsive to the therapy, 40% eventually become resistant antiestrogens. The mechanisms involved in TAM resistance (TAM-R) have yet to be fully ascertained. The orphan nuclear receptor Chicken Ovalbumin Upstream Promoter Transcription Factor II (COUP-TFII) is down-regulated in TAM-R breast cancer cell lines. When COUP-TFII expression is restored in TAM-R cells, cell proliferation is again TAM inhibited. The mechanism for COUP-TFII's restoration of TAM-sensitivity is unknown. Recently, COUP-TFII and nucleolin were shown to immunoprecipitate and colocalize in breast cancer cells and human breast tumors; nevertheless, the implications of this interaction are unknown. Nucleolin is primarily in nucleoli; however, it is in the cytoplasm and plasma membrane of cancer cells. Nucleolin acts in chromatin remodeling, rDNA transcription, rRNA maturation, ribosome assembly, and nucleo-cytoplasmic transport. The anticancer drug AS1411, a G-quartet aptamer, targets nucleolin. Thus, the focus of my research was to determine if AS1411 inhibited COUP-TFII-regulated endogenous gene transcription in breast cancer cells. COUP-TFII increased transcription of the tumor suppressor retinoic acid receptor  $\beta$  gene ( $RAR\beta$ ) in breast cancer cells. I found that AS1411 inhibited COUP-TFII stimulated  $RAR\beta$  transcription in T47D  $ER\alpha^+$  human breast cancer cells. These data indicate that nucleolin acts as a coactivator for COUP-TFII-regulation of  $RAR\beta$  gene transcription and offers a possible mechanism for COUP-TFII's restoration of TAM-sensitivity, i.e., by increasing differentiation as indicated by an increase in  $RAR\beta$  tumor suppressor expression.

## **60. Myesha Hollins**

**Kentucky State University**

**Mentors: Li Lu, Kirk Pomper, Jeremiah Lowe, and Sheri Crabtree**

### ***Using DNA Markers to Distinguish Scion and Rootstock Tissues on Grafted Pawpaw (*Asimina triloba*) Trees***

The pawpaw [*Asimina triloba* (L.) Dunal] is a native tree-fruit in Kentucky that is in the early stages of commercial production. Kentucky State University serves as the USDA National Clonal Germplasm Repository for pawpaw; therefore, research concerning pawpaw genetic diversity and DNA fingerprinting are priorities. Pawpaw varieties are propagated by placing a bud, or scion, from a selected variety onto a seedling root system. Scion death and the formation of shoots from the root system result in a tree which is no longer true to the original variety. Usually trees that develop from rootstock shoots produce poor quality fruit that is inferior to the scion variety. The objective of this study was to determine if scions of trees ('Sunflower' or 'Susquehanna') in the KSU Scion/rootstock trial are genetically true to type or have been replaced by shoots from the rootstock. Leaf samples were collected from varieties 'Sunflower', 'Susquehanna', and 7 trees that may not be true to type in the KSU pawpaw rootstock trial. Additional leaf samples of wild pawpaw trees in Cove Spring Park in Frankfort, KY were used as a secondary control. DNA was extracted from leaves using the DNAMITE Plant Kit. Primers B3, B103, B129, and G119 were used to amplify SSR products. These products were then



*Hollins Cont'd.*

separated using a 3130 Applied Biosystems capillary electrophoresis system. Trees in the Cove Spring patch showed a range of pawpaw genotypes. Scions of six of the seven trees were not true to type and were rootstock derived trees that should be removed.

## **61. Angel House, Victoria Lovelace, Ilena Mitchell, and Erin Robinson**

**Eastern Kentucky University**

**Mentor: Jon McChesney**

*Children with Cancer: Perspectives of a University Camp Experience*

Camp U-ROC (Using Recreation to Overcome Challenges) was a service-learning program planned and delivered by a senior-level class at ECU in conjunction with the Kentucky Cancer Program and the Madison County Breast Cancer Support Group. University students were divided into three teams to plan, deliver and evaluate their recreation program. This qualitative research focused on student, participant and parent thoughts about the program. The impetus for this program was recognizing the need to build social support networks for children that have cancer. The camp experience has been identified as an effective modality for reducing anxiety and fear in children with cancer. The interaction with other children with a similar condition and the resulting social support are important psychological outcomes of a camp experience. Winfree, Williams and Powell (2009) said, "These children can have a variety of limitations, but first and foremost, they are still children and want to be treated the same as children without cancer with opportunities to run, play, swim, and enjoy being with other kids." University students identified the experience as beneficial. One student reflected, "I would love to have one tenth of the strength and courage that these young kids show in their battle against cancer. I have learned so much from them about embracing life. I get chills thinking that for a few days these kids could just be themselves and not worry about dying, because for that moment in time throughout the camp they were living, having fun, and building friendships."

## **62. Jessica Houtz**

**University of Kentucky**

**Mentors: Karyn Esser and Kenneth Campbell**

*Automated Image Analysis of Electron Micrographs of Structurally Compromised Striated Muscle*

Striated (skeletal and cardiac) muscle is a highly organized and conserved tissue with a molecular structure comprised of bundles of actin (thin filaments) and myosin (thick filaments). We have observed that skeletal muscle from two genetically modified murine models showing disrupted circadian rhythms (Bmal knockout and Clock $\Delta$ 19), exhibit significant muscle weakness defined by a reduction in specific tension. Electron micrographs (EMs) of cross-sections from adult gastrocnemius in these mice reveal obvious divergences from the normal hexagonal arrangement of thin filaments around thick filaments. The goal of this project was to develop a tool for the high-throughput analysis of myofilament architecture. Image processing software written in MATLAB identifies myofilaments in EMs of muscle cross-sections as intensity peaks in the gray-scale image. Filaments are categorized as thick or thin depending on the cross-sectional area of the peaks after thresholding. Structural properties, such as the ratio of

*Houtz Cont'd.*

thin to thick filaments, the distance to closest neighbors, the angular distribution and the diameter of filaments will be determined for different muscle samples. This quantitative analysis should lead to improved understanding of structure-function relationships in striated muscle.

### **63. Scott Hunter, Roger Martin, and Katie Shelton**

**Madisonville Community College**

**Mentor: Terri Tillen**

#### ***Water Quality in a Surface Mining Reclamation Area***

The objective of the present study was to determine the water quality in a finalized coal mine reclamation area in comparison to a natural habitat. Water quality determines the types of organisms that can survive in an area and is an indicator of the overall health of the habitat. The water quality of the White City Wildlife Management Area near Mortons Gap, Kentucky was studied. The hypothesis is that the water quality at the reclamation site would be within normal range in comparison to a natural habitat. There were two testing locations: a stream on the reclamation site in Mortons Gap, and a stream in Nebo, Kentucky. Three water samples were taken from both sites. Metal, pH, Mercury, Nitrate, Iron, and *Escherichia coli* (*E. coli*) tests were conducted on all samples. Results from the stream located on the reclamation area showed acidic pH (average 4.4). The stream also contained high metal concentrations (over 1000 parts/billion), and is contaminated with *E. coli*. Results from the control stream in Nebo, KY were within the parameters of normal water. The hypothesis was rejected by the results of the water tests completed.

### **64. Joshua Ingram**

**Morehead State University**

**Mentor: Alana Scott**

#### ***Strength of the Spirit: The Evolution of the Role of Women in Eastern Kentucky Christian Churches, 1909-2009***

In the summer of 1801, The Great Revival held at Cane Ridge, Kentucky laid the early foundation for a new church that would “return to the ancient order of things,” following two basic principles; Christ as the head of the church and the Bible its sole authority. The mission of founders Barton W. Stone and Alexander Campbell emphasized the necessity to tear away from the binds of denominations and the word of man to reestablish the true Christian Church. As their message spread, Disciples of Christ congregations throughout the south and west took root and by 1909 the number of followers totaled 1,250,000. The role women were to serve was like that of most churches, banned from the pulpit and other leadership positions. Over the next 100 years, however, the position of women changed. So much so that by 2005 the head of the Christian Church, titled the President and General Minister, became Dr. Sharon E. Watkins, chosen by President Barack Obama in January 2009 to preach the Inaugural Prayer Breakfast. How did this transformation occur? The thesis was addressed through the study of Christian Churches in four Kentucky counties, including Bath, Montgomery, Fleming and Mason. The foundational knowledge from the secondary literature was employed to construct questions that could be answered through an examination of church records and interviews with the men and women in these churches.

## **65. Rebekah Jackson**

**Morehead State University**

**Mentor: Kelly Collinsworth**

### ***Foreclosure Defense in the Commonwealth: An Undergraduate Partnership with Kentucky Legal Services Programs***

The number of foreclosures across the country has risen in the past several years, and Kentucky is no exception. Although the foreclosure rates in the Commonwealth remain below the national average, one in every 1,731 homes falls to foreclosure. (RealtyTrac 2009). Many of the families who stand to lose their homes are indigent and rely on the services of Kentucky Legal Services for foreclosure defense. In response to the growing caseloads at Legal Aid, law schools have developed clinical programs to ease the burden on attorneys by allowing students to represent clients, under the supervision of licensed attorneys. The purpose of this study was to determine the need and methods for implementation of a foreclosure defense education program for individuals facing foreclosure in Eastern Kentucky. Similar programs, which provide families with literature and a forum to answer foreclosure questions, have been offered through local Legal Services offices across the state. In addition to an education program, another objective of this study was to design a clinical curriculum, comparable to those found in law schools, to allow undergraduate paralegal students at Morehead State University the opportunity to assist Legal Services attorneys in foreclosure defense.

## **66. Matthew Kessinger and Jordan Myers**

**Owensboro Community and Technical College**

**Mentor: Micah Perkins**

### ***Conservation of Eastern Bluebirds and Other Secondary Cavity Nesters at the Nature Area of Owensboro Community and Technical College***

The eastern bluebird (*Sialia sialis*), a native species of thrush found throughout Kentucky is of conservation concern. A cavity-nesting bird, the eastern bluebird is losing critical nesting habitat. Existing nesting habitat is often in competition by nonnative bird species such as the house sparrow (*Passer domesticus*) and European starling (*Sturnus vulgaris*). The present question was whether providing additional nesting habitat, bluebird boxes, would enhance the nature area of Owensboro Community and Technical College (OCTC) for bluebird nesting. During the 2008 breeding season, ten bluebird houses were placed throughout the nature area (18.5 acres) but no successful bluebird nests were recorded. During the 2009 breeding season, eight bluebird houses were placed. House sparrow competition and predation were noted but European starling competition was not recorded. Results for 2009 indicated that native Kentucky birds such as eastern bluebirds, house wrens (*Troglodytes aedon*), and tree swallows (*Tachycineta bicolor*) produced successful nests. The nature area of OCTC can be viable eastern bluebird habitat. Successful bluebird nesting may be dependent on placing boxes early in the spring and preventing house sparrow nesting.

## **67. Shanae Kincannon**

**Kentucky State University**

**Mentors: George Antonious and Tejinder Kochhar**

### ***Concentration of Capsaicin and Dihydrocapsaicin in USDA National Pepper Germplasm Collection***

A survey was conducted to screen 90 hot pepper accessions selected from the USDA germplasm collection for their major capsaicinoids content. Fresh fruits of *Capsicum chinense*, *C. frutescens*, *C. baccatum*, *C. annuum*, and *C. pubescens* were extracted with methanol, and analyzed for capsaicin (trans-8-methyl-N-vanillyl-6-nonenamide), dihydrocapsaicin (8-methyl-N-vanillylnonanamide), and nordihydrocapsaicin. Mass spectrometry of the fruit crude extracts indicated that the molecular ions at m/z 305, m/z 307, and 293 which correspond to capsaicin, dihydrocapsaicin, and nordihydrocapsaicin, respectively have a common benzyl cation fragment at m/z 137 that could be used for monitoring capsaicinoids in hot pepper extracts. Capsaicin and dihydrocapsaicin were the dominant capsaicinoids detected in *Capsicum* species. Capsaicin was higher than dihydrocapsaicin and total content of capsaicinoids varied between species and accessions of the same species from none detectable to 11.2 mg/fresh fruit. Accession PI-441624 (*C. chinense*) had the greatest capsaicin content (2.9 mg/ g fresh fruit) and accession PI-497984 (*C. frutescens*) had the greatest dihydrocapsaicin content (2.3 mg/g fresh fruit), while PI-439522 and PI-497984 (*C. frutescens*) contained the highest concentration of total capsaicinoids. Variability for these traits might be utilized via USDA plant breeding approaches to produce fruits desirable to the consumer for their value-added health-promoting characteristics.

## **68. Tara Kollenberg**

**University of Louisville**

**Mentors: Carolyn Klinge and Margarita Ivanova**

### ***Tamoxifen Increases Nuclear Respiratory Factor-1 Transcription by Activating Estrogen Receptors Alpha and Beta Interaction with an Estrogen Response Element in the Gene Promoter***

Estrogens promote breast tumorigenesis by binding to estrogen receptors (ERs), encoded by two genes, alpha and beta. Tamoxifen competes with estradiol (E2) for binding ERs and is used clinically to inhibit breast cancer progression. E2-ER alpha increases nuclear respiratory factor-1 (NRF-1) transcription in MCF-7 breast cancer cells. Dysregulation of NRF-1 and its downstream targets are associated with poor prognosis in breast cancer. Surprisingly, the active metabolite of tamoxifen, 4-hydroxytamoxifen (4-OHT), increased NRF-1 transcription in MCF-7 cells. To determine the mechanism for 4-OHT's induction of NRF-1 transcription, the 5' -1100 bp promoter of the human NRF-1 gene was transiently transfected with ER alpha or ER beta in ER-null COS7 cells. Both E2 and 4-OHT increased luciferase reporter activity with ER alpha and ER beta and the transcriptional activity of 4-OHT was blocked by the antiestrogen ICI 182,780, confirming that the response was ER-mediated. Mutation of the ERE in the -1100 promoter of the NRF-1 gene blocked E2 or 4-OHT- induction of luciferase activity. Together these data indicate that both ER alpha and ER beta are involved in E2 and 4-OHT upregulation of NRF-1 gene transcription. Because TFAM is a downstream target of NRF-1, an additional experiment examined the effect of E2 or 4-OHT on TFAM expression in MCF-7 cells. Results of quantitative PCR analysis showed E2 induced higher TFAM expression than 4-OHT. Thus, despite 4-OHT's induction of NRF-1, there is less NRF-1-mediated transcription in the 4-OHT-treated cells. This is likely due to induction of apoptosis in MCF-7 cells by 4-OHT treatment.

## **69. Mihir Kotwal**

**University of Louisville**

**Mentors: Carlos Rojas and Olfa Nasraoui**

### ***A Cloud-Based Framework for Web Usage Mining***

Web logs from web servers can be analyzed to reveal web usage profiles, page similarities, and other information gleaned from web mining processes. However, web logs must be preprocessed so that the data mining algorithms that work on them can have clean and well formatted data. Some of the preprocessing tasks include filtering requests from spider bots or search engine crawlers and sessionization to group separate requests by the same user into a single session. Unfortunately, preprocessing can be time consuming, especially if it is done on only one computer. The objective of this project is to use distributed computing to significantly decrease the time needed to perform preprocessing of a web log into a specially formatted file for input into existing web mining algorithm implementations. To accomplish this, we use an open source implementation of the MapReduce algorithm, Hadoop, which currently runs on a four node cluster of regular (recycled) workstations. Using a cluster to complete preprocessing is an essential step towards moving data mining and analysis towards generating real time results. Lessons learned here can be translated into performance gains in other uses of computation. Although our current implementation is still at a small scale, it can be extended to a much larger scale based on the same framework, leading to a genuine cloud computing based web usage mining.

## **70. Theresa Lakin**

**Eastern Kentucky University**

**Mentor: Robert Karolich**

### ***Public Opinion and Kinship Care: Does Societal Values Influence the Passage of Bills?***

Kinship care is a growing trend in the field of social work as more children become wards of the state due to multiple social problems (Stukes Chipungu, Bent-Goodley, 2004). Kinship care is defined as a family situation where a minor child, under the age of eighteen years of age, resides full time with a person who is either a relative or a known friend of the family, which is also called a fictive kin. It can be either formal foster care placement or one that is done informally, which leaves the care provider without legal guardianship and does not receive state benefits (Ziminski, 2007). I explored the question of whether kinship care represents societal values or if it is necessary occurrence due to financial issues surrounding the care of children under state's care. The Kinship Care Public Opinion Survey was sent out participants in six rural and urban areas in Kentucky to explore the premise that societal values do play a role in the passage of kinship care legislation. Those respondents with previous personal experiences with kinship care had more positive outlooks on the issue (rural-100%, urban-73%). Both rural and urban participants were willing to become kinship care providers (rural-66.7%, urban-68.2%) and responded positively to voting to support legislation that would make equal resources available for kinship care families. A disparity in the groups surveyed between rural and urban participants regarding whether kinship care was an obligation suggests that societal values may not be easily identified. This may be why legislation such as the Fostering Connections to Success and Increasing Adoption Incentives of 2008 was passed, but has failed to be funded. This lack of funding leaves valuable resources for kinship care families untapped, and may suggest that a division exists within our society, regarding values that have led to this contradictory behavior by legislators.

## **71. Keith Lanser**

**Northern Kentucky University**

**Mentor: Caryn Connelly**

*The Struggle for Change in Mexico*

Mexico, a country rich in both natural resources and culture, has one of the largest economies in world. It is not, however, developing as fast as some of its competitors like China and India. Mexico relies on foreign investment to promote economic growth. I have examined a few central issues that may be inhibiting foreign investment and greater economic success. Pemex, Mexico's state-run oil company, is in deep financial trouble, and its mismanagement could bring down the Mexican government and even its economy. The most daunting and worrisome of all of Mexico's problems is insecurity due to the plague of corruption, violence, and drug trafficking. This serious issue seems to be getting worse and could severely strain both the national economy and political stability.

## **72. Greg Lee**

**Western Kentucky University**

**Mentor: James Navalta**

*A Methodology for Determining Early and Late Exercise-Induced Apoptosis in Helper T (CD3+/CD4+) and Cytotoxic T Cells (CD3+/CD8+)*

Exercise-induced apoptosis has been assessed in lymphocytes as an entire immune cell set, typically in the early stage. Lymphocytes can be subdivided into specific subfractions (i.e. helper T, memory B cells) and apoptosis progresses through various phases (i.e. early and late stages). It's possible that exercise differentially affects subfractions, and at a variable rate of apoptosis. A methodology that allows evaluation of early and late cell death in lymphocyte subfractions is needed to understand more adequately the immune response to exercise. This study's purpose was to describe a technique for measuring early and late exercise-induced apoptosis in CD3+/CD4+ and CD3+/CD8+ cells. Male subjects who completed a treadmill test to exhaustion provided blood samples at rest and during exercise. Whole blood was added to red blood cell lysis buffer, then fixation buffer within 2-min of collection. The blood solution was incubated with antibodies specific to cell phenotype (helper T=CD3+/CD4+, cytotoxic T=CD3+/CD8+), markers of early apoptosis (annexin V+/7-AAD-), late cell death (annexin V+/7-AAD+) and necrosis (annexin V-/7-AAD+). Samples were analyzed using 4-color flow cytometry. The results for resting helper T apoptosis were 0.22±0.10% for early and 0.18±0.08% for late, and exercise-induced apoptosis was 0.38±0.18% for early and 0.10±0.1% for late. Cytotoxic T apoptosis at rest was 0.05±0.05% for early and 0.07±0.05% for late, but levels after exercise were 0.42±0.23% for early and 0.15±0.15% for late. Apoptotic measures can be obtained in lymphocyte subfractions and at varying stages of cell death.

### **73. Renee Levesque and Sarah Hargis**

**Murray State University**

**Mentor: Terry Derting**

***Energy Costs and Trade-Offs of the Adaptive Immune System in Old-Field Mice (*Peromyscus polionotus*)***

A high energetic cost of adaptive immune defenses is assumed in theoretical discussions of immune responses in animals. Little quantitative data are available to test the assumption, however, especially for mammalian species. We tested the null hypotheses that 1) there is no difference between energy expenditure of challenged and static cell-mediated and humoral immune systems and 2) there is no change in the magnitude of a humoral immune response when a cell-mediated immune response is introduced. To test these hypotheses, we used a two-by-two experimental design with humoral (sheep red blood cells) and cell-mediated (2,4-dinitrofluorobenzene) challenges as the independent variables. Using adult male old-field mice (*Peromyscus polionotus*), we measured hemagglutination, inflammation, metabolic rates, and organ masses to assess the energetic cost and potential energy trade-offs associated with cell-mediated and humoral immunity, and interactions between them. We rejected our first hypothesis. The cell-mediated, but not the humoral immune response, was associated with a 13.7% increase in resting metabolic rate, while neither response was associated with a significant change in daily metabolic rate. Also, the cell-mediated response was associated with a significant decrease in testes mass and colon length. Reduced organ sizes may indicate that part of the cost of mounting a cell-mediated response was met through reduced energy allocation to the digestive and reproductive systems. The cell-mediated response had no measurable effect on the humoral response. Our results supported the assumption of a significant energetic cost of cell-mediated, but not humoral immune defense.

### **74. Jonathan Lewis**

**West Kentucky Community and Technical College**

**Mentors: Felix Akojie and Zhonghua Li**

***Kinetic Study on Degradation of Methylene Blue by Fenton Reaction***

Fenton's reaction is an advanced treatment technology often used for the removal of hazardous and refractory organic compounds from industrial wastewaters. In the present project, Methylene Blue (MB) was selected as a model compound due to its readiness to be measured by visible spectrometer. The study was focused on the kinetic study of Fenton degradation of MB. The increase of  $[H_2O_2]$  and  $[Fe^{2+}]$  increased the degradation rate of MB. The ratio of  $[H_2O_2]/[Fe^{2+}]$  is a factor influencing the degradation rate of MB as well. According to the current experimental results, Fenton reaction was able to degrade MB rapidly while the ratio of  $[H_2O_2]/[Fe^{2+}]$  was in the range of 1-20.

## **75. Sudan Loganathan, Christina Jackson, Dan Varonin, and Michael Creed**

**Murray State University**

**Mentor: Alexey Arkov**

### ***Studying Germline Stem Cells Using the Fruit Fly as a Model Organism***

Stem cell biology is a promising area of research that is likely to advance medicine and human health. We are using the fruit fly *Drosophila* as a model system to study the germline stem cells. Germline cells are responsible for generating entirely new organisms from an early embryo. In particular, we are focusing on identification of proteins that determine stem cells and make them different from other more specialized types of cells. Furthermore, we are studying the specific genes that are also present in humans. Finally, we are exploring the pathways that stem cells use to produce energy for their development and maintenance.

## **76. Andrea Lowe and Shelby Fisher**

**University of Kentucky**

**Mentors: Don Helme, Carol Riker, Erin Lee, and Ellen Hahn**

### ***Studies of Tobacco in Print Media***

#### ***Study 1: The Ghost of Tobacco Companies Past: A Content Analysis of Tobacco Print Advertisements Before and After The Master Settlement Agreement of 1998***

The Master Settlement Agreement (MSA) of 1998 initiated many unwanted changes for participating tobacco companies in the U.S. Tobacco companies, drowning in lawsuits that dealt with untold truths about their products, needed a solution. Entirely inclusive, the MSA worked to provide a new set of rules—a settlement—between the tobacco companies and participating states. This large set of guidelines produced a significant change in what an “acceptable” tobacco advertisement might contain. For example, prior to the Master Settlement Agreement, Camel brand cigarettes utilized “Joe Camel” as their dominant figure for advertising appeal, but were no longer able to use the image after the implementation of the MSA due to the character’s appeal primarily to underage nonsmokers. This project codes five separate magazines (*Cosmopolitan*, *GQ*, *Rolling Stones*, *Golf*, and *Ebony*) over the course of six years (1995-2001) noting the shifts in persuasive appeals, location, product-placement, and other advertising techniques. Extensive analysis of this data will illustrate the effects of the Master Settlement Agreement on tobacco print advertisements.

#### ***Study 2: Smoke-free Policy and Media Coverage in Rural Communities***

Rural areas have a higher percentage of people who smoke, fewer smoke-free laws, and local newspapers are less apt to cover tobacco issues compared to urban areas. This study’s purpose was to examine how community-based assistance affects media coverage of smoke-free issues. In a 5-year study, 40 rural communities were monitored for the number, type, and placement of tobacco-related newspaper articles before community assistance began and 9 months after. Newspaper articles collected via a statewide clipping service from April 2007 through March 2008 were analyzed (N=724). A second researcher analyzed 12% of the articles to ensure consistency. The number of front page tobacco-related articles did not differ between communities with assistance and those without before the assistance began. However, during the nine months of assistance, those communities with assistance had more front-page articles than



those without assistance. There were no differences in the number of articles that discussed government/voluntary regulations on secondhand smoke during either time period, but both groups increased in frequency of these articles over the nine months when assistance was provided. The tobacco-related articles related to government/voluntary regulations in the print rural media increased over time in both groups. The slant (i.e., pro-health or pro-tobacco) of the articles did not differ by group, but tobacco control articles were more prominent (i.e., front page) in communities with assistance. Promoting smoke-free policy in rural communities may have a positive effect on media portrayal of the issue.

## **77. Ashley Mack**

**Kentucky State University**

**Mentors: John Sedlacek, Karen Friley, Kirk Pomper, and Jeremiah Lowe**

### ***The Effectiveness of Ripe Pawpaw Fruit Extract for Managing Striped Cucumber Beetle on Squash***

Fruit tissues of pawpaw (*Asimina triloba*) were recently found to contain annonaceous acetogenin compounds having insecticidal activity. Laboratory experiments were performed to determine the effects of pawpaw fruit extract on mortality and feeding deterrence of striped cucumber beetle (*Acalymma vittatum*). Ripe pawpaw fruit pulp was extracted with 100% ETOH to obtain acetogenin compounds. Pulp extracts of 0, 10, 100, 1,000, 10,000 and 50,000 ppm were used to assess feeding deterrence and mortality of beetles. Buttercup squash leaf disks 3.5 cm in diameter were treated individually with each concentration and placed on water moistened filter paper in 9 cm plastic Petri dishes. Five striped cucumber beetles were placed on each leaf disk. All Petri dishes were then placed in an environmental growth chamber set at 27° C and a 16: 8 hr light: dark photo period. After 24 hr the cucumber beetles were removed. An LC50 of 50,538 ppm was calculated for the extract concentration required to kill 50% of the beetles. Pawpaw fruit extract reduced feeding by 90% and 98% in the 10,000 and 50,000 ppm treatments, respectively. At 10,000 ppm 10% of the beetles were killed, however only 10% of the leaf tissue was consumed. A LFC10 value of 2,033 ppm was calculated for the extract concentration required to limit feeding to 10% of the leaf. This suggests that pawpaw fruit extracts may be effective insect feeding deterrents. The duration of treatment effectiveness and susceptibility of other pest and beneficial insect species to the extracts should be examined.

## **78. Jeff Marschall, Shane McDonald, Erin Shariff, and N. Cole Phelps**

**University of Louisville**

**Mentors: Cynthia Corbitt and Andrew Roberts**

### ***Effects of Estrogenic Action in the Aging Lung***

Women experiencing severe menopause symptoms (e.g. hot flashes, vaginal dryness, and osteoporosis) might use hormone replacement therapy (HRT) to reduce these side effects, but some women seek what they consider more “natural” alternatives to HRT, such as phytoestrogens. These are plant-produced estrogen receptor agonists that are available over the counter, but currently are not regulated by the FDA. Phytoestrogens are also found in soy-based foods. This study investigated the effects of estrogenic activity on lung structure and compliance

in a rodent model of menopausal women. Previous studies found that estrogen modifies lung morphology. To date, there are no published studies on the effects of phytoestrogens on static lung compliance or the ratio of collagen and elastin which affects lung tissue elasticity and stiffness. For this study we used 21 female retired breeder Sprague-Dawley rats that were randomly assigned to four different groups: sham control (no ovariectomy, soy-free food), estrogen (ovariectomy + estrogen replacement, soy-free food), phytoestrogen (ovariectomy, soy food), and negative control (ovariectomy, soy-free food). Here we report that neither estrogen nor supplement of phytoestrogens through a diet rich in soy gave the protective effects that we predicted in a measure of static lung compliance or in an assay of lung elastin content. The presence of these phytoestrogens did, however, slow the rate at which rats gained weight after ovariectomy when estrogen was not replaced. It is important to note that some other extracellular matrix component might account for the previously seen effects of estrogen on lung morphology and function.

## **79. Travis McCuddy and Anne Giorgis**

**University of Kentucky**

**Mentors: Julie Marusich and Michael Bardo**

### ***Methylphenidate as an Intravenous Reinforcer for Rats: Evidence from Progressive Ratio Schedule and Long Access Sessions***

Despite the abuse potential of methylphenidate (MPH) found in humans, one of the most widely prescribed drugs for treatment of attention deficit hyperactivity disorder (ADHD), little research has been done using MPH as a reinforcer for rats. The purpose of these experiments was to provide additional data on whether or not MPH was an intravenous reinforcer for rats. Experiment 1 tested for self-administration of MPH on a progressive ratio, as well as examining a variety of doses of MPH. Results of this experiment showed that subjects earned significantly more MPH than saline, and also had higher breakpoints for all doses of MPH examined than for saline. In experiment 2, subjects were divided into long access groups (LgA), rats exposed to six hour daily MPH self-administration sessions, and short access groups (ShA), rats exposed to one hour daily MPH self-administration sessions. Subjects in LgA groups administered significantly more MPH over the course of the 21 sessions, whereas subjects in the ShA groups did not change in the amount of MPH intake. The combined results demonstrated that rats will self-administer more MPH on a PR schedule of reinforcement than saline, rats given long access to MPH self-administration will escalate in the amount of MPH intake, and that rats can be trained to lever press for MPH without prior lever press training for food or another drug. These results indicated that MPH use is subject to dysregulated use and abuse, similar to that of other drugs of abuse.

## **80. Adam McCallum and Emilee Knue**

**Northern Kentucky University**

**Mentor: Isabelle Lagadic**

### ***Investigating Mesoporous Organosilicates as Carriers for the Controlled, Local Delivery of the Chemotherapeutic Drug Doxorubicin Hydrochloride***

Currently, the most effective and common course of cancer treatment is the use of specialized chemotherapeutic drugs. When administered in high systemic doses, these drugs can cause severe toxicity to the healthy tissue cells, resulting in hair loss, nausea, anemia, and decreased immune response. One way to reduce this toxicity while delivering a high concentration of the drug directly at the tumor site is through drug encapsulation into delivery particulates. Our ongoing research has focused on mesoporous inorganic-based silica particles as possible carriers for the anticancer agent doxorubicin (Dox). These mesoporous silicates were synthesized without and with the presence of organic functional groups — sulfonate (SO<sub>3</sub>-Na<sup>+</sup>) and carboxylate (CO<sub>2</sub>-Na<sup>+</sup>) — that can interact with Dox through an ion-exchange process and increase the capability of conjugating Dox. The non-functionalized (SBA), the sulfonate (SBA-SO<sub>3</sub>-Na<sup>+</sup>) and carboxylate (SBA-CO<sub>2</sub>-Na<sup>+</sup>) functionalized mesoporous silicate materials, were treated with aqueous solutions of doxorubicin in a 4:1 solid-to-drug weight ratio. Based on their Dox-loading capacity, the materials can be ranked as follows: SBA-SO<sub>3</sub>-Na<sup>+</sup> > SBA-CO<sub>2</sub>-Na<sup>+</sup> > SBA, with SBA-SO<sub>3</sub>-Na<sup>+</sup> capable of loading up to 200 mg of doxorubicin per gram of solid. The Dox-release profiles from the three Dox-loaded materials in saline solution (0.9 wt% NaCl) were monitored by UV-Vis at 37°C. The non-functionalized SBA material exhibits a rapid but incomplete (only 60%) and unreliable release of Dox. Dox releases completely from both SBA-SO<sub>3</sub>-DoxH<sup>+</sup> and SBA-CO<sub>2</sub>-DoxH<sup>+</sup>, but more slowly from the former than the latter.

## **81. Aakriti Mehta**

**University of Louisville**

**Mentor: Susanna Remold**

### ***Household Niches of Pseudomonas aeruginosa***

Cystic fibrosis (CF) is a genetic disorder characterized by an inability to battle bacterial infections in the lung. As CF patients are frequently affected by the activity of *Pseudomonas aeruginosa*, this research strived to identify household locations that contain *Pseudomonas aeruginosa* infestations in order to develop protocol to minimize exposure. This particular study focused on the *Pseudomonas aeruginosa* infestations in the home of a CF patient. This household was sampled over a two-year period, and analyses yielded information about the progression and spread over time of the bacteria. Environmental sampling involved swabbing of different areas around the home that are easily accessible to children. Samples were grown on Pseudomonas Isolation Agar (PIA). These areas included bathroom drains, pets, houseplants, toys, and kitchen appliances, among others. In addition, several samples are taken from body parts of the family members themselves, such as the ear canal and the navel to account for strains that have adapted to live in the human body. Upon completion of sampling, data analysis transpired, including inoculation of samples and extraction and amplification of DNA. Eventually, each sample was sequenced and classified according to known genomes to identify exact species (distinguishing between *Pseudomonas aeruginosa*, *Pseudomonas putida*, other *Pseudomonas*, and other species). Also, the locations, where *Pseudomonas aeruginosa* were found, were compared from one sampling to the next to identify migration within the home.

## **82. Kristyn Mickley, Kelly Leech, and M. Erin Alvey**

**University of Kentucky**

**Mentor: Patricia Burkhart**

### ***Parents' and Children's Evaluation of a Child Asthma Self-Management Program***

The purpose of this descriptive study was to evaluate the acceptability and helpfulness of a child asthma self-management program. Following a 16-week study that tested an asthma self-management intervention to promote children's adherence to daily peak flow monitoring (PFM), a program evaluation was completed utilizing a personal interview with each parent/child dyad ( $N=77$ ). Ease of use of the PF meter, the importance of PFM, strategies that helped children to remember to perform daily PFM, and the helpfulness of the overall self-management program were evaluated. Descriptive analyses of parents' and children's self-reports were conducted. Preliminary data analyses of participants who responded suggest that parents and children, respectively, reported that PFM (84%, 82%) was easy to perform. Ninety-six percent of the parent/child dyads indicated that PFM was important to do on a daily basis. Several behavioral strategies, particularly parent reminders (71%, 66%) were found to help children remember to perform daily PFM. The overall program was reported to be helpful (95%, 74%) in improving asthma self-management. Program evaluation from the participant's perspective is important to future development of acceptable asthma self-management protocols.

### **83. Shawntell Miles**

**Kentucky State University**

**Mentors: Williard Mazhawidza and Narayanan Rajendran**

#### ***Prevailing Adenylsuccinate Lyase of Exiguobacterium Acetylicum Strain SN Using Peptide Synthetase Primers***

For prokaryotic cells, the ability to biosynthesize essential elements such as peptides and nucleotides for DNA and RNA synthesis is pivotal. The enzyme peptide biosynthetase is critical to cell survival. In an effort to reveal such peptide synthetase biosynthetic mechanisms in a soil isolate *Exiguobacterium acetylicum*, the genomic DNA was probed in a PCR experiment using peptide synthetase primers. Amplified DNA was resolved by agarose gel electrophoresis and cloned at our molecular microbiology lab, and then sequenced at University of Louisville sequence facility. DNA sequence analysis was performed using MEGA 4.1 software. The Blast search analysis putatively identified our amplicon as Adenylsuccinate Lyase. Further DNA sequencing analysis and multiple sequence alignments revealed the conserved amino acids specific to that family of enzymes. Phylogenetic analysis of related bacteria based on matching sequences revealed close relationships of *Exiguobacterium acetylicum* strain SN related to some soil microbes. The revelation of similar microbes with regard to the biosynthetic complex, adenylsuccinate lyase suggests a potential common evolutionary trajectory amongst the matching bacteria. Further studies are underway.

## **84. Elizabeth Miller**

**Eastern Kentucky University**

**Mentor: Doris Pierce**

### ***Perceptions of Students with Disabilities of Supports and Barriers to Successful Transitions from High School to College***

The purpose of this research was to describe the perceptions of students with disabilities in regard to supports, barriers, and changes in daily occupations that they experienced during their transition into college. Applications from this population have drastically increased over the past several years. This increase has sparked interest among professionals at several levels including sociologists, psychologists, and occupational scientists. Theoretical and empirical literature in this area demonstrates particular needs in self-determination, social skills, academic preparation, and accommodations for these students. Using a qualitative design while encompassing a grounded theory method, semi-structured interviews were conducted. Six students aged between 18 and 28, enrolled full-time at Eastern Kentucky University, and registered with the Office of Services for Individuals with Disabilities were interviewed. Four additional students without known disabilities were interviewed for comparative purposes. Themes were discovered identifying areas which were experienced primarily by students with disabilities. Themes include study challenges, barriers in social involvement, significant support through the disabilities office, learning self-advocacy, and living with a disability. Recommendations to post-secondary schools include adding disability awareness into freshmen orientation syllabi, along with designing social events within the disabilities offices to enhance social participation amongst all students. Transition into college by students with disabilities has not been researched within occupational science, and findings will continue to enhance the rising population's transition through evidence-based reports and recommendations.

## **85. James Morris**

**Bluegrass Community and Technical College**

**Mentor: Norman Strobel**

### ***Effect of Culture Medium on Growth and Yellow Pigment Production by *Xanthomonas campestris pvr. vesicatoria****

*Xanthomonas campestris* pathovar *vesicatoria* (XCV), a bacterial pathogen of tomato and pepper plants, secretes xanthan, a high molecular weight gum that is widely used as a food additive. XCV also deposits in its cell wall the yellow pigment xanthomonadin which functions as an antioxidant and might also find commercial application. We assessed the effects of three culture media on production by XCV of total harvested biomass (weight of xanthan plus cells) and on abundance of XCV cells and xanthomonadin in aqueous suspensions prepared from that biomass, utilizing absorbance at 600 and 443 nm, respectively. Green bean agar (GBA) favored the production of xanthan over the production of cells and xanthomonadin. Xanthomonadin production per Petri plate was 4.0 times greater on tryptic soy agar and 5.3 times greater on *Pseudomonas* agar F than on GBA.

## **86. Derek Nance, Amy Green, and Justin West**

**Murray State University**

**Mentor: Chris Trzepacz**

### ***Screening Out the SPAM: Using Suppressor Genetics to Identify Novel Effectors of Fertility***

The biology and genetics of the nematode *C. elegans* makes it an attractive model organism for elucidating complex biological systems. For example, in many organisms the production of oocytes and sperm depends upon interactions between germline and somatic gonadal tissues. PAM-1, the *C. elegans* paralog of the human puromycin sensitive aminopeptidase, mediates a signaling pathway that participates in stimulating oocyte maturation. Mutations in *pam-1* result in a reduced brood size and a dramatic increase in embryonic lethality. PAM-1 and its paralogs are conserved throughout eukaryota and participate in numerous signaling pathways. However, identification of the other components of these pathways has remained elusive. We have initiated a genetic suppressor screen to isolate and identify novel components of the PAM-1 signaling pathway. In several separate experiments, we have mutagenized over 90,000 nematode genomes and have screened the F2 generation of the mutagenized animals for alleles that suppress the *pam-1* phenotype and result in a healthier and more fecund worm. From these screens we have isolated several suppressor alleles. Using classical genetic mapping techniques we have mapped one of these alleles, *spam-1(akr1)*, to the right terminus of chromosome IV. We predict that these suppressor alleles represent novel genes in the *pam-1* signaling pathway, and that identification of these suppressor alleles will provide some insight into the mechanisms that govern fertility in both *C. elegans* and humans.

## **87. Amanda Neace**

**Northern Kentucky University**

**Mentor: Timothy Murphy**

### ***The Meaning of Community: An Ethnographic Study in the Commonwealth***

My ongoing ethnographic study concerns the meaning of community in the Commonwealth of Kentucky. To complete a holistic analysis of the subject, I apply the research methods of anthropological participant observation, historical investigation, interviewing, and surveying. The examined community is a small, politically unincorporated neighborhood in Boone County, Kentucky, with roots tracing back to a settlement date in 1813. Located along the banks of the Ohio River and originally established for water transportation, the hamlet has literally risen and fallen in reverse correlation to the river, enduring a variety of weather-related disasters and economic near-collapse. Despite these crises, today the neighborhood is thriving due to local and national preservation efforts and a country charm that attracts tourism. Historical and contemporary perspectives of the meaning of community and how it influences individual behavior, the role of the environment in neighborhood development, the relationships formed between communities that make them interdependent, and the economical ties and variables that create settlements are at the core of this study. My project goal has been to discover the meaning of community in a town that has fought against the odds and survived the devastating forces of nature and economic loss.

## **88. Landon Oakes**

**Western Kentucky University**

**Mentor: Vladimir Dobrokhoto**

### ***Development of Nanospring-Based Device for Quick Remote Diagnostics by Analysis of Chemical Compounds in Human Breath***

As human breath analysis further develops as a multi-disciplinary field, it is clear that sensor development, instrumentation systems and algorithms play critical roles within this research area. Although much emphasis in the last decade has focused on breath biomarker compound identification and physiological relevance, we increasingly turn our attention towards portable, fieldable sensor platforms for non-invasive breath monitoring. In the human body the lungs have an intimate relationship with the blood: as a result, many volatile compounds from all over the body can be found in the breath. Because of that people with cancer, asthma, and many other diseases carry trace amounts of distinctive biomarkers in their breath. Exhaled breath is an ideal non-invasive medium for any diagnostic test. It is more convenient, efficient and cost-effective than blood and urine-based testing systems, allowing real-time or near-instantaneous results delivered at the point of need. Unlike blood, urine and other bodily fluids, exhaled breath is readily available for non-invasive sampling on a continuous basis. In many ways, breath-based testing is superior to conventional blood and urine sampling. The research was devoted to the design of an advanced chemical sensor (electronic nose) based on the novel nanomaterials – nanosprings. The device is able to determine the concentration of wide variety of chemical species especially volatile organic compounds (VOCs) – biomarkers of diseases, analyze the data using a recognition scheme, make a decision about the diagnosis, and send a corresponding signal with the condition and location of a patient to the doctor's office.

## **89. Justin Parrish, Trent Murdock, Kyle Overbey, Joshua Scott, William Scott Coleman, Robert Stuard, Josh Miller, and Wes Steele**

**Murray State University**

**Mentors: David Ferguson, Robert Miller, Robert Hill, Whitney Peake, William Bailey, and Iin Handayani**

### ***Plant Breeding, Pest Control, and Remote Sensing to Improve Dark Tobacco Production***

#### ***Study 1: Evaluation of Dark Fire-cured and Dark Air-Cured Tobacco Varieties***

The variety trials at Murray State University are part of a larger tobacco breeding program for the states of Kentucky and Tennessee. The main emphasis of the breeding program is to incorporate disease resistance into new varieties or hybrids and to restore the leaf quality to these new varieties to a level currently found in the older popular disease susceptible varieties. Two experiments will be analyzed to compare differences between tobacco varieties, hybrids or other tobacco genotypes. The first experiment was to compare the dark varieties or hybrids that were fire-cured. The fifteen dark-fired varieties or hybrids were: KT D4, KT D8, DT 538, ms D 2405, NL Madole, PD 319H, ms D 2404, PD 7309, TR Madole, PD 7312, KY 171, VA 309, KT D6, PD 7302 and PD 7318. The second experiment was to compare the dark varieties, hybrids and new genotypes that were air-cured. The genotypes were tested in the air-cured experiment first to eliminate variation in leaf quality sometimes caused by variances in the fire-curing process. The fifteen dark air-cured varieties, hybrids or genotypes were: KT D8, PD 7309, KT D6, ms D 2601, NL Madole, PD 319H, VA 359, Little Crittenden, KY 171, DT 538, PD 7312, KT D4, PD



*Parrish, Murdock, Overbey, Scott, Coleman, Stuard, Miller, and Steele Cont'd.*

7302, PD 7318, ms D 2602. For these experiments, the tobacco was transplanted into their respective plots on June 9th and June 10th, 2009. The dark fired-cured and dark air-cured were harvested on October 5th and October 12th, 2009, respectively.

***Study 2: A Comparison of Safety and Effectiveness of Two Insecticides for Dark Tobacco***

In cooperation with the University of Kentucky, Murray State University set 32 test plots of dark tobacco June 9 - 10 to determine the effectiveness and safety of two new tobacco insecticides set to enter the market. The tobacco hornworm and budworm can be devastating to tobacco plants if proper measures are not taken for their control. Numerous insecticides are available for their control; however, the search continues to find a safer chemical that will advance protection of the plants. Novaluran, produced by Chemtura, is an insect growth regulator being tested to determine phytotoxicity on the following varieties at different levels: PD 7318LC, NL Madole, and KY 171. A randomized complete block design is used with four replications and four treatments, including an untreated check and Novaluran applied at a rate of 9, 12, and 24 ounces per acre. The first two applications were sprayed at 15 gallons per acre and the last 3 applications were sprayed at 30 gallons per acre. With regards to testing Coragen, randomized complete block design was used again with four replications and four treatments including: Coragen at 3.5 and 5.0 ounces per acre, a local standard of Orthene and Belt, and an untreated control. Two applications were made on July 1 and August 18. Once the tobacco is stripped and weighed, data will determine whether the hypothesis that Coragen provides better insect control, supplies longer persistence, and is safer for the environment and the applicator, can be supported.

***Study 3: Normalized Difference Vegetative Index (NDVI) in Tobacco as Affected by Nitrogen Fertilizer Rates***

Nitrogen (N) is well known for being the primary nutrient for tobacco growth and production. Therefore, the study of N fertilizer effects on dark-fired and burley tobacco yields needs to be performed. Recently, limited research has been done to determine the impacts of N applications on NDVI (Normalized Difference Vegetative Index). NDVI is commonly used to measure plant health and vigor. In this study, GreenSeeker is used to determine the NDVI. GreenSeeker emits and captures infrared and near infrared beams of light that measure the color of crop plants, then delivers, in a fraction of a second, the amount of fertilizer needed for maximum yield. Therefore, the objective of this study is to observe NDVI from GreenSeeker under various N rates applied to burley and dark-fired tobacco. The tobacco used in this experiment was transplanted on June 9 and 10, 2009. The varieties were PD7318 dark and TN90 burley. Phosphorus and Potassium were applied prior to transplanting. Nitrogen fertilizer (34-0-0) was applied on June 15th. The N treatments were as follows: Treatment 1: control plot (no N application), Treatment 2 (100 lbs N/acre), Treatment 3 (200 lbs N/acre), Treatment 4 (300lbs N/acre), and Treatment 5 (400 lbs N/acre). Each treatment has four dark-fired tobacco and four burley tobacco plots. NDVI data from GreenSeeker was collected on July 7, 15, and 22, 2009. Results from this experiment will be discussed in the poster.

## **90. Trisha Patel**

**University of Louisville**

**Mentor: Stanley D'Souza**

### ***Arsenic Exposure Increases IL-8 Expression and Leukocyte Transmigration in Endothelial Cells***

Chronic arsenic exposure through contaminated drinking water is a worldwide health problem. In several recently published studies, mice exposed to inorganic arsenic (1- 10 ppm) via drinking water showed an increase in atherosclerotic lesions along the aortic tree that contained high amounts of leukocytes. Organic arsenic (Monomethylarsonous acid, MMAIII), a metabolite generated from inorganic arsenic, is highly toxic at lower concentrations in cultured cells. To determine the potential mechanism by which arsenic induces an increase in leukocyte accumulation in the atherosclerotic lesions, we hypothesized that arsenic exposure compromises the permeability of the vasculature, thereby increasing the transmigration(TM) of leukocytes through the Endothelial Cells (EC). Initially, we determined the viability of EC at various concentrations of MMAIII. Our results indicated that MMAIII exposure at higher concentrations (1-2nM) resulted in greater levels of cell toxicity, while at lower concentrations (0.25-0.5nM) EC were less affected. EC were exposed to MMAIII (0.25nM-1nM) for 0-48h. The levels of interleukin-8 (IL-8), a chemokine known to increase the permeability of EC, were measured by ELISA. Leukocyte TM was assessed using a transwell assay. An increase in IL-8 levels was found. Post 24h the IL-8 levels for the control was 268pg/mL, at 0.5nM it was 320 pg/mL ( $p \leq 0.78$ ) and at 1nM it was 445 pg/mL ( $p \leq 0.15$ ). A dose-dependent increase in leukocyte TM through EC exposed to MMAIII was observed. Post 24h, at 0.25nM there was a 0.52 fold increase ( $p \leq 0.03$ ), while at 0.5nM there was a 0.97 fold increase ( $p \leq 0.01$ ), and most dramatically at 1nM there was a 1.43 fold increase ( $p \leq 0.01$ ) in TM. Based on the compilation and analysis of the above results, we concluded that MMAIII exposure to EC resulted in vascular dysfunction leading to an increase in TM of leukocytes, which may be in part due to an increase in IL-8 induction.

## **91. Sarah Peddie and Kristen Ruga**

**Murray State University**

**Mentor: Rachel Allenbaugh**

### ***Synthesis and Characterization of Potentially Liquid Crystalline 3,6-Phenanthrenedicarboxamide Derivatives for Use in the Analysis of Metallophilic Interactions***

The LCD or liquid crystal display has become a ubiquitous component of any computer system and has prominently replaced the cathode ray tube in the modern television. By researching methods of designing liquid crystalline (LC) molecules and new ways of predicting and controlling their self-assembly, new and improved LC materials may be prepared. A LC mesophase is an intermediate phase between a three-dimensionally ordered crystalline solid and a completely disordered isotropic liquid. LC mesophases flow under pressure. The fluid behavior of the LC mesophase allows the material's orientation to be manipulated by an external magnetic or electric field. This is how the pixels in an LCD TV are switched on and off. This research focuses on studying a specific kind of interaction in LC phases; the metallophilic interaction. A metallophilic interaction occurs when closed-shell or pseudo-closed-shell metal complexes like Au(I), Pd(II), or Pt(II) stack very close together so that the metal-center electrons are in electronic communication. Having already synthesized metallophilic Pt(II) complexes in the group, we will present the syntheses of completely organic 3,6-phenanthrenedicarboxamide

*Peddie and Ruga Cont'd.*

derivatives. These control molecules have the same general size, shape, and rigidity as the Pt(II) complexes, but they cannot form metallophilic interactions. Their analysis therefore presents a vital control for the use of metallophilic interactions for the ordered self-assembly of liquid crystals. The liquid crystalline behavior of these control molecules will be compared to that of the Pt(II) complexes and analysis of the ordering via differential scanning calorimetry and optical microscopy will be presented.

## **92. Andrew Preston and Marika Wieliczko**

**Eastern Kentucky University**

**Mentor: Nathan Tice**

### ***Organometallic Pyridazine Complexes for Electronic Materials Applications***

Due to their unique properties including environmental stability, high processibility, and low production cost, organic-based electronic materials that contain heterocycles are an attractive alternative to conventional inorganic semiconductors. One such class of heterocycles, pyridazines (6-membered aromatic rings containing two adjacent nitrogen atoms), represents an alluring building block for electronic materials due to their ease of synthesis and stability. However, very little is known about the materials properties of pyridazines or the feasibility of incorporating pyridazines into electronic devices. Our current investigation focuses on the transition metal chemistry of pyridazines, namely, the formation of a fused-ring pyridazine complex bound  $\eta^5$  (eta-5) to a metal through a Cp moiety. By including a transition metal into the pyridazine, we hope to create hybrid materials which blend the synthetic versatility of organics with the novel structural and electronic properties that inorganic moieties possess. We have found that due to the relative instability of the free pyridazines, the formation of the more stable cymantrene complexes  $[\text{Mn}(\text{CO})_3\{\eta^5\text{-1,2-C}_5\text{H}_3(1,4\text{-}(\text{R})_2\text{N}_2\text{C}_2)\}]$ , is best accomplished from a 1,2-diketo precursor,  $[\text{Mn}\{\eta^5\text{-1,2-C}_5\text{H}_3(\text{COR})_2\}(\text{CO})_3]$  (R= 4-ClPh, 4-MeOPh, 5-BrTp). Reaction of these 1,2-diketo cymantrenes with excess hydrazine under mild conditions (room temperature) afforded the desired pyridazine complexes in good yield (65-83%). These complexes display high solid state stability in air and relatively good stability in solution. The analogous ring-closure transformation was also observed on  $\text{Re}(\text{CO})_3$  substrates, with the formation of  $[\text{Re}(\text{CO})_3\{\eta^5\text{-1,2-C}_5\text{H}_3(1,4\text{-}(5\text{-ClC}_4\text{H}_2\text{S}))_2\text{N}_2\text{C}_2\}]$  in moderate yield (52%). This poster will discuss the synthesis and characterization of various pyridazine complexes and their potential role in next generation electronic materials.

### **93. Sara Ratliff**

**Eastern Kentucky University**

**Mentor: Darrin Smith**

#### ***Chemical Analysis of Cosmetics to Determine Possible Health Risks***

The Environmental Working Group (EWG) has created an online database where consumers can search for specific brands of cosmetics and find a hazard rating for each cosmetic and a list of potentially toxic compounds. To ensure the credibility of this database that is trusted by so many consumers, chemical analysis was performed on certain cosmetics. Using gas chromatography mass spectrometry (GC/MS) and high performance liquid chromatography (HPLC) with spectroscopy detection, two common cosmetics used by consumers, foundation and lipstick, were analyzed for compounds that are considered toxic by the (EWG) database. These techniques separate the individual compounds that constitute a cosmetic sample and the resulting chromatograms contain peaks at specific retention times that represent a specific compound. Utilizing mass spectrometry makes it possible to derive the molecular weight and structure of each compound. The selected samples were screened for the following compounds of interest: methylparabens, phthalates (dibutyl-, dimethyl-, and diethyl-), and propylene glycol. After screening, any compounds present in the sample were further analyzed quantitatively. An additional avenue of this project was to compare organic cosmetic brands to non-organic brands to see if a natural alternative of cosmetics is less hazardous to a consumer's health. These organic brands were tested using the same instrumentation and for the same compounds. This research stresses the need for consumers to individually research products in order to make wise purchasing decisions.

### **94. Rachel Reetzke and Maggie Roe**

**Western Kentucky University**

**Mentor: Dana Bradley**

#### ***Analyses of Health Care Centers***

#### ***Study 1: A Cross-Cultural Comparative Study of Autism Spectrum Disorder (ASD): Lessons Learned From Comparing a Chinese and American Autism Treatment Center***

The purpose of this study was to glean a better understanding of Autism Spectrum Disorder (ASD) in the Chinese and American culture through a comparison of two Autism Spectrum Disorder treatment facilities. This work is based on observations and interviews conducted at The Kelly Autism Program (KAP), in Bowling Green, Kentucky and The Chengdu Autism Training Center in Chengdu, China. Over a two month period, 30 participants ranging from ages 2-7 were observed and key administrative informants were interviewed. Diagnosis and treatment protocols were analyzed and additional information on prevalence and awareness were noted to better understand familial and professional views of ASD in Chinese and Western culture. Through this cross-cultural comparative study, diagnostic measures were found to be similar among the Chinese and Western culture. However, the program structure and overall knowledge of the disability, was very different. Chinese knowledge and reporting measures of autism vary significantly from those found in the West. Similarly, training and education efforts appear to be more uniform and standardized in the US as well. According to the Centers for Disease Control and Prevention, accurate reporting of Autism Spectrum Disorders over time and from different communities can help answer the question: "Is their variability in autism spectrum disorders in different areas of the country or in different groups of people?" This study of autism spectrum

*Reetzke and Roe Cont'd.*

disorders (ASD) lays the groundwork for future studies by highlighting the need to develop uniform reporting and training mechanisms for ASD in different areas of the world.

***Study 2: Adapting to Aging in Place: An Assessment of Residential Living Facility Residents' Physical Activity Program Expectations.***

With almost 1 in 20 residents of Kentucky expected to be over 60 by 2020, aging in place has taken on a new urgency. Consider the case of Village Manor, a medium sized independent retirement community in rural Kentucky. When the community was built in the late 1980's, designers did not anticipate residents' long term physical activity needs. In order to meet the needs of current and future residents, both resident physical activity levels and their expectations were examined. The Physical Activity Scale for Elderly (PASE) was administered (n = 96) to develop a profile of current physical activity. Three focus groups were held to develop themes relating to residents' current physical activity program desires. Results showed that compared to the theoretical physical activity recommendations for this age group (mean age = 88; 64-98), resident's current activity levels were less. At the same time, their desires for specific physical activity programs (type, length, intensity) were not being met. Focus group participants were asked to discuss barriers to exercising and to brainstorm about ways in which their residence could be adapted which might lead to increased physical activity. This poster concludes with recommendations for fitness area enhancement to increase the likelihood of Kentucky older residents meeting nationally recognized physical activity levels.

## **95. Garrett Ridge**

**University of Louisville**

**Mentors: Olfa Nasraoui and Nurcan Durak**

***Principal Curve Extraction from Solar Images***

Astrophysicists currently study NASA's extensive databases of solar satellite images, in part because these images provide valuable data about solar events such as coronal loops. They lament that a lot of time is wasted sifting through these databases in order to find the images with interesting coronal loops. Our project automates the process of loop identification, using a computer algorithm to locate all shapes within an image that resemble pieces of ellipses. Our main challenge was that loop pieces are more easily distinguished by the human eye than by a computer in these usually cluttered solar images. Since only the principal coronal loops are desired, they are found by automatically tracing curves in an image as they fade in and out along their length, correctly following them even as they overlap with other curves, and finally delivering only the smoothest, most prominent curve segments as output. The proposed method successfully discovers the full length of coronal loops in real solar images. Our algorithm promises to accelerate the search for relevant data which can in turn support astrophysicists in various scientific analyses related to the coronal heating problem and solar weather prediction. This can in turn accelerate the science return from NASA's missions related to studying the Sun as a star.

## **96. Erica Riley, Kristi Adair, Harry Anderson, Ashley Driver, Emily Morris, and Ashley Winkler**

**Murray State University**

**Mentor: Bommanna Loganathan**

### ***Environmental Monitoring of Bee Creek and Clarks River, Kentucky***

Rivers and streams provide drinking water, attenuate flood waters, assist in maintaining biodiversity and offer recreational opportunities to our society. Water quality monitoring is essential in maintaining these resources. Western Kentucky has abundant water resources supporting a variety of ecosystems. These aquatic environments are impacted by multiple stressors associated with human activities. Several streams and rivers in this region are not thoroughly monitored. This poster presents monitoring data of conventional parameters measured in selected locations in Bee Creek and Clarks River. Four sampling locations including upstream Clarks River (F-91), downstream Clarks River (F-29), upstream Bee Creek (F-256) and downstream Bee Creek (F-255) were identified and monitored. Approved protocols were used to measure temperature ( $^{\circ}\text{C}$ ), dissolved oxygen (ppm), pH, conductivity ( $\mu\text{S}$ ), total dissolved solids (mg/L), water flow measurements ( $\text{m}^3/\text{s}$ ), soluble reactive phosphate (ppm) etc. The results revealed that (i) in general conductivity of down stream Bee Creek waters was higher than Clarks River sites. (ii) Conductivity of down stream of Bee Creek waters exhibited approximately three times higher than that of upstream Bee Creek waters, suggesting possible inorganic ions are input from a wastewater treatment plant, (iii) concentrations of soluble reactive phosphate varied with locations and dates of sampling, (iv) No abnormal levels of dissolved oxygen or pH were observed. This study was conducted at these sites in the fall 2009 as part of a service learning component for a course in analytical chemistry at Murray State University.

## **97. Christopher Robards and Tin Nguyen**

**Murray State University**

**Mentor: Andrew Kellie**

### ***Three Dimensional Modeling of Kentucky Oil Fields***

The purpose of this research is to prepare realistic three dimensional models of four Kentucky oil fields in order to develop a general understanding of the subsurface of the Illinois Basin. The research attempts to define work flow procedures and graphic techniques required to produce three dimensional oil field models. Work flow includes hardcopy digitizing, data testing and verification, and the use of different graphic modeling methods (filled contour maps, wireframe and draped wireframes, surface models, and vector models) to show the subsurface. The resulting graphics show morphology of the individual oilfields, and use of a common coordinate system provides a means of illustrating the spatial relationship between the fields. Finally, investigation of surface analogs has facilitated the use of realistic color (hue, value and chroma) in models developed for the basin.

## **98. De'Andra Robertson**

**Kentucky State University**

**Mentors: Avinash Tope and Phyllis Rogers**

### ***Prevalence of Obesity Linked Metabolic Syndrome in Young Adults in a College Setting***

Ethnic disparities in the prevalence of obesity continue to exist. African Americans (AA) continue to report higher rates for obesity than any other ethnic group. Overweight and obesity are linked to greater risk for Metabolic Syndrome (MtS), a cluster of chronic and serious diseases that include a high body mass index (BMI), diabetes, hypertension and lipid imbalance that overburden the health care system. With more than 2/3 of KSU students being AA young adults (18-24), KSU Land Grant Program's Nutrition and Health Research, the Teaching Faculty and the local Health Department collaborated together to address the risk for MtS in the student population with an objective for an early detection and intervention. SHAPE UP KSU, an integrated project involving freshmen students was launched in the fall of 2009 at KSU. Freshmen students (n=149) were recruited and clinical evaluations were performed. Following indicators of MtS were analyzed: 1. Body Mass Index, 2. Fasting sugar, 3. Total Cholesterol, 4. Good Cholesterol (HDL) and 5. Bad Cholesterol (LDL). Approximately 44% (n=27) of the participants were found to have MtS. Starting with freshmen, students will be tracked through their stay in the college and those identified with MtS will be offered nutrition and life style related counseling. These partnerships with local and national resources could be used as a 'model' for many other institutions of higher education, especially for other Historically Black Colleges and Universities (HBCU).

## **99. Eron Roy**

**University of Louisville**

**Mentor: Thomas Mitchell**

### ***Insights into the Potent Immunogenicity and Low Toxicity of the Vaccine Adjuvant Monophosphoryl Lipid A***

The pro-inflammatory cytokine IL-1 $\beta$  is involved in the pathogenesis of several inflammatory diseases and conditions including atherosclerosis, autoimmune arthritis, myocardial infarction, septicemia, stroke, and ulcerative colitis. Synthetic Monophosphoryl Lipid-A (sMLA) containing compounds have been shown to reduce or inhibit such inflammatory events where IL-1 $\beta$  plays a central role. Edgar Ribic discovered in the 1970's that MLA structures, retained the immunostimulatory properties of its *parent* biomolecule LPS and was less than 0.10% as toxic. Since Ribic's discovery much has been learned about MLA-containing compounds, which have been successfully implemented in vaccines as a part of their adjuvant profile. Small changes in the sMLA chemical structure can alter the kinetics and signaling outcomes of the TLR4 receptor complex. TLR4 uses MAL/MyD88 to induce the production of pro-inflammatory cytokines and TRAM/TRIF to induce the production of some immunostimulatory factors. Previously our lab has shown that sMLA like compounds differentially activate the TRAM/TRIF branch of the TLR-4 signalling pathway, leading to high expression of immunostimulatory cytokines, with low inflammatory consequences. This study focuses on characterizing cytokine transcript and protein levels in BM-DC's during response to sMLA and synthetic diphosphoryl lipid-A, a purified lipid-A subunit of E. coli. We also show that treatment with sMLA leads to the inability of BM-DC's to produce mature IL-1 $\beta$  cytokine. Currently we are using immunofluorescence confocal microscopy in order to gain further insights on IL-1 $\beta$  loss by investigating components of the inflammasome complex responsible for forming mature IL-1 $\beta$  cytokine, as well as IL-1 $\beta$  itself.

## **100. Melinda Rucks and Natosha Mulholland**

**Western Kentucky University**

**Mentor: Cathleen Webb**

### ***The Bio-accumulation of Mercury in Bat Hair in Kentucky/Tennessee National Parks***

Mercury (Hg) is a persistent neurotoxin that is easily transported through the karst aquifer systems; for example the South Central Kentucky Karst (SCKK) ecosystem, which includes the Mammoth Cave National Park (MCNP) area. The largest source of mercury to MCNP is atmospheric deposition, largely produced by coal-fired power plants. Hg from the atmosphere deposits in rivers, sediments, and organisms through rain, wind and bio-accumulation. Our project has expanded to three other national parks in the Kentucky and Tennessee areas including Abraham Lincoln, Cumberland Gap, and Big South Fork National Parks. Over 350 individual bat hair samples have been analyzed for Hg from these four areas with a wide diversity in species. Hg levels in hair of different bat species, including federally listed endangered species have been determined and found to range between 1-13 ppm. In addition to bat hair several guano samples have been analyzed for mercury and found to be within 0.0030 ppm to 0.9470 ppm. Through the past year our research has expanded to analysis on insects to gain further insight regarding how Hg bio-accumulates in bats through the food chain. Mercury analysis has also been completed on several sediment and fish tissue samples. Quality analysis and quality control tests were done using human hair reference samples.

## **101. Katherine Rush**

**Western Kentucky University**

**Mentor: Priscilla Baker**

### ***Landfill Contaminant and Fluorescent Dye Interference Project***

Tracing using fluorescent dyes is a practice used to map the flow of groundwater, using dyes that fluoresce at known wavelengths of light. The two particular dyes tested in this project were eosine and sulphorhodamine B. When using fluorescent dyes in a chemically diverse environment, such as a landfill or other contaminated situation, they will occasionally exhibit a fluorescence point lower than is scientifically acceptable. For example, in one particular landfill trace, the dye peak of eosine was found at 523.2 nm, 12.8 nanometers below eosine's typical fluorescence. This degradation of fluorescence was hypothesized to be caused by a chemical reaction between the eosine and a contaminant that permanently changed its chemical structure. Three substances were chosen to test against both dyes: trichloroethylene, hydrogen peroxide, and bleach. These tests were intended to determine if these substances reacted with the dyes to such an extent that their fluorescence could no longer be detected and/or quantified. The experiment showed that in the case of hydrogen peroxide, samples showed a decrease in the concentration of dye over time. Since hydrogen peroxide is used in groundwater remediation, this evidence would recommend not using these two dyes in an area where remediation has taken place.



## **102. Jenna Shapiro**

**University of Kentucky**

**Mentors: Samantha Meenach, J. Zach Hilt, and Kimberly Anderson**

### ***Magnetic Hydrogel Nanocomposites for Combined Chemotherapy and Hyperthermia Treatment of Cancer***

Chemotherapy and radiation are conventional cancer treatments that are still limiting for some types of cancer, despite their widespread use. Hyperthermia, the heating of cancerous tissues to 40-45°C, has shown to increase the efficacy of both chemotherapy and radiation. For example, hyperthermia treatment has been shown to increase the effectiveness of paclitaxel, a chemotherapeutic that disrupts mitosis. We hypothesized that magnetic hydrogel nanocomposites could be used for a dual-therapy application to treat cancer. Hydrogels are three-dimensional cross linked polymers that swell in water. Poly(ethylene glycol)-based hydrogels were fabricated with magnetic nanoparticles incorporated in the hydrogel matrix. These nanoparticles can be remotely heated by an alternating magnetic field (AMF), thus producing the hyperthermia effect from the hydrogel nanocomposite. When imbibed with paclitaxel, the hydrogels have the potential to provide synergistic heating and chemotherapy in a local area. Swelling analysis indicated an inverse relationship between temperature and volume swelling ratio (Q), and between crosslinking density and Q. AMF heating of the hydrogel nanocomposites indicated higher crosslinked hydrogels exhibit a greater change in temperature, due to a larger magnetic-nanoparticle-to-gel volume ratio. Hydrogels with lower crosslinking densities exhibited an overall faster release of paclitaxel due to increased effective diffusivity. Hyperthermia studies have demonstrated that these hydrogel nanocomposites can be remotely heated, causing an increase in cytotoxicity for M059K glioblastoma cells. Current studies are focusing on the cytotoxicity effect of combined hyperthermia and paclitaxel release.

## **103. Elizabeth Shelley**

**Northern Kentucky University**

**Mentor: Hazel Barton**

### ***Decontamination Strategies to Stop the Spread of White-Nose Syndrome***

Since 2006, White-Nose Syndrome (WNS) caused by the fungus *Geomyces destructans* has been decimating hibernating bat populations in caves in the Northeastern US, including the endangered Indiana (*Myotis sodalists*) and Gray (*Myotis grisescens*) bat populations. The epidemiology of *G. destructans* suggests that the fungus may be transmitted from cave to cave by the ropes and equipment used by cavers, or from bat to bat by bat researchers. We therefore focused on finding a protocol for disinfecting caving equipment by testing the efficacy of readily available household cleaning agents and organic compounds in killing fungal spores using three different assays: 1) a disk diffusion assay; 2) a germination assay; and 3) a growth assay. To avoid using the pathogenic *G. destructans*, we substituted the closely related species *Geomyces pannorum*. Our work suggested that washing equipment with a surfactant, such as Woolite, was critical to removing clays and muds that inhibit the functioning of disinfectants, followed by disinfection with 10% bleach or a 0.1% quaternary ammonium compound (Formula 409) for 10 minutes. We subsequently tested our protocol on climbing ropes and other safety equipment, subjecting these materials to strength tests to determine the risk of structural damage from the protocol. To identify compounds that would target *Geomyces* species without harming the normal fungal populations that grow in the caves, we tested these compounds against the unrelated *Penicillium pinophilium* and *Aspergillus brasiliensis*; those cleaning reagents that killed

*Shelley Cont'd.*

the *Geomyces* spores but had no significant effect on other species were tested further. Our results demonstrated effective and easily performed protocols for decontaminating *G. destructans* from the equipment of cavers and bat researchers, and they do not require a background in microbiology. Our recommendations have been incorporated into the US Fish and Wildlife Service WNS decontamination protocols.

## **104. Justin Shelton and Irina Vorobyeva**

**Northern Kentucky University**

**Mentors: Yi Hu, Alina Campan, and James Walden**

### ***An Effective Log Mining Approach for Database Intrusion Detection***

Database is a critical component of today's Web applications. Web applications permit users to remotely access sensitive data such as business transactions, personal financial information, and medical records. Organizations expend significant resources securing the network perimeter and servers. However, these mechanisms are not sufficient for protecting databases. We present a new technique for identifying malicious database transactions. Compared to many existing approaches, which profile SQL query structure and database user activities to detect intrusions, the novelty of this approach is the automatic discovery of essential data dependencies, namely, multi-dimensional and multi-level data dependencies, for identifying anomalous database transactions.

## **105. Kaira Simmons**

**Northern Kentucky University**

**Mentor: Rebecca Bailey**

### ***From Service Learning to Scholarship: The Cincinnati Fresh Air Farm History***

As part of a service learning class project, I helped develop a celebratory short film project about the Cincinnati Fresh Air Farm and subsequently helped draft a more formal historical narrative about the Farm's history. Research and development outside the classroom included working with community partners, examining local history documents, exploring primary documents from the Farm found in various archives, incorporating oral history video interviews conducted specifically for the project, using digital movie-making software, walking the grounds of the Farm, as well as the use of scholarly research resources and secondary sources. Transitioning from a celebratory film project to historical narrative, the story is an exploration of local history that also examines the Farm's account in a greater historical context. The Fresh Air Farm, founded by wealthy philanthropic female socialites of the Progressive Era, was a working manifestation of the reforms that focused on the health and wellbeing of the "deserving poor" of urban America. Its operations throughout the twentieth century paved the way for the facilities to still be managed today as an entity that continues to serve the good of the community under a different mission statement. The Fresh Air Farm's history exemplifies the importance and viability of sometimes retrospectively marginalized Progressive Era reform efforts.

## **106. Chelsey Smith**

**Western Kentucky University**

**Mentor: Mary Moore**

### ***The Effect of a Three Point Sensory Diet on Vocal and Verbal Behavior in a Non-Verbal Child on the Autism Spectrum***

The study involved a single subject, a non-verbal child on the autism spectrum, in a clinical setting over a 22 week period. The subject was on a sensory diet that was administered before therapy sessions. The tactile, vestibular and proprioceptive systems were targeted with deep pressure touch, a suspension swing, and joint compression. The primary focus was on participation in therapy and language development with specific attention given to the enhancement of vocalizations and/or verbalizations. The child experienced the sensory diet for schedule of 1 week off, 2 weeks on, 1 week off, 3 weeks on, 1 week off and 2 weeks on the 10 weeks. For the next 12 weeks a 2 weeks off, 2 weeks on, 1 week off, 4 weeks on, 2 weeks off, 1 week on schedule was followed. A student speech-language pathologist is assigned to plan, direct and work with the client for one hour twice a week for twelve weeks. A researcher observed to document data and oversee progress. From this study, positive efficacy of sensory integration therapy was seen in direct relation to an increase in vocalization/verbalization as well as being more engaged in the therapy session and in daily life.

## **107. Tasia Smith**

**Kentucky State University**

**Mentors: Changzheng Wang, Cecil Butler, Lingyu Huang, and Steven Mims**

### ***Water Phase Salt Content of Smoked Paddlefish Meat was Affected by the Rotating Speed of the Tumbler Used for Brining***

According to the regulations of the Food and Drug Administration, smoked fish need to contain a minimum of 3.5% water phase salt to ensure the water activity of the product is low enough to inhibit the growth of *C. botulinum*. The objective was to determine the effects of rotating speed of the tumbler used for brining on the water activity and water phase salt content of smoked whole paddlefish. Three paddlefish each were brined for 1 hr in a 15% salt solution in a vacuum tumbler that was rotating at 1, 5 or 10 rotations per minute. At the end of the brining, fish were rinsed in tap water and left to dry at 4<sup>o</sup> C overnight. They were hot smoked until the internal temperature reached 145<sup>o</sup>C for 30 min. After cooling down in a refrigerator, the smoked fish were vacuum-packed and stored at -20C before analysis. The smoked meat was homogenized in a grinder. Two gram samples were soaked in distilled water for two hrs. The supernatant was used for salt analysis by a salt analyzer. The water activity of fish brined with higher rotating speed was lower and the water phase salt content was higher than fish brined with rotating speed at 1 rotation per min. The fish texture was not adversely affected by rotating speed up to 10 rotations per minutes. These results indicate that whole paddlefish could be brined in vacuum tumbler rotating at up to 10 rotations per minute. Rotation of the tumbler helped the meat to absorb brine solution to assure adequate salt content in the smoked paddlefish products.

## **108. Tiffany Smith**

**Morehead State University**

**Mentor: Sarah Hawkins**

### ***The Effects of Embedded Instruction on Teaching Statewide Pre-Kindergarten Learning Standards to Children with Significant Disabilities within Inclusive Preschool Classrooms***

This project shares the results of a series of single subject studies that assessed the effects of a linked system on the attainment of pre-kindergarten standards by children with significant disabilities. Teachers in inclusive public preschool classrooms implemented authentic assessment strategies, selected individualized objectives, embedded objectives in classroom activities, and monitored children's progress. The results show that: a) teachers can reliably teach children with significant disabilities within inclusive classroom activities and b) the children can attain pre-kindergarten skills when: a) authentic assessment strategies are employed; b) effective individualized plans are developed; c) embedding consistently occurs; and d) instruction is monitored.

## **109. Guela Sokhadze**

**University of Louisville**

**Mentors: Ayman El-Baz, Tato Sokhadze, and Lonnie Sears**

### ***Autonomic Nervous System Dysfunctions in Children with Autism***

Many children with autism exhibit symptoms associated with autonomic dysfunction. The main findings of autonomic abnormalities studies in Autistic Spectrum Disorders (ASD) point to reduced baseline parasympathetic activity in association with evidence of increased baseline sympathetic tone. We investigated autonomic nervous system activity in 14 children with ASD (mean age 14.3 years) and 16 typically developing subjects (17.8 years). Physiological activity measures such as skin conductance level (SCL), heart rate (HR), HR variability (HRV), and skin temperature (SKT) were recorded during resting state with a C-2 J&J Engineering Inc psychophysiological monitor. Analysis of autonomic measures during 5 min long resting baseline revealed higher HR (95.6 beats/min in ASD vs. 80.8 beats/min in controls,  $F=7.98$ ,  $p=0.009$ ), higher SCL (7.4 microSiemens vs. 4.3 microSiemens in controls,  $F=4.49$ ,  $p=0.043$ ), and a tendency ( $p=0.068$ ) to reduced respiratory sinus arrhythmia reflected in lower power of high frequency (HF) component of HRV in autism. High basal tonic electrodermal activity (SCL) and accelerated HR in association with lower HRV index found in children with autism are indicators of excessive sympathetic and reduced parasympathetic activation in ASD resulting in a limited psychophysiological flexibility. Beside comparison of autonomic measures between autism and control groups we investigated changes in autonomic activity during a repetitive magnetic transcranial stimulation (rTMS) course in the same children with autism. Post-rTMS measurements showed a decrease of low frequency (LF) component of HRV without statistical changes in HR, SCL, and SKT. Assessment of autonomic balance in autism is important for understanding neurobiological mechanisms of this neurodevelopmental disorder.

## **110. David Day Song**

**University of Louisville**

**Mentor: Claudio Maldonado**

### ***Effects of Normothermia Versus Hypothermia on Serum Complement Activation and Cytokine Production During Simulated Cardiopulmonary Bypass***

It is well known that during cardiopulmonary bypass (CPB) surgery, serum complement is activated and can lead to a significant systemic inflammatory response, resulting in adverse effects to the patient. CPB is a procedure that involves the use of the Heart-Lung machine, which replaces heart and lung function while the heart is being repaired. As blood comes into contact with pump tubing and other foreign materials, the complement alternative pathway is activated and results in the production of two potent pro-inflammatory anaphylatoxins; C3a and C5a, which bind to their corresponding cellular receptors on monocytes and are thought to modulate the production of pro-inflammatory cytokines. In the course of CPB, the heart is intentionally arrested and the patient's temperature is lowered (cardioplegia) to decrease cellular metabolism to mitigate ischemia/reperfusion injury. Yet, a recent report using an *in vitro* model simulating sepsis has demonstrated that temperature modulates the production levels of inflammatory cytokines in whole blood. Contrary to popular belief, hypothermia (28°C) has been reported to actually increase pro-inflammatory cytokine production compared to normothermia (37°C) or hyperthermia (40°C), suggesting that hypothermia over-stimulates inflammatory cytokine production, which potentially have deleterious consequences in patients. To our knowledge the effects of hypothermia on foreign body complement activation and pro-inflammatory cytokine production in a simulated model of CPB has not been studied. Thus, the clinical question that I sought to answer was whether cardioplegia during CPB increased over-stimulation of pro-inflammatory cytokines promoting an inappropriate inflammatory response that is potentially harmful to patients.

## **111. Robert Stallard**

**University of Louisville**

**Mentor: Gamini Sumanasekera**

### ***Single-Walled Carbon Nanotubes as Infrared Detectors and Transparent Electrodes***

Single-Walled Carbon Nanotubes (SWNTs) have displayed their use in a variety of applications. One such application is infrared (IR) sensing by fabricating a bolometric device. SWNTs were grown directly (via Chemical Vapor Deposition (CVD)) on a Silicon/Silicon Oxide substrate across a narrow trench. SWNTs were then exposed to IR radiation and the electrical response measured. Specifically, resistance was plotted against time as the infrared source was activated and deactivated. A change in resistance greater than 1% was measured in response to the activation of the LED. Another application of SWNTs was explored by growing (via CVD) SWNTs on a quartz substrate with the goal of creating a transparent electrode. Because the existing technologies' electrical resistance is strongly affected by temperature, one measurement consisted of plotting resistance vs. temperature. As transparency is also important, the absorption of light was measured for a range of wavelengths. It was found that, metallic SWNTs resulted in a low resistance highly transparent (and yet still conductive) substrate where an increasing temperature resulted in increased resistance. Semi-conducting SWNTs resulted in a higher resistance substrate where the resistance actually decreased with an increasing temperature.

## **112. Stephanie Teater**

**Morehead State University**

**Mentor: Steve Chen**

### ***Understanding Students Fans' Motives and Expectations for Attending Athletic Events***

To identify effective strategies for enhancing student attendance in athletic events, this study examines the student fans' motives for attending athletic events and identifies their interests toward an incentive program that is designed for them. Three hundred thirty seven student fans (males =149, 44%; females = 188, 56%) of a southeast regional state university were surveyed during the last two 2008-2009 home games (n = 163) and from six randomly selected academic classes in March and April of 2009 (n = 174). A modified 62-item, five-point Likert scale survey questionnaire based on the studies of Beccarini & Ferrand (2006), McDonald & Shaw (2005), Pan and Baker (2005), and Chen, Salazar, & Fitzgerald (2009) was utilized to assess demographics, motives for attending athletic events, preferences toward incentive items, and willingness in participating in reward programs. The results indicated free admission, excitement of the game and social influences were all important game attending motivators. Bad weather and time-conflict were the key barriers that hindered student attendance. Significant differences were found in three of the four game attendance factors ( $p < .05$ ) and preference toward gift items based on different testing variables such as athletic status, traveling time for the events, and annual spending on athletic merchandises. In general, the results support previous studies' conclusions on the positive effects of incentives to increase student attendance. Practical strategies for increasing student attendance for athletic events were further addressed.

## **113. Jamie Testa**

**University of Kentucky**

**Mentor: Suzanne Segerstrom**

### ***Repetitive Thought and Depression in Older Adults: A Longitudinal Study***

Repetitive thought (RT) can have constructive or deconstructive consequences on mental health. For instance, negatively valenced RT is connected with higher rates of depressive symptoms. This study examined the relationship between RT qualities of valence (i.e., positive vs. negative) and topic (i.e., self-focused vs. other-focused) and depression in individuals over 60. Whether self- or other-focus affects depression more for older adults is unknown. On the one hand, depressed people give more self-focused responses than control groups, suggesting that RT about the self may be more important. On the other hand, socioemotional selectivity theory states that with aging, individuals will place a high priority on well-known social partners suggesting that RT about others, especially in older adulthood, may be more important. It was hypothesized that negative valence would correlate with higher depression within and between subjects. We also tested the interaction between valence and topic within and between subjects. RT ratings and Geriatric Depression Scale scores were collected from 167 participants up to 6 years (total=582) and subjected to multi-level modeling. More negative valence across waves associated with higher depression scores ( $\gamma = 1.24$ ,  $t(163) = 4.50$ ,  $p < 0.0001$ ). This effect was moderated by topic, such that valence had a stronger relationship with depression when the topic was about the self than when it was about others ( $\gamma = -0.82$ ,  $t(163) = -2.75$ ,  $p < 0.007$ ). When thoughts are self-focused, it may indicate a deficit in the individual in terms of attention to social relations or a small social network.

## **114. D. Lynn Thompson**

**Eastern Kentucky University**

**Mentors: Marta Miranda and Betsy Hopkins**

***Issues in Gender & Intersexuality***

This project involved personal and professional development in issues of gender and intersexuality, achieved through research into and review of previously published, scholarly (peer-reviewed) work. This research required coordination between student and faculty in location of scholarly work in the fields of psychoendocrinology, biology, sociology, and psychology in individuals with atypical gender presentations and intersexual conditions. The project included review and analysis of existing research in regard to methods of diagnosis under the DSM guidelines (both historical and present), the medical ethics of treatments, and the history of social attitudes across cultures toward affected individuals. Faculty provided guidance in the development of teaching skills at the university level through a teaching assistantship. Current methods of medical and social treatment of individuals with atypical gender presentation and intersexual conditions are questioned, and alternative treatments are suggested. Implications include alterations of medical and psychological treatments, deviation from current sociological trends, and education of medical and psychological professionals in the needs of these individuals.

## **115. Dakota Thornberry**

**Morehead State University**

**Mentor: Layne Neeper**

***“Kill the Brain and You Kill the Ghoul”: The Zombie Motif in Stephen Wright’s***

***Meditations in Green***

Near the end of Stephen Wright’s novel *Meditations in Green*, Wright likens the Vietnam-era U.S. military to one of the flesh-eating ghouls in George Romero’s *Night of the Living Dead* by associating the military’s intelligence department with the brain, the weak-point of Romero’s ghouls. By retroactively applying the concept of the military as a zombie to the preceding portions of the text, one finds that the military as portrayed by Wright exhibits other traits of Romero’s creatures, including greatly heightened levels of hostility and homicidal intent, as well as the seeming loss of individuality and higher thought processes. One can also see that these traits persist into the post-war lives of some of the novel’s characters, indicating a permanent alteration to the self akin to the transformation that afflicts the undead in *Night of the Living Dead* and thereby cementing Wright’s image of the military as a dehumanizing transformative force.

## **116. Kristen Tinch**

**Murray State University**

**Mentor: Meagan Musselman**

### ***The Case for the Graphic Novel in Kentucky's Classrooms***

Graphic novels (or in layman's terms "extended comic books") are a genre of literature surrounded by controversy in the world of the high school classroom. Since graphic novels and comic books are closely linked, the advent of the graphic novel in 1978 raised serious questions about the comic book's role in literature—are graphic novels simply glorified comic books or do they go beyond the superhero stereotypes associated with the comics of American youth? As graphic novels gain more acceptance as a serious literary form in the public eye, educators throughout the United States are introducing them into school curricula for students of all ages. While curriculum specialists debate their legitimacy as beneficial teaching tools and students snub the genre as mere "kiddy stuff," teachers decide to use graphic novels and/or comic books for at least one of four reasons: (1) to spark the interest of reluctant readers, (2) to supplement previously instructed content, (3) to analyze artistic/visual elements, and/or (4) to explain complicated ideas. This research explores the trends in teachers who are using the graphic novel in Kentucky's secondary English classrooms (e.g. years of experience or grade taught). Furthermore, this research analyzes the graphic novel's place in education as a valid tool for accomplishing learning objectives.

## **117. Lori Wheeler**

**Northern Kentucky University**

**Mentors: Liza Benham and Sharlene Graham Lasisiter Boltz**

### ***The Stark Reality of Human Trafficking in Northern Kentucky***

Human trafficking is currently the third largest form of organized crime in the world. It has surfaced in the Northern Kentucky area, yet the majority of citizens are unaware of its existence. Bonded labor, forced labor, domestic servitude, or sex trafficking has presented itself in our local communities. My research encompasses the evidence of human trafficking as reported by police, prosecutors, hospital personal, as well as others. Stronger laws, increased training, and enhanced education are proposed in order to combat this problem. My focus is on a galvanized approach to bring exposure and attention to the human trafficking problem in Northern Kentucky, a documented reality that yet remains hidden. My investigations provide documentation that concerns prevention, prosecution, victim protection, as well as the apparent need for education. With this material I hope to challenge individuals to gain a new outlook and take action as citizens, giving them the tools to begin to address modern-day slavery within their communities. Public awareness is the first and biggest step to approach this issue. Without it, human trafficking will remain a reality for the victims.



## **118. Travis Wheeler**

**Eastern Kentucky University**

**Mentor: Rebekah Waikel**

### ***ABO Blood Group Genotyping by PCR-RFLP***

Blood typing typically involves mixing a blood sample with antibodies A and B and observing any antigen – antibody reactions (agglutination). Blood borne diseases, ranging from HIV to Hepatitis make blood typing in a classroom setting risky. The purpose of this research is to design a DNA based ABO blood typing protocol that does not require the use of blood. DNA can easily be obtained through a cheek swab. Blood type can be determined by the presence or absence of glycosyl transferase genes, whose protein products add carbohydrate antigens to proteins and lipids on the surface of erythrocytes. Analysis of the known gene sequences of the ABO glycosyl transferase genes revealed detectable sequence differences found in exons 6 and 7. We amplified exons 6 and 7 of the ABO genes via the Polymerase Chain Reaction (PCR). We then digested the amplimers with sequence specific restriction endonuclease and separated resulting DNA bands by agarose gel electrophoresis (RFLP). Based on predicted DNA band sizes, we have been able to successfully determine blood types through PCR-RFLP of genomic DNA. To our knowledge, this is the first PCR-RFLP experimental test for blood type. This genotyping scheme will be used in undergraduate laboratory courses.

## **119. Brent White, Sam Nicaise, Keith Etheredge, Kyle Stein, Brian Passafiume, Raghu Mangu, and Krishna Prayaga**

**University of Kentucky**

**Mentor: L. Scott Stephens**

### ***University of Kentucky's Solar Powered Car: Gato del Sol IV***

Engineering students at the University of Kentucky are designing and building a new solar powered car to compete in the 2010 North American Solar Challenge and the 2011 World Solar Challenge. The car, “Gato del Sol IV” will be powered by an array of 2,132 Gallium Arsenide photovoltaic cells. The cells are mounted to a carbon fiber and honeycomb paper core shell. The shell rides on a lightweight aluminum tube chassis, which is then powered by a 90% efficient brushless DC motor. Gato del Sol IV will be one of the fastest solar powered cars in the world with an estimated top speed of 70 mph. “Gato IV” is building on the team’s previous successes including a 2nd place finish at the 2009 Formula Sun Grand Prix. The team defeated top schools including Northwestern and California–Berkeley at that race. To build a better car, the team is improving aerodynamics, the solar array, and shedding 50 lbs in comparison to the previous car. The team’s research advances the potential for mainstream solar-powered transportation. The cars excel in using small amounts of power to travel at high speeds. According to finite element analysis, “Gato IV” is expected to be able to travel 46 mph on the 1500 watts from its solar array. In addition, the project will continue to benefit K-12 students throughout the state, because the previous car was taken to elementary, middle, and high schools, to inspire students to study math, science, and engineering. More information can be found at [www.uksolarcar.com](http://www.uksolarcar.com).

## **120. Joseph Wilkins**

**University of Louisville**

**Mentor: Benjamin MacCall**

### ***Introduction to Numerical Modeling of the Atmosphere***

Using the fundamental principles of physics, a set of governing equations result that describes the dynamics of a fluid. Unfortunately these equations are nonlinear and cannot yet be solved. Instead, the equations are approximated using various numerical schemes and converted into a series of calculations to be done on a computer. There are many types of numerical schemes used; all have advantages and disadvantages that must be weighed against the physical behavior being simulated and the resources available for the computation. This work is a survey of well established finite-difference methods applied to two sets of linear equations - the advection equation and the linear shallow water equations. Finite differencing was used to approximate the partial derivatives in the equations with finite differences between discrete points in space and time. The resulting algebraic equations only approximate the original partial differential equations that lead to unwanted behavior, such as computational instability, damping, dispersion, and unphysical solutions. For the linear advection equation (LAE), forward-in-time-and-space and the Euler schemes were completely unstable. The Backward scheme was stable but experienced significant damping and dispersion. The leapfrog scheme showed little damping, but exhibited a computational mode. Lax-Wend off had no computational mode but experienced significant damping. The linear shallow water equation (LSWE), the leapfrog scheme exhibited minor damping but showed computational mode. The Lax-Wend off scheme does not have computational mode, but there is significant damping of the gravity waves. When rotation is included, both simulations exhibited the process of geotropic adjustment.

**The *Posters-at-the-Capitol* Organizing Committee  
would like to thank the following individuals and  
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to this year's event!**

**Mr. Bob King, President**  
Council on Postsecondary Education

**Ms. Jean Burgin, House Clerk**  
Kentucky House of Representatives

**Mr. Bruce Phillips, Assistant Public Information Officer**  
Legislative Research Commission

**Ms. Paula Weglarz, Event Coordinator**  
Kentucky Division of Historic Properties

**Mr. Thomas Kroner, Ms. Camille Newell, & Ms. Kathryn Reinhardt**  
**Graduate & Student Assistants**  
Murray State University

**Ms. Sally Mateja & Ms. Sachiko Brown, Program Volunteers**  
Murray State University

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