

MURRAY STATE UNIVERSITY • NORTHERN KENTUCKY UNIVERSITY
UNIVERSITY OF KENTUCKY • UNIVERSITY OF LOUISVILLE • WESTERN
KENTUCKY UNIVERSITY • EASTERN KENTUCKY UNIVERSITY
KENTUCKY STATE UNIVERSITY • MOREHEAD STATE UNIVERSITY

Posters-at-the-Capitol



February 6, 2003



Joanne K. Glasser
President

Welcome from Eastern Kentucky University:

I am sure you agree with me that *Posters-at-the-Capitol* is an impressive showcasing of the work of college and university undergraduates from across the Commonwealth. We can all be justifiably proud of the remarkable achievements of our students.

At Eastern Kentucky University we promote, nurture, and celebrate academic excellence and achievement. As a student-centered institution, we seek to engage our students in the educational process. I know that the same challenges and opportunities are made available to the students of the other great institutions in the Commonwealth, as well.

This abstract booklet highlights some of the very best Undergraduate scholarship, creativity, and research done in Kentucky institutions. The students, faculty, and staff of Eastern Kentucky University are proud to be part of this wonderful uplifting of academic vitality.



Paul E. Bibbins, Jr.
Interim President

Welcome from Kentucky State University:

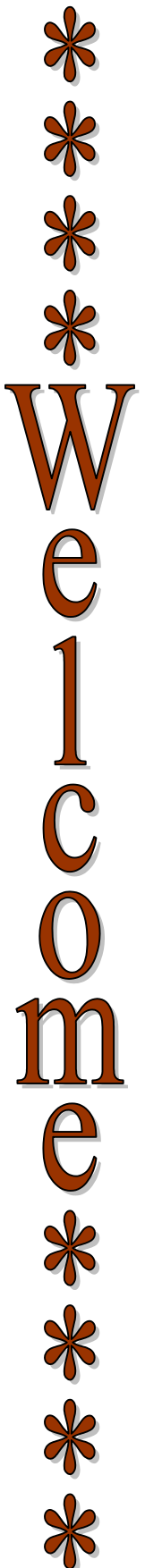
Kentucky State University is the Commonwealth's unique, small, liberal studies, land-grant, comprehensive institution. The University has the lowest student:faculty ratio in the state system which affords the student the opportunity for more one-on-one interaction with his/her professors.

Kentucky State University is excited to support and participate in the second annual *Posters-at-the-Capitol*. Even though Kentucky State University has been historically known as a teaching institution because of its inception in 1886 for the development of African-American for the education of other African-Americans, this is a wonderful opportunity for our students to showcase their research and creative talents.

The quality of the abstracts that have been submitted by our students is a reflection of the outstanding contributions of our faculty and members of the Land-Grant Program in preparing our students to become exemplary graduate students and professionals. As you attend *Posters-at-the-Capitol*, and view the posters that have been prepared by our students, you will witness the University's commitment to academic excellence which is reflected by the quality and diversity of the projects the students have been involved in.

After you have had an opportunity to visit the exhibits from our students, you will have a greater appreciation for the exciting learning environment the University provides. *Posters-at-the-Capitol* is just another way to demonstrate Kentucky State University's commitment to preparing students to make significant contributions to society.

I want to commend each participant on a job well done





Ronald G. Eaglin
President

Welcome from Morehead State University:

We at Morehead State University are very pleased to once again participate in the "*Poster-at-the-Capitol*" event. What a creative way to showcase the scholarly research accomplishments of our undergraduate students. At Morehead State University, we take great pride in our commitment to provide high quality research experiences to undergraduate students. We believe that these research experiences strike at the core of education by providing opportunities for faculty and students to work together in the development of new knowledge. In addition, these faculty-mentored projects allow students to interact on important topics, and reinforce cooperation in academic pursuits. The diversity of projects reflects the multidisciplinary research that will be needed to solve the issues facing our world, and strengthens the inter-connectivity among disciplines in formulating solutions to these issues. My congratulations to all participants, and thanks again for including Morehead State University in this cooperative effort.



F. King Alexander
President

Welcome from Murray State University:

As Kentucky's universities strive to help the Commonwealth's students achieve their full potential, engaging our students in research, scholarly and creative work under the watchful eye of a caring faculty is an essential component of that education. We at Murray State are again pleased and proud to be represented at *Posters-at-the-Capitol* by a set of undergraduate projects that clearly demonstrate the kind of high quality work students and faculty at Murray State are engaged in today.

Throughout the year, our students work closely with outstanding faculty from an array of academic disciplines to develop and foster new ideas that are at the cutting edge of their disciplines. This kind of scholarly collaboration between students and faculty produces new knowledge that can shape the career paths of our students while also affecting the social and economic development of our cities, counties, and states.

Murray State is not interested in the status quo. We are taking steps to see that even greater numbers of undergraduates have the opportunity to engage in scholarly work with our faculty. We have established the Undergraduate Research and Scholarly Activity Office to help ensure that these educational opportunities are available to students across our entire campus. Through this office, students at Murray State have the opportunity to submit proposals and to obtain campus-based funding to support their faculty mentored work. We are also showcasing our students' accomplishments to the Murray community through a weeklong celebration called *Scholars Week*.

I look forward to watching these educational opportunities grow at Murray State and throughout Kentucky in the years to come. I invite all residents of Kentucky to come to *Posters-at-the-Capitol* and see how our students are contributing ideas that are impacting our communities and our understanding of the world around us.



James C. Votruba
President

Welcome from Northern Kentucky University:

It is with pride and pleasure that I draw your attention to the work of some Northern Kentucky University students that are on display at the “*Posters-at – the-Capitol*” event. These posters represent some of the best creative and scholarly efforts of our students. The students have worked hard, with the guidance of their faculty sponsors, to produce the interesting results that are exhibited.

NKU prides itself in supporting its students as they experience the full range of opportunities available in undergraduate education. This includes the opportunity to explore intellectual issues under the leadership of the outstanding faculty members at the University. Our tradition of faculty excellence in research coupled with our commitment to learner centered values offers Northern students research and creative opportunities that are normally available only to graduate students.

This research helps our students to develop important problem-solving skills and fosters communication skills as are demonstrated by their poster presentations. These skills are important for furthering our student’s career and professional opportunities and will do much to help build the intellectual infrastructure in the Commonwealth.



Lee T. Todd, Jr.
President

Welcome from the University of Kentucky:

Research is a powerful engine that helps drive the economic and educational missions of the Commonwealth. I believe some 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.

Posters-at-the-Capitol is an excellent opportunity to recognize undergraduate research as an essential part of the educational experience; one that benefits both students and faculty. 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 foundation of scholarship at the University of Kentucky.

For faculty, there is no more rewarding teaching opportunity than to serve as 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.

The University of Kentucky is proud of its strong commitment to undergraduate research and creativity. That commitment is reflected by our recent efforts to expand support of undergraduate scholarship, the creation of Kaleidoscope -- a new University journal dedicated to scholarly accomplishments of our undergraduates-- and the Annual National Conference on Undergraduate Research that was held at the University of Kentucky in 2001. We look forward to building upon this success.

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.



James R. Ramsey
President

Welcome from the University of Louisville:

The University of Louisville is delighted to participate in the second annual *"Posters-at-the-Capitol"* program on February 6, 2003. Not only does this event give our students an opportunity to share with state leaders the excitement we have for undergraduate research, but it also allows our students to interact with the legislators who shape state policy. We are pleased to support this program, which introduces undergraduate students to the importance of scientific investigation, the creation of new knowledge, and the investment of the state in R&D. This collaborative event brings together talented undergraduates, their faculty-mentor and elected officials to showcase the academic achievement of Kentucky's higher education system.



Gary Ransdell
President

Welcome from Western Kentucky University:

Western Kentucky University takes great pride in the fact that excellent faculty from a wide array of academic disciplines involve students in applied research activities outside the classroom. These scholarly collaborations utilize the concepts learned in classrooms and laboratories thereby better preparing students for the workforce and graduate/professional schools. In addition, many of the research projects address issues important to constituents outside the University thereby impacting the social and economic development of our community, counties, state, and nation.

As in last year's event, it is very gratifying to see the number and diversity of student scholars, along with their faculty mentors, participating in the *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 impact on job creation, quality of life, and economic development for the Commonwealth. I look forward with anticipation to the growth of this event in the coming years.

Schedule of Activities

9:00 a.m. to 11:00 a.m.	Poster Setup
9:00 a.m. to 2:00 p.m.	Legislative Visits
11:00 a.m. to 5:00 p.m.	General Poster Session Viewing
3:00 p.m. to 5:00 p.m.	Reception

Posters-at-the-Capitol Organizing Committee

John Mateja, Chair
Murray State University

Jose Varela
Eastern Kentucky University

Paul Bibbins, Jr.
Kentucky State University

Bruce Mattingly
Morehead State University

Phil Schmidt
Northern Kentucky University

Philip Kraemer
University of Kentucky

Pamela Feldhoff
University of Louisville

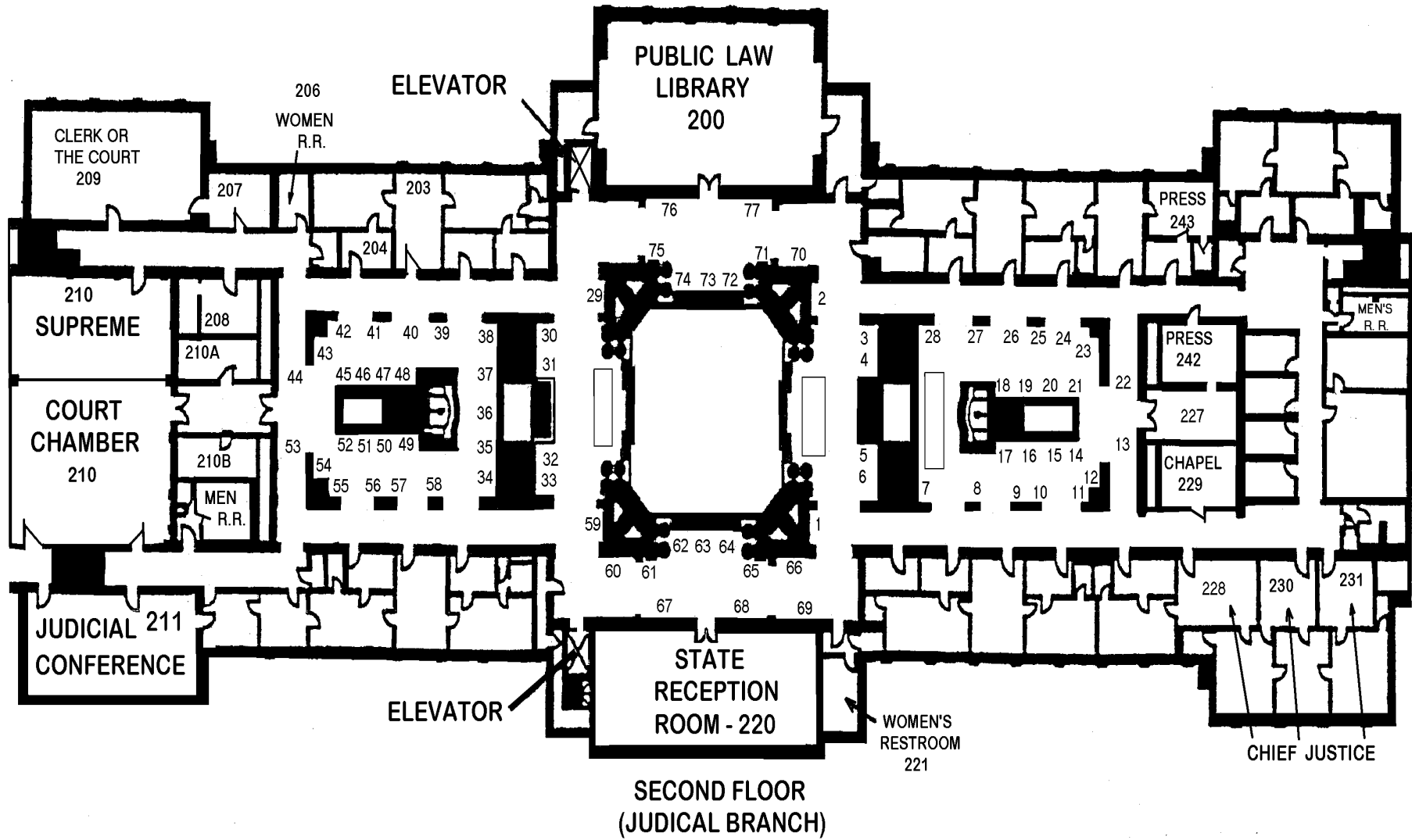
Blaine Ferrell
Western Kentucky University

Please visit the *Posters-at-the-Capitol* web site at:
<http://campus.murraystate.edu/services/ursa/>



Poster Locations

February 6, 2003



Posters by University

Eastern Kentucky University

Poster No.	Students		Faculty Sponsor		Page No.
23	Mandi	Benson	Robert	Mitchell	12
19	Jordan	Hall	William	Farrar	10
48	Kelli	Harris	David	Eakin	24
58	Kristin	Kearns	Jon C.	McChesney	29
31	Sara	Pace	Frank	Shaw	16
31	Suresh	Sah	Frank	Shaw	16
06	JoAnn	Sturgill	Danita	LaSage	03
19	Jamie	Thompson	William	Farrar	10

Kentucky State University

70	Alaji	Bah	Kanzi	Javed	35
52	Pasano	Bojang	George F.	Antonious	26
26	Eniolami	Dosunmu	Kanzi	Javed	13
12	Akua	Henaku-Larbi	Jim	Tidwell	06
65	Toni	Leake	John	Sedlacek	32
60	Sayward	McKee	George F.	Antonious	30
32	Kenyari	Moore	George F.	Antonious	16

Morehead State University

49	Kathryn	Adrian	Lynn	Haller	24
76	James	Armstrong	Ilsun M.	White	38
55	Holly	Beach	Adrian	Mandzy	27
02	David	Charles	Bruce A.	Mattingly	01
44	Christopher F	Garris	Laurie L.	Couch	22
68	Cheryl	Gerde	Gordon	Nolen	34
11	Nao	Hagiwara	Ilsun M.	White	06
44	Chrystin N.	Hudson	David R.	Olson	22
46	David	Johnston	Scott A.	Wymer	23
34	Ashley	Justice	Ilsun M.	White	17
39	Karen L.	Laufer	Philip E.	Prater	20
20	Donald D.	Patton	Wesley	White	10
72	David G.	Riffe	Mark	Blankenbuehler	36
16	Eric	Robinson	Charles E.	Mason	08
37	Jessica	Skeens	Ilsun M.	White	19
24	John Scott	Stauble, Jr.	David K.	Peyton	12

Murray State University

08	Catherine	Aubee	Howard	Whiteman	04
63	Adam	Bell	Kenneth	Bowman	31
69	Maryalice	Bighinatti	William	Mulligan	34
59	Richard	Blalock	Terry	Derting	29
64	Brandon	Chandler	David	Fereguson	32
62	Carla	Creasey	Jay	Morgan	31
22	Melissa	Engleman	William	Spencer	11
63	Courtney	Flood	Kenneth	Bowman	32
25	Kimberly	Freeman	Ken	Wolf	13
64	Olivia	Grace	David	Fereguson	32
62	Jesse	Gray	Jay	Morgan	31
15	Adam	Green	Howard	Whitman	08
62	Chad	Hall	Jay	Morgan	31
64	Cory	Hicks	David	Fereguson	32
62	J.C.	Hicks	Jay	Morgan	31
18	Joshua	Kitchens	Bommanna	Logananthan	09
77	Han-Yu K.	Lee	John	Porter	38
63	Justin	Lovell	Kenneth	Bowman	31
63	Scott	Lowe	Kenneth	Bowman	31
64	Joshua	Monroe	David	Fereguson	32
45	Janine	Perkins	Ed	Zimmerer	23
71	Ryan	Pigford	James	Hereford	35
62	Cody	Robertson	Jay	Morgan	31
38	Satinder	Sidhu	David	Canning	19
56	Maninder K.	Virk	Terry L.	Derting	28



Posters by University (continued)

Northern Kentucky University

Poster No.	Student	Faculty Sponsor	Page No.
07	Ray Cannon	Steven Wilkinson	04
42	Joshua T. Cooper	Miriam Steinitz-Kannan	21
14	Elizabeth A. Dennemann	Doug Krull Robin Bartlett	07
50	Rebecca F. Foltz	Mark E. Bardgett	25
21	Michelle Fry	Denice Robertson	11
61	Sara Goetz	Diana McGill	30
53	Valerie Heib	Doug Krull	26
53	Julie Herrmann	Doug Krull	26
75	Nathan Lee	Andy Long	37
75	Stephanie Lehman	Andy Long	37
47	Mike Mallott	David E. Hogan	24
28	Melissa A. Miller	Richard D. Durtsche	14
53	Ashley Murphy	Doug Krull	26
53	Micah Noyes	Doug Krull	26
17	Jennifer K. Quammen	Richard D. Durtsche	09
53	Sheila Ruark	Doug Krull	26
05	Stephen J. Tully	James Ramage	03
35	Pete Wilson	Kevin G. Kirby	18

University of Kentucky

03	Bradley Bieber	Susan Barron	02
27	Michael Caudill	Frank Ettensohn	14
41	John Cox	Donald Saucier	21
67	Angela Hayden	Richard Milich	33
33	Sarah Mardon	James Hower	17
54	Nam Nguyen	Thomas Zentall	27
13	Christine Pasatta	Rick Hoyle	07
41	Lindsay Sharp	Donald Saucier	21
29	Dawn Virag	Susan Barron	15

University of Louisville

01	Jonathan Ballard	Ronald Fell	01
09	Matthew Druen	L.A. Dugatkin	05
30	Wensa Juleus	Barbara Burns	15
57	Micheal Lerner	Patricia B. Cerrito	28

Western Kentucky University

51	Chris M. Aud	Christopher Byrne	25
74	Gretchen E. Berryman	Cathleen J. Webb	37
73	Gretchen E. Berryman	Cathleen J. Webb	36
74	Stephen V. Hartman	Cathleen J. Webb	37
43	Daniel Hatcher	Christopher Groves	22
36	Lindsay Hopper	Michael Carini	18
74	Glenda H. Jones	Cathleen J. Webb	37
73	Glenda H. Jones	Cathleen J. Webb	36
04	Jake B. Lyon III	Ritchie Taylor	02
51	Evan K. McCasland	Christopher Byrne	25
74	Melissa A. Petty	Cathleen J. Webb	37
73	Melissa A. Petty	Cathleen J. Webb	36
66	Richard N. Talley	Christopher Groves	33
10	Joey Wilcox	Ritchie Taylor	05
40	Whitney Wills	Michael Carini	20

01. Jonathan Ballard

University of Louisville

Faculty Sponsor: Ronald Fell

Effect of Delivery System of Photosensitizer in Photodynamic Therapy and Tumor Response Using Liposomal Complexes

The effect of Photofrin photosensitizer encapsulated in liposomal delivery vehicles was studied by observing tumor response after conducting photodynamic therapy (PDT). PDT involves the administration of a tumor-localizing photosensitizing agent followed by activation of the agent by light of a specific wavelength. The therapy results in a sequence of photochemical and photobiological processes that cause irreversible damage to tumor tissue. Three liposomal delivery vehicles were chosen to deliver the photosensitizer in vivo: DDPC/cholesterol, DMPC/ HPC and stealth liposomes. Selective tumor destruction was observed with each delivery vehicle upon observation of tumor response.

02. David Charles

Morehead State University

Faculty Sponsor: Bruce A. Mattingly

Effects of Nafadotride on Cocaine-Induced Behavioral Sensitization

It has recently been suggested that the development of behavioral sensitization to psychostimulant drugs may be related to the development of tolerance in dopamine D3 receptors, which are inhibitory with respect to locomotor behavior (Richtand et al., Neurosci. Biobehav. Rev., 2001). Consistent with this view, the preferential D3 antagonist nafadotride blocks the development of locomotor sensitization to amphetamine (Richtand et al. Brain Res, 2000), and concurrent treatment with the D3 agonist 7-OH-DPAT enhances the development of locomotor sensitization to cocaine (Mattingly et al., Pharmacol. Biochem. Behav., 2001). The purpose of the present study was to determine whether concurrent treatment with nafadotride and cocaine would block the development of sensitization to cocaine. Consequently, groups (n = 7-8 each) of male Wistar rats (250-300g) were first habituated to activity chambers (Med-Associates) and then assigned to four drug treatment groups: vehicle (saline), cocaine (15 mg/kg), nafadotride (0.1 mg/kg, P. Sokoloff, INSERM, Paris, FR), or nafadotride-cocaine. These groups were then tested for activity daily for four days after injections (IP) of the assigned drug(s). All rats were then tested after vehicle injections for two days followed by a cocaine challenge test on the third day after drug treatment. In contrast with previous findings with amphetamine, the results indicated that concurrent treatments with nafadotride did not block the development of locomotor sensitization to cocaine as measured during the pretreatment phase or on the cocaine challenge test. These findings suggest that the development of behavioral sensitization to cocaine is not mediated by the development of tolerance in dopamine D3 receptors.

03. Bradley A. Bieber

University of Kentucky

Faculty Sponsor: Susan Barron

The Effects of Alcohol Exposure on a Cerebellar Functioning Task in Rats and the Neuroprotective Effects of Agmatine: A Third Trimester Model

This study investigated the effects of neonatal alcohol exposure on a balance task that relies on cerebellar function. This exposure period was selected because it closely resembles central nervous system development during the human third trimester of pregnancy. The cerebellum experiences considerable growth during this period and thus alcohol may have some of its most detrimental behavioral effects at this time. One hypothesis for alcohol's effects on the developing brain is that neurons become overexcited during withdrawal and die. Some drugs are thought to protect the brain during alcohol withdrawal, one of which is agmatine sulfate. The hypothesis was that neonatal alcohol exposure would lead to deficits in cerebellar task performance and that agmatine would help reduce these deficits. Male and female rat pups were administered either alcohol, agmatine, an isocaloric control, or a combination of alcohol and agmatine, twice daily during postnatal days 4 through 9. At 19 days of age, animals had to walk and balance on two parallel rods. There were ten subjects per sex and treatment condition. With each successful trial, the distance between the bars was widened. Animals were tested three trials per day for three days. Alcohol exposed animals performed more poorly than all other treatment groups. Furthermore, animals neonatally exposed to the combination of alcohol and agmatine performed better than those exposed only to alcohol. This suggests that agmatine may have some utility as a neuroprotective agent for cerebellar damage due to neonatal alcohol exposure, but more research is needed.

04. Jake B. Lyon III

Western Kentucky University

Faculty Sponsor: Ritchie Taylor

Utilization of GIS Technology in a Small Rural Water System Located in Western Kentucky, West McCracken Water District.

The Center for Water Resource Studies, a program of distinction at Western Kentucky University (WKU), operates the Technical Assistance Center for Water Quality (TACWQ). Funded by the Small Systems Program of the U.S. EPA's Drinking Water Branch, the TACWQ works to assist small rural water systems in developing uses for advanced technologies that improve management and operations. During the summer of 2002 students and personnel from the TACWQ engaged in a technology cost-benefit study with West McCracken Water District (WMWD) and Spatial Data Integrations (SDI). This study was designed to determine the cost effectiveness of developing a Geographic Information System (GIS) for a small rural water system. Components of the study included mapping locations of all meters, hydrants, valves, and tanks using Trimble© Global Positioning Systems (GPS), compiling the data in WaterWorks FM™ supplied by SDI, building the final GIS, and providing technical support to the WMWD. This data and the GIS have allowed WMWD to more accurately determine its needs for future growth, management, and operation of the water system. The overriding factors discouraging small water systems from utilizing new GPS and GIS technologies is the high costs of equipment, software, and labor, and the potential for technical deficiencies. By working with WKU's TACWQ, costs were dramatically reduced, thus enabling WMWD to benefit from the same technologies used by larger systems. This study provides a benchmark for other small rural water systems as to the costs, needs, and benefits of developing a GIS.

05. **Stephen J. Tully**

North Kentucky University

Faculty Sponsor: James Ramage

The Triumph of the Blues Form

The music form known as the "Blues" has had a profound influence on how we as Americans experience music today. Although the Blues originated within the African American musical idiom, it quickly achieved a nearly ubiquitous transcendence across the entire American music spectrum. Jazz, Rock, Country, Hip-Hop, Bluegrass, Zydeco and other music genre in the United States have been crafted around a central Blues super-structure. Application of the Blues form is virtually limitless. This paper critically examines both how and why the Blues form has become a defining element of American music culture, its cross-cultural aspects, and the qualities that make it such a malleable parent form. The paper addresses the notion that much of today's music has suffered a diminution of quality, through a combination of technological advances, and a move toward the esthetic of shock-value, known as "perverse modernism." Yet even the radical new forms spring from the Blues tradition. In the final analysis, the Blues is American music. It gives the rest of the world insight into who we are as a people. Though it owes much of its flavor to the rich artistry and brilliant inventiveness of African Americans, it speaks for all Americans. It expresses the struggles and hardships of a youthful nation. It announces the cruelty of racial injustice, and screams about the frustration of trying to measure up to the American ideal. It is social criticism delivered in personal terms. The Blues express the indomitable spirit of people who have dedicated themselves to making this country live up to its promise.

06. **JoAnn Sturgill**

Eastern Kentucky University

Faculty Sponsor: Danita LaSage

Characterization of Water Quality in an Eastern Kentucky Stream.

Quality of water in small streams of the eastern United States can be impacted by land uses within the watershed. The Muddy Creek Watershed, a subbasin of the Kentucky River, contains a total of about 52 miles of streams draining 43,491 acres. The creek receives effluent from permitted sites and runoff from agricultural areas. Among the threats to water quality are pathogens, nutrients, and pesticides, cumulative downstream storm-water impacts from suburban development, and proximity to the U.S. Army Bluegrass Depot. A volunteer monitoring group, Kentucky River Watershed Watch, samples four sites along the 29-mile stream three times a year. One Kentucky Division of Water ambient water quality monitoring site along Muddy Creek is sampled annually. While occasional targeted samplings may be useful for determining permit compliance or identifying critical areas on a broad basin-wide scale, documenting overall stream or watershed health on a subbasin scale may require greater coverage and more frequent sampling. We collected monthly baseflow surface-water samples (April through September, 2002) from 8 sites along Muddy Creek and analyzed them for ten parameters commonly used to characterize water quality, such as pH, conductivity, nutrients, and metals. Because agricultural impacts on surface water sources are of particular interest, we also collected nitrate and phosphate samples from stream sites upstream and downstream of targeted agricultural areas following major storms. We examined trends in data through time and space and compared results obtained from commonly-used, lower cost testing equipment such as might be available to student or volunteer groups, and more expensive equipment that might be used by industry professionals or researchers. While trends for some parameters (for example, nitrate) were reasonably well correlated with land use, other parameters did not follow anticipated trends. Levels of orthophosphate, for example, were highest at the most upstream point, a fish and wildlife management area with no known sources of phosphate. Results of this initial water-quality survey will be incorporated into an ongoing study of the Muddy Creek watershed that will examine headwater impacts, meander erosion, and watershed vulnerability.

07. Ray Cannon

North Kentucky University

Faculty Sponsor: Steven Wilkinson

NKUGrapher - A Web Tool For Visualizing Mathematical Expressions

NKUGrapher is an interactive web-based tool that aids in the visualization of mathematical expressions with the help of *Mathematica*, a powerful tool used to handle and display technical computations. Users simply access <http://zappa.nku.edu/~grapher/> from their web browser, enter a function, and visualize the expression in a 2D or 3D environment. With *NKUGrapher*, one can visualize these mathematical expressions from home without the cost of an expensive mathematical package. In addition a user can rotate and view those expressions in real time from different perspectives using several different coordinate systems

08. Catherine Aubee

Murray State University

Faculty Sponsor: Howard Whiteman

Breeding Phenology in the Polymorphic Mole Salamander, Ambystoma talpoideum, in Western Kentucky

Ambystoma talpoideum, commonly known as the mole salamander, reaches the northern extremities of its range in western Kentucky. As a facultatively paedomorphic species, *A. talpoideum* presents an opportunity to study the comparative life histories and potential interactions of metamorphic and paedomorphic individuals within the same population. The initial focus of this research was to locate potential breeding sites of *A. talpoideum* in western Kentucky and to observe breeding patterns within these populations. Paedomorphic individuals have been confirmed at two sites in rural Calloway County and at one of eleven potential sites in Land Between the Lakes (LBL). Breeding activity (indicated by cloacal swelling and the presence of spermatophores) at the LBL site concluded by mid-February. Metamorphic individuals were discovered at the Calloway County sites in late December, and showed signs of breeding activity during the same time frame as paedomorphic individuals. Breeding continued throughout February and waned in early March in these populations. The timing of breeding is atypical because previous studies have shown that paedomorphic individuals generally begin and cease breeding earlier than metamorphic individuals. Exceptions have been noted when paedomorphic salamanders have only recently reached maturity, but individuals from the Calloway County sites were comparable in size to those from the LBL site. No LBL populations have been discovered which contain both paedomorphic and metamorphic individuals, but sampling will continue through the 2002-03 season.

09. Matthew Druen

University of Louisville

Faculty Sponsor: L.A. Dugatkin

Repeatability of Intrinsic Aggression in Green Swordtail Fish (Xiphophorus Helligeri) and Contest Outcome.

Animals across taxa must often compete for resources that are essential to survival and reproduction such as mates, territory, and social status. Past studies have focused on behavioral attributes such as attack latency, bite number and frequency, and threat-display number and frequency and the role they play in determining the outcome of such contests. However, no rigorous statistical treatment has yet been done to ascertain whether this behavior is manifested in any repeatable manner. This experiment examined whether an individual's aggressive responses were consistent over time when subjected to a series of a standardized aggression test and whether those behaviors predicted the dynamics and winner of subsequent staged fights. Relatively high repeatability statistics indicate a high repeatability of intrinsic aggression although correlation with contest outcome has not been definitively established.

10. Joey Willcox

Western Kentucky University

Faculty Sponsor: Ritchie Taylor

Distribution and Occurrence of Atrazine in an Agricultural Karst Watershed and a Community Supply Reservoir

The Center for Water Resource Studies, a program of distinction at Western Kentucky University, operates the Technical Assistance Center for Water Quality (TACWQ). Funded by the Small Systems Program of the U.S. EPA's Drinking Water Branch, the TACWQ works to improve source water for small rural water systems. As part of the source water protection program within the Center, water sampling was initiated in 2001 to assess elevated levels of atrazine, a herbicide used for weed control, in Spa Lake and the adjoining karst watershed. This watershed was identified as a priority by the Kentucky Pesticide Workgroup due to atrazine concentrations above the Maximum Contaminant Level (MCL), 3.0 µg/L, in treated drinking water supplied by Spa Lake. Water samples collected since 1999 by Novartis, the company that produces atrazine, and TACWQ indicated that atrazine was persistent year round in Spa Lake, with seasonal variations correlated to the atrazine application season. Weekly monitoring of finished drinking water from the Lewisburg water treatment plant indicated that the herbicide was present in concentrations above the MCL for extended periods of time after the application season. Land use analysis with ARCGIS and stream monitoring indicated that the primary source of atrazine was from applications related to corn production. By understanding the occurrence and distribution of atrazine in the Spa Lake watershed, effective Best Management Practices can be imitated to protect source water.

11. **Nao Hagiwara**

Morehead State University

Faculty Sponsor: Isun M. White

Excitatory Modulation of Hippocampus on Amphetamine-induced Hyperactivity in Rats

Psychostimulants, such as amphetamine and cocaine, produce hyperactivity in mammalian species. Hyperactive behavior is thought partly due to excessive dopamine in the nucleus accumbens (NAc). Recent evidence indicates that stimulation of the hippocampus (HIP) also produces hyperactivity, possibly via modulation of dopamine in NAc. The present study investigated hippocampal modulation of hyperactivity induced by amphetamine in rats. Hippocampal stimulation was done via NMDA infusions into the ventral hippocampus. Hippocampal inhibition was done via lidocaine infusions. Amphetamine was infused into NAc to enhance dopamine transmission in NAc. We tested the hypothesis that excitation or inhibition of HIP would differentially affect dopamine-induced hyperactivity: stimulation of HIP would augment hyperactivity, whereas inhibition of HIP would decrease hyperactivity. Wistar rats were anesthetized, were surgically implanted with bilateral cannulae for subsequent microinfusions, and were allowed 7-10 days for recovery. We found that amphetamine (10mg/ml, 0.5 microliter/site) infusions into NAc produced hyperactivity, measured by distance traveled. Hippocampal stimulation augmented hyperactivity induced by amphetamine infusions in NAc. Hippocampal inhibition blocked amphetamine-induced hyperactivity. The present findings support our hypothesis and provide evidence for a critical involvement of hippocampus in expression of hyperactivity possibly via modulation of dopamine and another neurotransmitter, such as glutamate in NAc. Future research on the precise role of hippocampus in hyperactivity will expand our understanding of hyperactivity disorders associated with dysfunction of the mesolimbic system.

12. **Akua Henaku-Larbi**

Kentucky State University

Faculty Sponsor: Jim Tidwell

The Effect of Production Intensification on Water Quality in Pond Growout of the Freshwater Prawn, "Macrobrachium rosenbergii".

The freshwater prawn, *Macrobrachium rosenbergii*, is becoming a commercially important species in the south central United States including Kentucky. In pond production, several different management techniques and levels of production are being employed by growout farmers. This study compared the relative effect of production levels commonly used by growers in the region on pond water quality. Three different stocking densities (35,000, 48,000 and 61,000/ha and corresponding increased feed rates) were evaluated in 0.04 ha with two, three, and two replicate ponds per treatment, respectively. A 28% protein steam pellet diet was fed twice daily according to a feed chart based on the number and size of prawn. The effect of these management practices on water quality was measured as total ammonia-nitrogen, nitrite-nitrogen, and pH which were taken once per week. After 106 days, the overall means for total ammonia-nitrogen were significantly higher ($P < 0.05$) in ponds stocked at 61,000/ha (0.69mg/L) than ponds stocked at either 35,000 (0.51mg/L) or 48,000/ha (0.47mg/L); which were not significantly different ($P > 0.05$) from each other. Nitrite-nitrogen was also significantly higher ($P < 0.05$) for prawn stocked at 61,000/ha (0.04mg/L) than for prawn stocked at either 35,000 (0.01mg/L) or 48,000/ha (0.01mg/L); which were not significantly different ($P > 0.05$) by treatment and averaged 8.3 for all three treatments combined. These data demonstrate that stocking densities and feed rates used in commercial production and nutrient inputs can significantly impact water quality; however, the measured values in this study were probably not sufficient to cause negative impacts on prawn health or growth.

13. Christine M. Pasatta

University of Kentucky

Faculty Sponsor: Rick Hoyle

Effects of Social Acceptance and Rejection on Self-Esteem

Current psychological research on self-esteem focuses on the various factors that give rise to feelings about the self. One theory posits that self-esteem is based on the degree to which one feels included in a group. Another theory proposes that self-esteem comes from many domains that may or may not include belonging to a group. This experiment seeks to examine the effects of social acceptance and rejection on self-esteem. Participants were identified as having self-esteem that is based on inclusion-exclusion in a pre-screening measure. During the experiment they wrote about a time in which they were included or excluded from a group. The experiment concluded with measures of self-esteem. The predictions are that high self-esteem people whose self-esteem is predicated on inclusion-exclusion will show a defensive reaction that results in an ironic but temporary boost in self-esteem following an experience of exclusion. Low self-esteem people whose self-esteem is based on inclusion-exclusion are expected to show a temporary decline in self-esteem after an experience of exclusion. Self-esteem should temporarily rise for high and low self-esteem people following an experience of social inclusion.

14. Elizabeth A. Dennemann

Northern Kentucky University

Faculty Sponsors: Doug Krull and Robin Bartlett

The Bias of Illusory Bias: Legal Judgments and Estimates of Legal Judgments

The goal of this research was to investigate legal judgments and what people think about legal judgments. One-hundred-sixty-eight participants read a scenario about a 35-year-old male African-American or Caucasian target convicted of assault, embezzlement, or negligent homicide. Participants indicated the number of years in prison that the target should receive and made several other judgments. Participants also indicated how most people would answer these questions. No ethnic biases in sentencing decisions were found for any crime. However, differences were found in participants' estimates of the sentences that most people would recommend. For both assault and embezzlement, significant interactions were found. Participants estimated that the Caucasian target would receive a more lenient sentence than what was actually given, and that the African-American target would receive a more severe sentence than what was actually given. For negligent homicide, only a main effect was obtained such that estimates were more lenient than the sentences targets actually received. Effects for the number of years that the target should be in prison before being considered for parole were similar. No significant biases with regard to the target's ethnicity were found. However, participants' estimates revealed effects similar to those for sentencing. Although no actual biases with regard to the target's ethnicity were obtained in the current investigation, such biases can occur. However, the current results suggest that participants can also see biases where none actually exist.

15. Adam Green

Murray State University

Faculty Sponsor: Howard Whiteman

Factors Affecting Seasonal Migration of Herpetofauna Within Ledbetter Embayment

Reptiles and amphibians are important indicator species of the health of an ecosystem. However, little research has been conducted on the ecology of reptiles and amphibians within man-made reservoirs. This study focuses on the variables that affect movements of herpetofauna within Ledbetter Bay on Kentucky Lake, a reservoir of the Tennessee River. From April 2002 to October 2002, numerous species of herpetofauna were captured, and environmental variables, such as water depth, water and air temperatures, and lake elevation, were recorded. Red-eared sliders, Ouchita map turtles, and musk turtles were the most common species captured within the embayment. Preliminary analyses suggest that date, along with other correlated variables, seem to affect the abundance of each species, but in differing ways. Movements of recaptured turtles are currently being analyzed.

16. Eric Robinson

Morehead State University

Faculty Sponsor: Charles E. Mason

Geologic Map of the Southern Half of the Pond Run 7.5 Minute Quadrangle, Scioto County, Ohio.

The purpose of this study was to map the bedrock geology of the southern half of the Pond Run 7.5' Quadrangle. The study area is located in southernmost Ohio, along the Ohio River. The majority of Pond Run mapped is found within Shawnee State Forest. This area has dendritic drainage, moderate relief (750 feet), and is heavily vegetated. Bedrock geology of Pond Run is composed of siliciclastic rocks of Devonian and Mississippian age, which dip to the southeast at less than 1.0 degree per mile. Lithologic units encountered from oldest to youngest are: Cleveland Member of the Ohio Shale (Devonian), Berea Sandstone/Bedford Shale undifferentiated (Devonian), Sunbury Shale (Mississippian), Cuyahoga Formation (Mississippian), and the lower part of the Logan Formation (Mississippian). Additionally, Quaternary alluvial deposits were mapped along the Ohio River. The primary field methodology was the utilization of a Brunton Multi-Navigational System with a built in altimeter to record position of contacts and their elevations. The area was structurally contoured on the base of the Sunbury Shale. No faults or other structural features were noted. Pond Run contains significant slumping in its southwestern corner, especially where the Bedford Shale thickens in the Berea/Bedford interval. Additional slumping occurs in the base of the Cuyahoga Formation where the Henley Shale Member thickens. Slumping is generally triggered by deforestation or over-steepening of these slopes. Key discoveries in this mapping project include neptunian dikes in the Ohio Shale and the first zonal conodont assemblage (Upper duplicata Zone) from the Sunbury Shale. These discoveries exemplify the need for detailed geologic mapping in the field at a 1:24000 scale.

17. **Jennifer K. Quammen**

North Kentucky University

Faculty Sponsors: Richard D. Durtsche

Do Tadpoles have a Stomach: Evidence of Enzymatic Activity in the Wood Frog (Rana sylvatica).

Digestive physiology in anuran tadpoles is a relatively unstudied area of biology. The gastrointestinal tract in these larvae consists of a relatively simple tube with little differentiation of distinct organs. An enlarged section of the foregut, the manicotto glandulare, is suspected to have gastric function. This manicotto glandulare is acidic in pH and morphologically different from the otherwise long and tubular gut. The activity of digestive enzymes reported varies considerably. We are interested in understanding the digestive characteristics of anuran larvae, specifically enzymatic activity. Quantitative enzymatic assays for pepsin, lipase, amylase and trypsin were measured for entire GI tract from homogenate in the larval anuran, *Rana sylvatica*. Activity was detected for each of these enzymes within the gut. The enzyme of highest activity was trypsin, followed by lipase, amylase, and pepsin. The presence of a functioning stomach has not been verified in larval tadpoles. Our examination of digestive enzyme activity also included quantitative pepsin assays for five sections of the GI tract to determine the position of maximal pepsin activity. From these data, *R. sylvatica* tadpoles were found to have the highest level of pepsin activity in the area of the manicotto glangulare, suggesting that it is an enzymatically functional stomach.

18. **Joshua Kitchens**

Murray State University

Faculty Sponsor: Bommanna Loganathan

Polychlorinated Biphenyls and Chlorinated Pesticides Concentrations in Fish from Kentucky Lake.

Polychlorinated biphenyls (PCBs) and chlorinated pesticides are well known environmental pollutants and responsible for serious environmental and health problems. One of the major routes of human exposure to PCBs and chlorinated pesticides is consumption of contaminated fish. The purpose of this study is to measure the levels of PCBs and chlorinated pesticides in Kentucky Lake fish. Several species of fish were collected from selected locations in the Kentucky Lake. The samples were dissected and only edible flesh portions were analyzed for PCB congeners and selected chlorinated pesticides. Standard analytical procedures were followed to measure the compounds in fish. In general, total PCB concentrations in fish fillet were relatively higher than the pesticides. Total PCB concentrations in Kentucky Lake fish ranged from 1.6 ng/g wet weight to 73 ng/g wet weight. Chlorinated pesticide concentration in fish ranged from 1.14 ng/g wet weight to 3.3 ng/g wet weight. The levels of PCBs and chlorinated pesticides in Kentucky Lake fish were below the Food and Drug Administrations established limits for human consumption.

19. **Jamie Thompson and Jordan Hall**

Eastern Kentucky University

Faculty Sponsor: William W. Farrar

An Improved Purification Protocol for Chicken Muscle Beta-enolase

Enolase is a Mg^{2+} -dependent metalloenzyme in the glycolytic pathway that catalyzes the dehydration of 2-Phosphoglyceric acid (2-PGA) to Phospho(enol)pyruvate (PEP). In vertebrate organisms there are three genes, designated as alpha, beta, and gamma, that code for enolase subunits of the same designation. Since vertebrate enolases are dimers, there are six possible molecular forms (isoforms). The enolase isoform in vertebrate muscle is the beta-enolase. Chicken muscle beta-enolase has previously been purified by a research group in Japan, but the protocol used nine procedures involving six column steps, and a yield of 5.5%. Our protocol uses three procedures involving one column step. The purification scheme is fast, requiring only 1.5 days to complete, and results in homogeneous enolase having a specific activity of 121 Units mg protein. The isoelectric point (pI) was determined to be 7.3, close to the theoretical pI of 7.2. The X-ray crystallographic structure of enolase is known only for enolases from yeast, lobster, and *E. coli*. Thus, no vertebrate enolase structure is presently known. Therefore we have initiated crystallization trials in an effort to obtain suitable crystals for structural studies at the Kentucky Center for Structural Biology.

20. **Donald D. Patton**

Morehead State University

Faculty Sponsor: Wesley White

Apomorphine-induced Acute Withdrawal in Rats.

Moderate doses of amphetamine (AMPH) produce an immediate stimulant state (during the first several hours post-drug and indicated by excessive locomotion) and an acute withdrawal (around hour 20 post-drug and reflected in hypoactivity), followed by a recovery (beginning around hour 24 post-drug and reflected in a normalization of activity). The purpose of the study was to determine whether the selective dopamine agonist apomorphine (APO) could mimic these changes in activity. Adult male Wistar rats were treated four times at 96-hour intervals: Two control treatments were followed by two drug treatments. Two hours before each treatment, animals were placed in individual open fields (45 cm square), where activity was quantified, with arrays of infrared detectors, for 33 hours following each treatment. While in the open fields, animals were on a 12-12 hour light-dark cycle and had free access to food and water. For drug treatments, different groups of rats received AMPH (2.0 mg/kg, sc) or APO (1.0 or 2.0 mg/kg, sc). All treatments occurred at lights on. APO, like AMPH, produced both hyperactivity immediately post-drug and hypoactivity around hour 20 post-drug, followed by normalization of activity beginning around hour 24 post-drug. Dopaminergic systems appear to be involved in acute withdrawal and recovery from AMPH administration.

21. Michelle Fry

Northern Kentucky University

Faculty Sponsors: Denice Robertson

Investigating the Link Between a Dinoflagellate and Marine Head and Lateral Line Erosion on "Zebrasoma scopas" (brown sailfin tangs).

Fish diseases in aquariums both commercial and personal are common, and captive fish are very susceptible to disease. The goal of my research was to determine if there is a link between a dinoflagellate and a serious fish disease Marine Head and Lateral Line Erosion (MHLLE). MHLLE was found to be affecting fish in the Coral Reef Tunnel Exhibit at the Newport Aquarium, Newport, Kentucky, USA. I found a dinoflagellate, tentatively identified as "Amyloodinium sp.", which appears to be associated with the diseased fish. The dinoflagellate exists in association with marine sponges, many protista, and other invertebrates and has proven difficult to isolate. It forms cysts and is very resilient to known disease treatments. Water samples from the exhibit tank were cultured and the bacterial cultures allowed us to eliminate bacteria as a cause of MHLLE. The dinoflagellate was added to experimental tanks, which contained the dinoflagellate and healthy brown sailfin tangs, "*Zebrasoma scopas*". Control tanks were also setup, which contained healthy "*Z. scopas*" only. Visual assessments using a 35-millimeter and digital camera were used to determine the progression of the disease, while a compound microscope was used to determine if the dinoflagellate was present in the tanks. The results thus far suggest that the dinoflagellate does cause MHLLE, and the mechanism appears to be parasitism of the dinoflagellate on the fish.

22. Melissa Engleman

Murray State University

Faculty Sponsor: William Spencer

Allelopathic Interactions Among Flora of the Ledbetter Embayment Mudflat

Observations of the plants living on the Ledbetter Embayment Mudflat of Kentucky Lake have led to testing for the presence of allelopathy. Observations of *Eleocharis* were the inspiring factor of the study. Allelopathy is defined as the direct or indirect effect of one plant on another through the production of organic chemical compounds that escape into the environment. These organic chemicals are known as allelochemicals and can be produced through the leaves (leachates) and roots (exudates) of a plant. Allelopathic interactions have been observed using lettuce seed assays and photosynthetic rate comparisons. Statistical results indicate the presence of allelopathy in the mudflat environment. The plants tested in this study include: *Eleocharis acicularia*, *Potamogeton diversifolius*, *Rotala ramosior*, *Sagittaria montevidensis*, *Justicia americana*, *Xanthum strumarium*, and a species of the genus *Carex*. The purpose of this study is to determine the role and importance allelopathy plays but not the chemical nature of the allelochemicals involved. Several tests can be done using these plants to determine the importance of allelopathy in the environment, but actual field tests are difficult to conduct. Further study is planned to determine the importance of allelopathic interactions in the mudflat environment.

23. Mandi Benson

Eastern Kentucky University

Faculty Sponsor: Robert W. Mitchell

The Emotional Experience of Music.

In this study, we examined whether people listening to music experience emotions which are congruent with those the music was intended to express. Eastern Kentucky University student participants were randomly assigned to listen to one of three 4-minute musical selections: one was intended to express happiness; another sadness; and the third (Balinese music) acted as a control, as it has an ambiguous emotional expressiveness which is somewhat irritating to Western ears. After listening to one piece of music, participants completed a questionnaire in which they rated their experience of 25 emotions on a 6-point scale (from 0 to 5). (Questionnaires were counterbalanced for order of emotions.) We expected (for the "happy" and "sad" pieces) that participants would experience emotions consistent with the emotions the music was intended to express. We analyzed participants' ratings for 3 emotions (happy, sad, and irritating) using ANOVA. Participants rated the "happy" piece as happy (with an average rating of 3.7) and also rated it as happier than the "sad" piece. Participants rated the "sad" piece as sadder than either of the other two pieces, but their rating of sadness was only 2.4, a rating just below the middle of the ranking scale. Participants did not experience the Balinese music (or any of the other pieces) as irritating. Apparently participants are aware of emotional expression in music, though more so when the emotion expressed is happiness than when it is sadness.

24. John Scott Stauble, Jr.

Morehead State University

Faculty Sponsor: David K. Peyton

Deletion Analysis of the DNA-Binding Domains of HNF-3 Factors

The Alpha-fetoprotein gene in rodents is regulated by a promoter and three enhancer elements. Members of the Forkhead Box (Fox) family of transcription factors actively bind to the upstream regulatory elements of the AFP gene. One member, HNF-3b (now called FoxA2), can bind to the promoter and repress activity when assayed in tissue culture cells. A PCR-generated clone of HNF-3b that contained only the DNA-binding domain (DBD) of the protein was effective in repressing activity, in spite of lacking the transactivation domain. To localize the critical region of the DBD that was sufficient to confer repression, a series of mutants were generated that had successive deletions from either the amino, carboxy, or both ends of the protein. The deletion mutants were subsequently cloned into a mammalian expression vector (pTARGET) and then assayed for their DNA-binding activity by electrophoretic mobility shift assay. The mutants were also co-transfected with an AFP promoter reporter construct to determine if the deletion mutants retained the repressive capacity of the full-length DBD clone. Our data indicate that a significant portion of the full-length DBD can be removed without destroying binding ability or repressive activity. Our analysis has now been extended to include the HNF-3 alpha factor. Currently we are in the process of generating a new series of clones to analyze this related but functionally distinguishable transcription factor.

25. **Kimberly Freeman**

Murray State University

Faculty Sponsor: Ken Wolf

Preliminary Plans for Land Between the Lakes: The Early Sources of Later Controversy

The development of Land Between the Lakes National Recreation Area between the Cumberland and Tennessee Rivers came to be associated with controversy and tenacious resistance to the project on the part of residents of that area. However, this was not always the case. In the early years, there was considerable support for the project from a host of local residents, business leaders, and public officials. They were united in their belief that Land Between the Lakes would be a tremendous opportunity for the area, bringing in millions of dollars in added revenue for an area that was traditionally very poor. In fact, there was such enthusiasm for the project that control of development was turned over to the Tennessee Valley Authority in order that the project be undertaken with greater speed. Despite the enthusiasm that surrounded the planning stages of the project, this paper will show that there were discreet signs of the discontent that was to come. Actions taken and other actions that were deliberately not taken by the Tennessee Valley Authority led residents of the area to believe very strongly that TVA was trying to cheat them out of what was theirs. Why was there such a wide disparity between the intentions of the Tennessee Valley Authority regarding development and what residents understood their intentions to be? To answer the question, this paper will examine the early attention given to the project in local and national newspapers, government documents, and TVA press releases.

26. **Eniolami Dosunmu**

Kentucky State University

Faculty Sponsor: Kazi Javed

Synthesis and Reactivity of 1,3,7,7-Tetramethyl-4H,10H-6,8,9-trioxa-2-thia Benzo[f]azulen-5-one

Meldrum's acid is an attractive substitute to acyclic malonate esters in organic synthesis. Monoalkylated malonic acids and esters have found importance in pharmaceuticals as useful organic synthons. Dialkyl Meldrum's acids are versatile synthetic intermediates and their applications in organic reactions have been well documented. In this study, we performed reaction of two equivalents of Meldrum's acid (2,2-dimethyl-1,3-dioxane-4,6-dione, isopropylidene malonate), with one equivalent of 3,4-bis(chloromethyl)-2,5-dimethyl-thiophene or bis(bromomethyl)-2,5-dimethylthiophene which resulted in the kinetically favored O-alkylated product 1,3,7,7-tetramethyl-4H,10H-6,8,9-trioxa-2-thia-benzo[f]azulen-5-one in high yield.

27. **Michael J. Caudill**

University of Kentucky

Faculty Sponsor: Frank R. Ettensohn

Dinosaur Trackways in the Cretaceous Glen Rose Formation of South Central Texas

The Cretaceous Glen Rose Formation in Texas has long been made famous for its content of superbly preserved dinosaur trackways. The most famous of which are found near the city of Glen Rose itself in Dinosaur Valley. The trackways preserved there have been interpreted by ichnologists in a number of ways over the years; the most dramatic and most popular of which tells the story of an attack by a predatory dinosaur (a mid-sized Carnosaur) on a sauropod, the gargantuans of the Cretaceous world. The work that I am currently a part of, however, is not focused on working out the ichnological details of a track site. My goal for this project is to gain an understanding of the geologic environments in which these creatures lived and some insight into the processes that influenced and/or dominated their lives. This is being done primarily through analysis of stratigraphic relationships between lithologies within the study area, as well as characterizing the paleoenvironments that those lithologies represent. The study area is located in Canyon Lake, Texas in the heart of the hill country. Unfortunately this portion of Texas has not been mapped geologically, and the Glen Rose itself has not been broken down and described on a depositional environment scale. Hopefully, this project will produce at least one more portion of the Glen Rose Formation in which depositional environments are firmly attached to the ichnological record.

28. **Melissa A. Miller**

Northern Kentucky University

Faculty Sponsors: Richard D. Durtsche

Nutrient assimilation in Green Frog tadpoles (Rana clamitans).

Green frogs (*Rana clamitans*) are a ubiquitous anuran species in Kentucky, and previous investigations have shown their larvae to consume algae as the largest component of their diet. Other studies on conspecifics have documented that detritus, and not algae, is the major dietary food. Our study investigates the assimilation of nutrients based on a strict algal diet in *R. clamitans* tadpoles. Through a series of feeding experiments using algal foods in a “tadpole jello” presented to the larvae, we were able to measure various nutritional components of the diet. We analyzed energy content with bomb calorimetry, crude protein with Kjeldal’s technique, percent organic matter from ash-free dry weight, and various macrominerals (including: Ca, P, and Mg) with color spectrophotometry. Food passage rate were also measured both at the beginning and end of the study using fluorescent dye markers in the jello. In addition, ammonia levels were monitored throughout the study.

29. Dawn Virag

University of Kentucky

Faculty Sponsor: Susan Barron

Neonatal Exposure to Agmatine Does Not Improve Spatial Memory in Ethanol Exposed Rats.

Children exposed to ethanol prenatally show a variety of behavioral problems including learning and memory deficits. In this study, we investigated the effects of neonatal ethanol and/or agmatine exposure on spatial learning using a rodent model. The neonatal exposure model is used because this developmental period is similar, in terms of central nervous system development, to the third trimester “brain growth spurt” in humans. While ethanol affects many areas of the brain, the hippocampus (important for learning and spatial memory) appears particularly sensitive. Agmatine is thought to protect the brain during ethanol withdrawal by decreasing neuronal death due to over-excitation, thus possibly reducing some of ethanol’s effects. Rats were intubated twice daily with either ethanol, agmatine, both ethanol and agmatine, or an isocaloric control diet. A non-treated control group was also included. At 30 days of age, offspring (10/sex and treatment group) were tested in the Barnes Maze, a circular platform with 18 holes around the edge and an escape box hidden under one of the holes. The subject had to learn to find this escape box to avoid bright light and noise. We hypothesized that neonatal rats exposed to ethanol would show poorer performance on this spatial task, however, results indicated that performance was not significantly impaired. Further work is currently underway to make the task more difficult. These results are also in contrast with other recent findings from our laboratory suggesting that ethanol impaired balance and coordination, with improved performance by offspring that received ethanol and agmatine.

30. Wensa Juleus

University of Louisville

Faculty Sponsor: Barbara Burns

Temperament and Attentional Processes in Children Born Prematurely

Many children born prematurely have problems in school including being held back a grade level or being involved in special services. The purpose of the current study was to examine an aspect of temperament, effortful control, to examine the impact temperament had on the self-regulation of attention and parent-child interactions. A sample of 15 children born prematurely and weighing less than 1000 grams at birth were tested around the age of 4 ½ years. Children completed a puzzle-copying task with their mothers and a week later, the children were given a similar puzzle to complete on their own. The children were also given the Kaufman Brief Intelligence Test (K-BIT) and the mothers assessed their child’s temperament by completing the Children’s Behavior Questionnaire (CBQ). Attention was assessed by the number of times the child’s gazes were self-regulated or other-regulated (by the mother). Premature children who had higher maternal ratings of effortful control appeared to have more self-regulation in the puzzle task with their mother. Premature children, who were unable to complete the puzzle task correctly while alone, received more attention regulation from their mothers during the puzzle-copying task in session 1. Temperament, more specifically, effortful control, appeared to impact the child’s ability to self-regulate their attention. Parents also appeared to play an important role in the development of attention regulation in their children born prematurely.

31. Sara Pace and Suresh Sah

Eastern Kentucky University

Faculty Sponsor: C. Frank Shaw III

Metallothionein Peptide 31-61 - A Model for Metal-induced Protein Folding

The full realization of benefits from Genomics, the cataloguing and analysis of an organism's genome, requires Proteomics, the study of protein structure and function, which is the next stage of the bioinformatics revolution. Proteins are produced in cells as linear polymers which must fold into their final, functional forms. One third of all proteins contain bound metal ions. Metallothionein is a protein that detoxifies Cd^{2+} , Hg^{2+} , oxidizing agents and alkylating antitumor agents, in addition to its role in Zn^{2+} and Cu^+ metabolism. Metallothionein is structureless until it folds in the presence of metal ions. Hence, it is an excellent model for studying protein folding. The 20 cysteine residues among its 61 amino acids form two domains: the a-domain with 11 cysteines and 4 Cd^{2+} ions and the b-domain with 9 cysteines and 3 Cd^{2+} ions. Our hypothesis is that folding of the a-domain is initiated when two Cd^{2+} ions bind to cysteines 33, 36, 37 at one end and cysteines 50, 57, 59 and 60 at the other end. A mutated a-domain in which the four remaining cysteines (33, 41, 44 & 48) were replaced with alanine residues was prepared commercially by Genesys. Our research on the reactions of this peptide with cadmium during summer 2002 revealed that the peptide-cadmium complex is more labile than the complete protein.

32. Kenyari L. Moore

Kentucky State University

Faculty Sponsor: George F. Antonious

Screening Wild Tomato Accessions for Sugar-Ester Contents

Both native and greenhouse populations of *Lycopersicon pennellii* Corr. (a wild relative of commercial tomato, *L. esculentum*) have sticky exudates known as sugar-esters (glycolipids) covering their leaves and stems. *L. pennellii* resistance to important vegetable pests has been attributed primarily to type-IV glandular trichome secretions. This study was initiated to extract and quantify sugar-esters in four wild tomato accessions (PI-503516, PI-246502=LA 716, PI-365972=LA 1277, and PI-414773) of *L. pennellii* which have long been known to entrap insect pests in their sticky exudates. Extracts of glandular trichomes containing sugar-esters were prepared in chloroform and reconstituted in ethanol. A simplified micro-colorimetric method was used for sugar-esters quantification. The method is based on breaking the ester-bonds between the sugar moiety and the fatty acids using sodium hydroxide and quantifying free glucose molecules liberated after hydrolysis. This simple, rapid, and accurate procedure can be used for screening wild tomato accessions of *L. pennellii* for sugar-ester contents

33. Sarah Mardon

University of Kentucky

Faculty Sponsor: James Hower

Impact of Coal Properties on Coal Combustion By-product Quality: Examples from a Kentucky Power Plant

Coal properties impact the quality of coal combustion by-products. Tracking impacts can often be difficult, particularly in the eastern United States, because utilities use blended coal feeds to meet their quality specifications. To circumvent this problem, we made arrangements for a single seam/single mine coal to be burned at a 200 MW boiler. The feed coal is a medium sulfur, high volatile A bituminous Fire Clay seam from Knox County, eastern Kentucky. The coal was mined over a two-week period in order to supply the utility with sufficient fuel for a two-day run. The coal was sampled as a whole channel and benches at the mine, as the shipped coal at the power plant, and as a pulverized coal prior to injection into the boiler. The pulverizer reject, commonly called “pyrites” by utilities, was also sampled. Fly ash was sampled from the economizers, two rows of mechanical hoppers, and four rows of electrostatic precipitator hoppers. Bottom ash also was sampled. The plant is not equipped for flue-gas desulfurization. Analyses on the mine and plant samples include, as appropriate, proximate/ultimate/ sulfur forms/heating value, major oxides, trace elements, x-ray diffraction, and petrographic composition. The influence of coal properties on fly ash properties in this isolated case will be discussed. While specially-arranged burns, such as for this study, are not representative of the reality of coal purchasing and coal combustion in the eastern US, attempts to follow a single coal through the process can be instructive for the purposes of understanding the origin and fate of trace elements in combustion.

34. Ashley Justice

Morehead State University

Faculty Sponsor: Ilun M. White

Prefrontal Cortex in Spatial Learning

The rat medial prefrontal cortex (mPFC) is hypothesized to be involved in spatial learning, behavioral flexibility or inhibition, and attention. Animal lesion studies that characterize specific functions of mPFC have yielded conflicting results. One factor varied across these experiments is lesion sites within mPFC (dorsal, ventral, or both). The present study examined functional differences between the dorsal and ventral mPFC in simple spatial discrimination, using reversible lesions. We hypothesized that the ventral, but not the dorsal mPFC, is critical for successful performance. Wistar rats were trained on a spatial discrimination task, which required a correct barpress matching the cue location. Upon reaching criterion (³ 85% correct, 3 sessions), rats were implanted with bilateral cannulae aimed at mPFC (dorsal or ventral). Post-surgery training resumed after a 5-7 day recovery period. Once performance reached a pre-surgery criterion, either lidocaine (2%) or saline was infused (0.5 ml/site), 5 min prior to testing on the task. Lidocaine and vehicle infusions were counterbalanced within subjects, allowing 2-3 days between infusions. We found that lidocaine infusions into the ventral mPFC, but not the dorsal mPFC, decreased correct responses. Vehicle infusions in neither region affected performance. This was consistent with our preliminary observation that permanent, excitotoxic lesions in the ventral mPFC disrupt acquisition of spatial discrimination. The present findings support our hypothesis, and suggest that the integrity of the ventral, but not the dorsal mPFC, is required in spatial discrimination.

35. **Pete Wilson**

Northern Kentucky University

Faculty Sponsors: Kevin G. Kirby

An Interactive 3D Floorplan Viewer

This project is an interactive 3D environment that demonstrates collision detection and clipping algorithms based on linear algebra. It uses Microsoft's DirectX8.1 application user interface designed for high-end real time applications. The program is written in C++ and is about 3,000 lines of code. It reads in a two - dimensional floor plan, specified by the user, and constructs a three dimensional world in which the user can move around freely. In each room there are flickering ceiling lights and textured floors and walls. The user will see a floating ball randomly moving through the rooms (which the user can chase). The user also has the option to view the world from a bird's eye perspective. This project is an integration of mathematics and computer science. I used two types of algorithms for detecting collisions between moving objects in the world: a bounding-box / plane intersection algorithm, and a custom algorithm based on winding number calculations to detect whether an object is at the border of a virtual room. Occlusion clipping was used to optimize performance.

36. **Lindsay Hopper**

Western Kentucky University

Faculty Sponsor: Michael Carini

Optical Photometric Monitoring of Gamma-Ray Bright BL Lacertae Objects

BL Lacertae objects are the most extreme members of a class of objects known as Active Galactic Nuclei. Most models of the AGN phenomena involve a central, supermassive black hole, surrounded by an accretion disk. Perpendicular to the accretion disk are two jets of material, and the type of source we see depends on the angle the jet makes with the line of sight and the strength of the jet itself. In the case of BL Lac objects, the jets are aligned with the line of sight, and the radiation is being beamed directly at us. The defining characteristics of BL Lac objects are large amplitude continuum variability at all wavelengths, a featureless optical continuum, and large amplitude, highly variable polarization. Variations on the timescale of hours are known as micro-variability, and represent the fastest variations observed in these sources and thus (via light travel time arguments) provide the tightest constraints on the size of the emission region. Using the 0.6m telescope at the Bell Observatory of Western Kentucky University we obtained observations of BL Lacertae in B and I filters to 1) set limits to the size of the emission regions responsible for any observed microvariability and 2) test models of the jet physics and of the origin of the seed photons responsible for the observed gamma-ray emission.

37. Jessica Skeens

Morehead State University

Faculty Sponsor: Ilsun M. White

Caudate-Putamen in Hyperactive Behavior in Rats

Previous neurophysiological studies indicated that in rats amphetamine produced hyperactivity and also excited neurons in the caudateputamen (the dorsal striatum). The present study further examined the involvement of the caudate-putamen (CPu) in amphetamine-induced hyperactivity in rats, using CPu lesions and direct infusions of amphetamine into CPu. In Experiment 1, rats received either NMDA or sham lesions in CPu. In Experiment 2, rats were implanted with bilateral cannulae, aimed at the dorsal CPu. Our hypothesis was that CPu lesions would suppress amphetamine-induced hyperactivity, and that direct infusions of amphetamine into the CPu would produce hyperactivity. Activity of each animal was measured by distance traveled in an open-field. Data were recorded every 5 min for a 60 min period, during habituation, vehicle, and amphetamine sessions, occurring on different days. During habituation, distance traveled did not differ between lesioned rats and the controls. Following systemic amphetamine injection (1mg/kg, i.p.), rats with CPu lesions and the control rats showed comparable markedly enhanced behavioral activity. We also found that amphetamine (10mg/ml, 0.6ml/site) infusions into CPu failed to produce hyperactivity. Our data suggest that CPu lesions failed to block amphetamine-induced hyperactivity, and that amphetamine-induced hyperactivity is not directly mediated by excess dopamine within CPu. Our hypothesis was not supported by the present findings. Given that amphetamine infusions into the nucleus accumbens (the ventral striatum) reliably produce hyperactivity, future research on regional specificity within the striatum in psychostimulant-related behavior is warranted.

38. Satinder Sidhu

Murray State University

Faculty Sponsor: David Canning

Autonomous Differentiation of the Head Region in Chick Embryos

The growth and differentiation of the presumptive head region in chick embryos has been studied. In amniote embryos, the head forms from a small region of epithelium immediately anterior to the notochord. This area, referred to as the prechordal plate, is thought to be under instructive signaling influences emanating from the underlying endoderm that ultimately dictates the morphogenesis and cytodifferentiation of cells of the head. However, it is not known how cell interactions in the prechordal plate lead to morphogenesis of head tissues. In this study, presumptive head regions from very early chick embryos were cultured in isolation for periods of 24-48 hours. The cultures were cryosectioned and probed with fluorescently labeled monoclonal antibodies to reveal specific patterns of adhesion molecules and extracellular matrix molecules. Images of the cultures were digitized with peltier-cooled photomicroscopy in order to detect the expression of various extracellular matrix and cell surface adhesion molecules known to influence the differentiation of cell types during development. We have found that the expression pattern of chondroitin sulfate can be correlated to autonomous head development in culture. Furthermore, expression pattern of N-cadherin in these cultured heads suggests a synergistic mechanism of extracellular effects that may determine cellular mechanisms of head development in the normal embryo. Taken together with the expression of genes during early chick development, this study suggests the head develops autonomously and independent of the embryonic axis.

39. Karen L. Laufer

Morehead State University

Faculty Sponsor: Philip E. Prater

Serum Biochemical and Hematological Profiles in Sheep After Oral Administration of the Anthelmintics, Eprinomectin and Moxidectin

Parasitism in small ruminants is the most economically devastating disease today in the United States. As parasites, such as *haemonchus contortus*, become increasingly resistant to common anthelmintic agents, newer anthelmintics, such as eprinomectin and moxidectin, are receiving more use by sheep and goat producers. Eprinomectin and moxidectin belong to the class of anthelmintics known as macrocyclic lactones. Although eprinomectin and moxidectin have demonstrated an excellent safety record in beef and dairy cattle, there is no specific data on their effect on the physiologic and biochemical functions of sheep. It was the purpose of this study to demonstrate the safety of eprinomectin and moxidectin in sheep. Fifteen (15) ewes ranging in age from 1-2 years of age were selected from the Morehead State University Sheep Program. Five of the ewes served as controls and received a placebo (sterile plant-based oil), orally. Ten ewes were assigned to two treatment groups of five animals each. One treatment group received a one-time dose of eprinomectin (1ml / 22lbs. body weight) orally. The other treatment group received a one-time dose of moxidectin (1ml / 22lbs. body weight) orally. Blood samples from both groups were obtained pre-treatment and at 48 hours, 7 days, and 14 days post-treatment. Hematological and biochemical analysis included complete white and red blood cell counts, hemoglobin content, liver and kidney function parameters, serum glucose, total protein, and electrolytes. Statistical analysis of these groups (hematological and biochemical profile analysis) demonstrated no significant differences between pre- and post-medication in control, eprinomectin treated, or moxidectin treated animals. No overt clinical side effects were noted in the control or treatment groups of sheep. These results indicate that oral administration of the anthelmintics eprinomectin and moxidectin may be safe and effective for small ruminants in its current formulation and could be a marketable drug for sheep and goat producers, pending approval by the FDA.

40. Whitney Wills

Western Kentucky University

Faculty Sponsor: Michael Carini

Long Term Monitoring of Active Galactic Nuclei with Bell Astrophysical Observatory

Active galactic nuclei (AGN) are some of the most energetic objects in the Universe. They are composed of an ordinary elliptical galaxy with a super massive black hole at the center. A disk of material, called an accretion disk, surrounds the super massive black hole, and jets of material moving at nearly relativistic speeds are emitted perpendicular to the disk. In the BL Lacertae class of AGN jets are pointed almost directly along the line of sight, resulting in large amplitude, erratic brightness variations. Our primary goal is the monitoring of the brightness variations of BL Lac objects and using these variations to investigate the physics at work in these objects. BL Lacs are the most extreme example of an AGN with highly variable continuum emission as one of their defining characteristics. We have undertaken a program to monitor these continuum variations by using the Bell Observatory 0.6m telescope. Undergraduate students run the sessions from WKU's campus via the Internet or on-site. The telescope is equipped with CCD camera, which is used to obtain data that is then transferred to WKU's campus where it is archived and analyzed by undergraduate students. I will report on the results of the first year of monitoring BL Lacertae objects, specifically BL Lac, A0235+164, 3C 66A, and MRK 501.

41. Lindsay Sharp and John Cox

University of Kentucky

Faculty Sponsor: Donald A. Saucier

The Effects of Race and Prejudice Level on the Influence of Famous Figures.

We hypothesized that varying the race and prejudice level of a famous individual would alter participants' reactions to the individual, evaluation of the individual, and performance on numerous racism measures. One-hundred and fourteen White undergraduate students participated in a 2 (race of the famous individual: black or white) x 2 (prejudice level of the individual's statement: prejudiced or non-prejudiced) independent groups factorial design. Our results showed that participants had more negative reactions towards the prejudiced, White individual than towards the Black, and felt significantly guiltier and after reading the prejudiced, White individual's statement than participants in the prejudiced, Black condition. Further, the participants expressed less prejudice when exposed to the high-prejudiced White individual than when exposed to the low-prejudiced White individual, contrary to our predictions. These results demonstrate that exposure to extreme opinions of high-prejudiced in-group members may actually reduce the expression of racism.

42. Joshua T. Cooper

Northern Kentucky University

Faculty Sponsors: Miriam Steinitz-Kannan

Digital Imagery of Diatoms from the Upper Ohio River Basin

As a cosmopolitan group of organisms, algae are important water quality indicators. Diatom taxonomy has been recorded from many aquatic systems all over the world. Distinguishing between diatom species involves observations of detailed physical characteristics and specific measurements. We are compiling a taxonomy database of diatom images from the Ohio River Basin as a baseline for identification of common species. The Ohio River was sampled every 5 miles from Pittsburgh, PA to Rising Sun, IN including selected tributaries. The samples were collected using a 10- μ m mesh plankton net during the first week of August 2001 and 2002 as a part of River Run. Samples were boiled in concentrated Nitric Acid to remove all organic material in order to have an unobstructed view of diatom physical characteristics. The diatoms were mounted in Naphrax® mounting medium and counted under oil immersion (1000X) using a compound light microscope. The images were captured using an Olympus D-12 digital camera. Common taxa consisting of mostly centric forms include five species of Aulacosiera and five species of Cyclotella, which are found throughout the length of the river. These forms can be difficult to identify to species or variety. This database will be useful to distinguish between similar species found in the Ohio River Basin so that indicator species can be more easily identified

43. Daniel Hatcher

Western Kentucky University

Faculty Sponsor: Christopher Groves

Agents of Poor Water Quality in Carchi Province Ecuador

Twenty-two thousand people, primarily indigenous agrarians, live in the 100,000 hectares supplied by the river El Angel located in the northern highlands of the Carchi Province of Ecuador. The highly mineralized volcanic soils of the region are intensely used for the competitive potato-farming business. This rivalry for potato sales in the province lead to intense use of pesticides on the crops, in many instances seven applications per growing season. This study was conducted to understand the persistence of the poor water quality of the region leading to high skin cancer, and the highest colon and stomach cancer rates reported in Ecuador. An interview with Christopher James, the director of the Guandera Biological Station, located in the province, who is involved in local and regional health improvement councils was the primary source of the studies' information. It was established that lack of farmer education, lack of success of cleaning and transport facilities, lack of aid from developed nations, resistance from environmentalists and the dehumanization of the indigenous population of the northern territory were the sources of the problem of water quality and lack of assistance given to the local communities attributed to the persistence of this issue.

44. Christopher P. Garris and Chrystin N. Hudson

Morehead State University

Faculty Sponsor: Laurie L. Couch and David R. Olson

Mental and Physical Health Predictors After Romantic Betrayal

Participants were 123 victims of romantic betrayal (55 males/68 females, mean age = 34.8 years) who volunteered to be in the study in exchange for monetary compensation. Each completed a questionnaire that asked participants to describe their worst experience as a victim of romantic betrayal, and to complete a widely used measure of adult attachment (Hazan & Shaver, 1987) and a checklist of mental/physical health symptoms experienced within the first month after betrayal. Participants were divided into three groups based on the attachment measure, yielding groups of avoidantly attached (those who feel very uncomfortable with intimacy and lack basic trust in others), anxious-ambivalently attached (those who are nervous about intimacy but seek it anyway to quell their doubts), and securely attached individuals (those who are comfortable with intimacy and trusting of their partners). Using a multivariate analysis of variance (MANOVA) technique, the three groups were compared to determine if attachment style was related to the number of mental and physical health symptoms reported by victims. Results indicated that securely attached individuals reported significantly fewer symptoms of major depression and serious anxiety reactions after betrayal, as well as fewer physical health symptoms, than those who were avoidantly attached. Implications for identification and treatment of individuals who are at risk for mental and physical health problems after betrayal will be discussed.

45. **Janine Perkins**

Murray State University

Faculty Sponsor: Edmund Zimmerer

Sympatry or Intergradation Between L.t. sypila and L.t. elapsoides in Western Kentucky
Lampropeltis triangulum sypila (the Redmilk Snake) and *Lampropeltis triangulum elapsoides* (the Scarlet Kingsnake) are small to medium tricolored snakes belonging to a much larger group that ranges throughout most of the US, Mexico, Central American and much of South America. Although currently listed as members of the same species, there is a growing belief that they may in fact represent two distinct species. In western Kentucky where both occur, they have been described by some as intergrading, and by others as living in sympatry. To test these alternative hypotheses, we have analyzed mitochondrial 16s rRNA gene sequence from both subspecies to look for the presence or absence of gene flow. A comparison of the roughly 860 base pair sequence of 16s gene sequence from both subspecies shows nearly a seven- percent difference. Sequence from *L.t. sypila* from areas where both occur shows sequence identity to reference *L.t. sypila* from areas where only it occurs. Similarly, sequence from *L.t. elapsoides* from sympatric areas shows only identity to reference *L.t. elapsoides* from more southern reference populations where only it occurs. Although we are still in the process of collecting more samples, the data so far gives no indication of gene flow, and supports the second hypothesis that these two subspecies in western Kentucky are living in sympatry and acting as two true species.

46. **David Johnston**

Morehead State University

Faculty Sponsor: Scott A. Wymer

Surveying Information Technologies Currently in Use on the World Wide Web

The goal of this research is to assess the use of technologies and protocols across the World Wide Web today and in the future. This will be done through a robot agent, which will programmatically download, store and analyze websites and web server information. The results of these site examinations will be held in a database. The first step was to setup the server hardware and software to host the database and to run the robot agent program used to examine the websites. The server was setup using a Linux operating system, it hosted a MySQL database server and an Apache web server. The robot agent was written in PERL, and has been successfully implemented in preliminary testing. A key element was development of a database model to hold the complex data that describes a website, its hosting server(s), domain, and the owners of those items, as well as the structure and contents of the web pages at that site. Sources for URLs to start examining were extracted programmatically from online ranking sites. Over 20,000 URLs, along with rating information for the sites, have been extracted and written to the database. In the next stages, more URLs will be gathered, and the robot agent will begin to spider the list of collected URLs, collecting data on each site. The next major step will then be to parse all of the HTML pages and server responses, and analyze what types of technologies are being implemented and how they are being used.

47. Mike Mallott

Northern Kentucky University

Faculty Sponsors: David E. Hogan

Does a College-level Race / Gender Course Reduce Prejudicial Feelings Toward African Americans?

The present research employed the Modern Racism Scale (McConahay, 1986) to assess whether taking a course on race and gender issues reduces feelings of prejudice toward African Americans. Multiple regression analysis confirmed that four variables independently correlated with an end-of-semester assessment of prejudice: 1) Whether or not students had completed a race/gender course; 2) the student's disposition to think rigorously about complex problems (measured with the Need for Cognition Scale (Cacioppo, Petty & Kao, 1984)); 3) the student's disposition to avoid social disapproval (measured with the Marlowe-Crowne Social Desirability Scale (Crowne & Marlowe, 1960)); and 4) the student's willingness to take a race/gender course even if it were not a university requirement. The conclusion from the research is that a race/gender course does indeed produce a small but statistically significant reduction in racial prejudice independent of the effects of dispositional variables.

48. Kelli Harris

Eastern Kentucky University

Faculty Sponsor: Dave Eakin

University of Kentucky

Collaborators: Ruth E. Beattie

An Assessment of the Role of Multimedia in Enhancing Student Learning in Freshman Level Biology Courses.

Over the past five years, the number of biology multimedia products being commercially produced has increased dramatically. While some research suggests that students benefit from using computer-based instructional materials, there have been few studies conducted on the role of multimedia in enhancing student learning. During the summer 2002, a pilot project was conducted that assessed student perceptions of the value of multimedia supplements in enhancing student understanding of course concepts. The goals of this presentation are (a) to describe the pilot project, and (b) to discuss the preliminary results of the study.

49. Kathryn Adrian

Morehead State University

Faculty Sponsor: Lynn Haller

My Computer Reminds Me of a Rock, It Just Sits There: Gender Difference in Children's Production of Metaphor About Science Topics

The project aimed to determine whether modeling science metaphors to children (first, third, fifth grade) would increase their production of metaphors about science topics. Children participated in an open-ended interview about science topics. In the metaphor condition, the investigator modeled metaphors in order to encourage the use of metaphoric language. In the literal condition, children heard corresponding literal descriptions. The interview format was also manipulated. Children were asked both factual and experiential questions about science. The results demonstrated that children in the metaphor condition used more metaphors than children in the literal condition. Further, girls were more likely to use metaphors to communicate their knowledge of science than boys. Such a gender difference has not been found in previous metaphor production research. Finally, questions pertaining to experiential science topics were more likely to be answered metaphorically than questions pertaining to factual science topics. The project broadens our knowledge of children's understanding of science. Finally, it is the only project to examine children's expression of science metaphors. Science educators will find this information useful in developing teaching methods, understanding the way children acquire knowledge about their physical world and how children may develop misconceptions of that same physical world.

50. Rebecca F. Foltz

Northern Kentucky University

Faculty Sponsors: Mark E. Bardgett

Animal Models of Hippocampal Deficits in Disorders: Does Size Matter?

Many neuropsychiatric disorders, such as Alzheimer's disease, schizophrenia, and depression, are marked by memory impairment. Some researchers believe that these memory deficits may be due to disorder-related alterations in the size or shape of the hippocampus, a brain region important in learning and memory. Studies of experimentally-induced hippocampal alterations in laboratory animals may provide a means to develop better treatments for the memory deficits associated with neuropsychiatric disorders. To this end, we have characterized behavioral changes in rats with small and moderate hippocampal lesions. Adult male rats received intrahippocampal infusions of either a low or high dose of NMDA, a substance which produces neuronal loss in the hippocampus (i.e. a lesion). Beginning at two weeks post-lesion, all rats along with a control group were tested in several behavioral paradigms. The NMDA infusions produced modest and qualitatively dose-dependent neuronal loss in the hippocampus on a scale consistent with the hippocampal volume loss reported in many neuropsychiatric disorders. The results show that rats with large lesions produced by the high NMDA dose were hyperactive and displayed a clear spatial memory deficit. Additional studies have found that the novel antipsychotic drug, clozapine, can improve memory in rats with large hippocampal lesions. Our work demonstrates that some symptoms of memory loss found in people with neuropsychiatric disorders can be emulated in rats with hippocampal damage. More importantly, we are starting to identify drugs which may improve memory disturbances in neuropsychiatric disorders that may be a consequence of hippocampal dysfunction.

51. Evan K. McCasland and Chris M. Aud

Western Kentucky University

Faculty Sponsor: Christopher Byrne

Material Properties of Steel

The objective of this research project was to determine the influence of cold work and heat treatment on the formability of steel plates. Steel specimens were tested in tension to determine Young's modulus, apparent yield strength, ultimate tensile strength and ductility. Twenty-four specimens were tested for this project. Of these, twelve were annealed and twelve were tested as received. For each set of twelve, six were oriented with the original rolling direction and the remaining six were oriented normal to the rolling direction. Rockwell hardness of each specimen was also measured. The results indicated the direction of the grain had little influence over the steel strength. Annealed specimens exhibited a substantial reduction of strength and hardness compared to the material as received. Both hardness and yield strength were reduced by approximately 50%. This work demonstrated that the steel plate received had a significant amount of strain hardening that could be reduced by heat treatment making it easier to form in an industrial application.

52. Pasano B. Bojang

Kentucky State University

Faculty Sponsor: George F. Antonious

Insecticides From Wild Tomato: Trichome Counts and Contents

Wild species of plants contain numerous non-nutritive, bioactive compounds known as “phytochemicals”. Many of these compounds cause the leaf to be less suitable for insect growth and may influence leaf palatability. A significant positive correlation was found between the intensity of wild tomato leaf trichomes (leaf hairs) and mortality of many vegetable insects. Type-IV and type-VI glandular trichomes on the leaves of three accessions of *Lycopersicon hirsutum* f. *typicum*; six accessions of *Lycopersicon hirsutum* f. *glabratum*; two accessions of *Lycopersicon pennellii*; and one accession of *Lycopersicon pimpinellifolium* were counted monthly (January to December, 2001). Crude extracts prepared from the leaves of each species were also prepared in n-hexane and chloroform, separated, purified, and quantified using GC/MSD for biochemical composition. Monthly variations in concentration of methyl ketones, sesquiterpene hydrocarbons, and sugar esters (glycolipids) were determined. Considerable variations in biochemical constituents among accessions were detected.

53. Julie Herrmann, Micah Noyes, Valerie Heib, Ashley Murphy, and Sheila Ruark

Northern Kentucky University

Faculty Sponsors: Doug Krull

Miguel seems Scarier than Steve, but Only if You Meet Him in an Alley: Effects of Ethnicity and Locale on Perceived Dangerousness

This research investigated how dangerous a person seems. Hispanic targets might be judged more dangerous than Caucasian targets, depending on whether the setting encourages the application of the stereotype. Participants read about a 29-year-old man with a briefcase who was either standing in an alley or sitting on a park bench. The target’s name was Caucasian (Steve Jones) or Hispanic (Miguel Rodriguez). Participants indicated how approachable the man was, how comfortable they would be helping him with directions, and how dangerous he seemed, on 7-point scales. Higher numbers indicated less approachable, less comfortable, and more dangerous, respectively. The three dependent variables were correlated (r s of .63, .46, and .53, all p s=.001). These DVs were summed to create a perceived dangerousness index. A 2 (Ethnicity: Caucasian, Hispanic) X 2 (Locale: alley, park bench) ANOVA revealed a marginally significant interaction, $F(1,90)=3.73$, $p=.056$. Whereas perceived dangerousness was similar for the Hispanic ($M=8.39$) and Caucasian ($M=8.74$) targets when on a park bench, $F<1$, the Hispanic target ($M=12.29$) was judged to be more dangerous than the Caucasian target ($M=10.54$) when in an alley, $F(1,46)=4.37$, $p=.042$. Whether or not a stereotype is applied may depend not only on the target’s ethnicity, but also on whether the setting is consistent or inconsistent with the stereotype.

54. Nam Nguyen

University of Kentucky

Faculty Sponsor: Thomas Zentall

Complex Imitation in Pigeons

Developmental psychologists have often described imitation in humans as a complex process indicative of perspective-taking abilities. However, comparable imitative behavior has been identified in animals, which are generally not considered to possess such complex abilities as perspective-taking. Imitative behavior in these cases is not defined as one animal duplicating the behavior of another animal it observed. Several alternative accounts (e.g., social facilitation, stimulus enhancement, and emulation of affordances) could explain similar behavior between animals, potentially construed as imitation. Previous studies have sought to control for these variables by implementing either a bi-directional control or two-action method procedure. In both procedures observer animals witness behavior operated in one of two different ways by a demonstrator animal. For instance, an observer pigeon views either a demonstrator pigeon pecking or stepping on a treadle for reinforcement. When observers are tested, responses similar to their demonstrators can be measured against chance to indicate if imitative learning has occurred. This study examines the extent to which pigeons can show complex imitation, or imitate an unfamiliar sequence of behaviors. Four groups of pigeons observed a demonstrator first either peck or step on a treadle and, second, push a screen over the feeder opening either to the right or left. Planned analyses will assess the proportion of observers' matching responses to their corresponding demonstrators against chance. If a significant effect is found, it will provide further evidence for imitation in pigeons by suggesting that animals can imitate unfamiliar sequences of behavior.

55. Holly Beach

Morehead State University

Faculty Sponsor: Adrian Mandzy

Recognizing the Past: Creating a Civil War Heritage Trail based on John Hunt Morgan's 1864 Raid

Confederate General John Hunt Morgan is considered to be a hero and a role model to many Kentuckians. Historians and those who study Morgan focus most of their attention on his first three raids in the central and western part of Kentucky. Scholars, however, have traditionally ignored Morgan's fourth and final eastern Kentucky raid. To readdress this problem, the authors have sought to increase the body of knowledge about this raid. While there are highway markers in Eastern Kentucky acknowledging the presence of Morgan and his men, no interpretive framework exists for their interpretation. In order to rectify this situation, the authors have attempted to bring together the historical sites that relate to Morgan's final raid through Kentucky. After proper study, the authors have developed a heritage trail linking together the people and the events from Morgan's last raid. This ongoing project, which developed from a Public History class offered by Dr. Adrian Mandzy through the Department of Geography, Government and History at Morehead State University, fits within existing state and federal Civil War heritage programs devoted to John Hunt Morgan. The popularization and the implementation of this program will not only help bring Eastern Kentucky's Civil War history into the forefront, but also provides a more balanced view of America's bloodiest and most costly war.

56. **Maninder K. Virk**

Murray State University

Faculty Sponsor: Terry L. Derting

Patterns of Energy Allocation in Immunochallenged and Testosterone-treated White-footed Mice (*Peromyscus leucopus*).

The cost of mounting an immune response was studied in normal and testosterone-treated male white-footed mice (*Peromyscus leucopus*) that were fed ad libitum. We tested the null hypotheses: 1) there is no change in metabolic rate during an immunochallenge and 2) there is no change in energy allocation to other systems during an immunochallenge. We established four groups of animals: 1) control, 2) testosterone-treated, 3) immunochallenged, and 4) immunochallenged plus testosterone. Testosterone propionate injections were given to elevate the level of testosterone. Immunochallenged animals were injected with sheep red blood cells (SRBC) and phytohemagglutinin (PHA) to challenge the humoral and cell mediated branches of the immune system, respectively. To test our first hypothesis we determined the daily metabolic rate (DMR) and resting metabolic rate (RMR) of each animal. To test our second hypothesis we measured the masses of the body organs. There was a significant increase in RMR in the immunochallenged animals, but no difference in DMR among groups. Thus, our first hypothesis was partially supported. Immunochallenge had no significant effect on the masses of intestinal and vital organs, but was associated with a significant increase in the masses of the reproductive organs. We, therefore, rejected our second hypothesis. Our findings indicated that there was a significant cost associated with mounting an immune response, as indicated by the increase in RMR. In addition, there was an increase in energy allocation to the reproductive organs. Thus, under good conditions there was no trade-off in energy use for immunity and reproduction

57. **Michael Lerner**

University of Louisville

Faculty Sponsor: Patricia B. Cerrito

Exercise Induced Asthma Study

The study was performed to determine whether there is a correlation between athletes with asthma and several factors including gender, weight, primary sport, and home location. The study also investigates the possibility of a stigma associated with asthma in the sports world that prevents diagnosis and treatment. Approximately 500 athletes were required to fill out surveys as part of their annual physicals. Athletes were asked six questions concerning asthma symptoms. They were asked if they had symptoms such as chest tightness, coughing, wheezing, fatigue, or shortness of breath. Demographic information was also collected. Gender ($p=0.0444$), school ($p=0.0002$), and sport ($p=0.0036$) have a significant relationship to the responses to the asthma questions. Female athletes were 8% more likely to respond positively than male athletes. Approximately 23% of football players reported positive responses contrasted with 44% of soccer players. Athletes at one school were 7% more likely to respond positively than athletes at a second school. A high percentage of athletes reporting potential symptoms of asthma are not currently receiving treatment (35% overall). Based on the results, athletes were referred for follow-up and treatment.

58. Kristin Kearns

Eastern Kentucky University

Faculty Sponsor: Jon C. McChesney

Interrelatedness Between Leisure Activity and Spirituality: The Perspectives of Persons with Disabilities

A person's spirituality and belief system are recognized as critical to the development of self-identity and social identification (McDonald & Schreyer, 1991). Aside from religious involvement, leisure is perhaps the most significant domain for the experience of spirituality. The purpose of this study was to gain an understanding of spirituality as perceived by persons living with disability. Further, this study examined the interrelatedness between spirituality and leisure activity. This qualitative research study involved open-ended interviews with 14 adults with various disabilities. The results of the study underscore the connection between recreation and spirituality, with activities that involve the natural environment serving as at least one conduit for spiritual experience. Data analysis revealed a relationship between engagement in leisure activities and spirituality. Leisure activities such as camping, canoeing, walking or riding in wooded areas, and gardening were reported by some participants as a way of realizing or accessing feelings of spirituality. This finding is consistent with previous research touting the connectedness of outdoor recreational experiences and spirituality (James, 1936; McDonald, 1989; Tuan, 1975). It is critical to note, however, that some study participants voiced limitations associated with their physical disabilities that rendered them less able to fully experience the outdoors as a means of connecting with or giving voice to their spirituality. Another study finding was the apparent linkage between spirituality and creative activity such as writing, music, and yoga. A compensation effect may explain passive activity selections by some individuals since cerebral activities may be necessitated by the nature of a given disability. Additionally, a sense of community and belongingness was perceived by some participants to be realized through shared recreational activities. Such feelings of community may shape a person's view of their place in the universe and positively impact on life satisfaction and quality of life.

59. Richard Blalock

Murray State University

Faculty Sponsor: Terry L. Derting

Effects of Testosterone on the Mammalian Immune System: Immunosuppression or Immunoredistribution?

Testosterone is believed to be immunosuppressive in mammals. Recent research suggests, however, that testosterone may cause redistribution of leukocytes rather than an actual reduction in leukocyte numbers. One hormone known to induce immunoredistribution is corticosterone. To investigate the effects of testosterone, we tested the null hypotheses that: 1) testosterone has no effect on corticosterone level and 2) testosterone has no effect on the distribution of leukocytes. We established four groups of adult male white-footed mice (*Peromyscus leucopus*): 1) control, 2) testosterone-treated, 3) immunochallenged, and 4) testosterone-treated and immunochallenged. Testosterone injections were given to mice for 10 days. The immunochallenged mice were treated with sheep red blood cells (SRBC) and phytohemagglutinin (PHA). To determine if immunoredistribution occurred, blood samples were taken from the heart and the retro-orbital sinus. There was no significant redistribution of leukocytes in any group of mice; however, the reaction to PHA was much greater in the control mice than the testosterone treated mice. Total white blood cell counts revealed no significant differences between the control group and testosterone treated group. Corticosterone levels were lowered by the testosterone injections so redistribution could not have occurred due to corticosterone. We concluded that testosterone does not raise corticosterone levels and is not related to immunoredistribution. Testosterone did lower the activity of leukocytes.

60. Sayward B. McKee

Kentucky State University

Faculty Sponsor: George F. Antonious

Pesticide Movement in Highly Erodible Lands

Agricultural activity is the leading non-point source pollution statewide which affects 89% of the streams surveyed. The use of pesticides in plant protection releases large quantities of pesticides into rivers and streams. Studies were conducted at Kentucky State University Research Farm to determine the influence of sewage sludge treated with lime for land farming and yard-waste mixed with native soil at 50 t/acre (on dry weight basis) on the persistence and mobility of pesticides (Treflan and Diazinon) in soil and runoff water. Our main objective is to develop management alternatives that mitigate environmental degradation while maintaining agricultural productivity and profitability. Residues of pesticides were significantly ($P < 0.05$) higher in amended soils than no-mulch (NM) soils which indicates that the organic fraction in amended soils is primarily responsible for pesticides adsorption and/or degradation rather than clay. Concentration of pesticides in runoff water collected from the amended soils was lower than NM soil. This low residues of pesticides in runoff water provide the allowable safety needed for human health and environmental quality.

61. Sara Goetz

North Kentucky University

Faculty Sponsor: Diana McGill

Optimizing Activity Assays of Tryptophan 2,3-Dioxygenase in Mouse Liver

Studies conducted at NKU have provided evidence that magnesium depletion in mice leads to behavioral changes and to increases in expression of tryptophan 2,3-dioxygenase (TDO) mRNA. The purpose of this study is to establish a link between these two findings. TDO is an enzyme involved in serotonin degradation; it converts tryptophan to N-formyl kynurenine, which is further converted to L-kynurenine by formamidase and arylformamidase. If TDO enzyme activity is increased, serotonin levels should decrease which could cause the behavioral changes noticed. The ultimate goal of this study has been to determine TDO enzyme activity from control and magnesium depleted mouse liver. The first step has been to determine the optimum assay conditions for TDO. The assays used in these studies involved measuring the formation of N-formyl kynurenine and L-kynurenine from tryptophan by measuring the absorbance at 321 nm and 365 nm. These assays include phosphate buffer (pH 7.0), hematin, and tryptophan to start the reaction. Once these optimal assay conditions are established, then TDO activity in experimental mice can be determined. Results of these enzyme assays will be presented.

**62. Carla Creasey, Jesse Gray, Chad Hall, J.C. Hicks,
and Cody Robertson**

Murray State University

Faculty Sponsor: Jay Morgan and Tony Brannon

University of Kentucky

Collaborators: Tim Lax, Robert A. Hill and Robert D. Miller

***The Effects of Recommended Rates of Nitrogen and Foliar Fertilization on
Dark-Fired Tobacco.***

The recommended rates of nitrogen for the production of dark-fired tobacco are 300 lbs./acre in Kentucky and 250 lbs./acre in Tennessee. In the past, many producers have used in excess of 400 lbs./acre of soil-incorporated nitrogen in addition to spraying foliar fertilizer throughout the growing season. Studies have been conducted from the year 2000 to the present in Princeton, Kentucky, and in Springfield, Tennessee. The same study was started in Murray, Kentucky in the year 2001, and conducted again in 2002 as a joint project between the University of Kentucky and Murray State University. The purpose of this study is to determine the optimum rate of incorporating nitrogen and investigates the effects of foliar fertilizer on dark-fired tobacco. The study was repeated in 2002 with irrigation because many growers who had incorporated irrigation with high rates of nitrogen fertilization, reached yields in excess of 4000 lbs./acre versus the 2500-3200 lbs./acre achieved in the research plots, which were not irrigated. The experiment utilized a split-plot design arranged in a randomized complete block with three replications. The plots consisted of 200, 300, 400 lbs. nitrogen acre incorporated, and subplots of three foliar fertilizer products applied every two weeks after transplanting with an unsprayed check, with 100 or 200 lbs. of nitrogen/acre side dress into the remaining plots to obtain 300 and 400 lbs. nitrogen/acre. Data from the previous study indicate there is no additional benefit of high nitrogen rates of foliar fertilizer in dark-fired tobacco. When the yields are obtained, statistical differences may be observed for the 2002 data due to irrigation.

63. Courtney Flood, Adam Bell, Justin Lovell, and Scott Lowe

Murray State University

Faculty Sponsor: Kenneth Bowman and Tony Brannon

University of Kentucky

Collaborators: Tim Lax, Robert A. Hill and Robert D. Miller

Trickle Irrigation of Burley and Dark Fire-Cured Tobacco

A study was conducted to determine the effectiveness of drip irrigation in the production of burley and dark fire-cured tobacco. Burley and dark fire-cured plots were treated as separate experiments; TN 90 was the burley variety and NL Madole was the dark variety. A randomized complete block with three replications was used for each study. Plot size was four rows, with data collected only from the two middle rows of each plot. Water used was from the city water source. Lay flat tubing was placed between each replication; with drip tape placed the length of each row near the base of the plants. A water flow meter was used for each plot to determine the amount of water each plot received and a ball valve so that it could be irrigated as a separate event. Burley plots were transplanted on June 4th and dark plots were transplanted on June 7th, with irrigation withheld from all plots approximately six weeks following transplanting. After this period, irrigation was applied by the following treatments: 1) Check plot with no irrigation; 2) a weekly minimum of 2.5 cm of water, including incident rainfall with drip tape placed along the rows; 3) application of 2.5 cm of water every ten days, including incident rainfall with drip tape placed along the rows; 4) application of 2.5 cm of water every ten days, including incident rainfall with drip tape placed down every other middle row; 5) irrigation applied as indicated by available soil moisture measured by sensors, with drip tape down each row. Irrigation treatments continued until the dark plot was harvested on September 11th and the burley plot on September 10th.

**64. Brandon Chandler, Olivia Grace, Cory Hicks,
and Joshua Monroe**

Murray State University

Faculty Sponsor: David Ferguson and Tony Brannon

University of Kentucky

Collaborators: Tim Lax, Robert A. Hill and Robert D. Miller

Evaluation of Dark Fire-Cured Tobacco Varieties

On the campus of Murray State University, we have five acres of dark fire-cured tobacco for research test plots. To better enable dark-fired tobacco producers to select the best varieties of tobacco, we have conducted replicated trials to compare the advantages and disadvantages of current commercial dark tobacco varieties during the 2002 season. The varieties tested include DF 485, DF 911, DT 583, DT 595, DT 508, DT 518, DT 592, KY 160, KY 171, KY 190, TN D94, TN D950, VA 355, VA 359, VA 309, Little Crittenden, TR Madole, Jordan Madole, Smith Madole, Narrow-leaf Madole, Elliott Madole, and Black Mammoth. The two experimental breeding lines also included in the trial were SN 2105 and SN 2108. The layout of the test plots was a randomized complete block design with four replications. Each plot was 300 ft², with 4,350 plants per acre. The following herbicides were applied: 1.1 pounds of pendimethalin per acre and 4 ounces of sulfentrazone per acre. The amount of fertilizer applied was 300 lbs. N, 200 lbs. P₂O₅, and 200 lbs. K₂O per acre, respectively. The plots were transplanted into the field on June 4. No irrigation was applied to these plots. On August 1, the plants were detopped. Suckers were controlled by applying a butralin and fatty alcohol mix to each plant. The plants were harvested, or housed in the barn on September 10, 11, and 12. We will be reporting the overall yields, yield of each leaf grade, and the quality of the leaves from each variety. Statistical analysis will be conducted to determine differences between the varieties.

65. Toni S. Leake

Kentucky State University

Faculty Sponsor: John D. Sedlacek

Impact of Cry 1F Bacillus Thuringiensis Transgenic Corn Kernels on Laboratory Populations of Indian Meal Moth and Angoumois Grain Moth.

Indian meal moth (IMM), *Plodia interpunctella* (Hübner), and Angoumois grain moth (AGM), *Sitotroga cerealella* (Olivier) are global pests of stored grains and grain products. Emergence, fecundity, and duration of development of Kentucky and Kansas *Bacillus thuringiensis* (Bt) susceptible and resistant IMM and susceptible AGM reared on 'Mycogen 2832 IMI Cry 1F' transgenic corn kernels and 'Mycogen 2832', its non-Bt isolate, were evaluated under laboratory conditions. IMM were reared on ground wheat-based diet. Kentucky and Kansas Bt (Dipel®) resistant IMM strains were reared on 500 ppm Dipel-treated diet while AGM were reared on 'Dekalb 679' non-Bt corn. Fifty eggs of each IMM and AGM strain were added to 100 grams of each grain type and were allowed to incubate at 27°C and 60% RH. Emergence was checked after 28 days and fecundity was recorded for 5 weeks. Duration of development was also calculated. There were no significant differences in emergence, fecundity, or duration of development of AGM reared on each grain type. However, compared to the non-Bt isolate, emergence and fecundity of Kentucky and Kansas's susceptible and resistant IMM strains were lower on the Cry 1F transgenic grain. Also, duration of development was longer on the Cry 1F transgenic grain compared to the non-Bt isolate for all IMM strains. Impact was greatest on fecundity of all four IMM strains. These results suggest that Cry 1F is not cross resistant with Cry 1A proteins found in Dipel or other Bt transgenic corn hybrids.

66. Richard N. Talley

Western Kentucky University

Faculty Sponsor: Christopher Groves

Unsaturated Zone Hydrology of the Edna's Dome Shaft Complex of the Mammoth Cave System, Kentucky

A long-term hydrochemical monitoring program is underway in the Edna's Dome Shaft Complex in Mammoth Cave National Park to study karst aquifer development, atmospheric carbon fluxes, and groundwater flow within the unsaturated zone above the shafts. As part of this work we are mapping the conduit flow system feeding the shafts using fluorescent dyes. Understanding this flow system is a prerequisite to detailed geo-chemical studies, and offers an interesting challenge: the known conduits are all too small for human exploration, and so the traditional methods of cave survey can not be used. Five dye injections were conducted during wet conditions in spring 2002. After testing for the absence of background contamination, dyes were injected into two sinking surface streams (the "Eastern" and "Western" branches of an unnamed ephemeral stream) above the shaft area. The waters of six separate shafts were monitored with charcoal dye receptors, which were analyzed by elution and spectrofluorophotometry.

67. Angela Hayden

University of Kentucky

Faculty Sponsor: Richard Milich

Differences in On-Line Narration Between Younger (4-6) and Older (7-9) Children with ADHD and Their Nonreferred Peers.

Children with ADHD tend to be impulsive and inattentive. One of the major areas in which these characteristics are detrimental is in a school setting. Children with ADHD have trouble finishing their work, are more likely to fail courses, and drop out of school. Research suggests that these difficulties are due to this impulsiveness and inattention they exhibit. One of the major deficits that these children have is in their ability to tell a story. Research with normally developing children suggests that as children grow older, the story structure of their stories becomes more organized and abstract. Younger children's stories tend to be concrete and less organized. According to the research, stories narrated by children with ADHD tend to resemble those of younger children without ADHD. The research on this has many limitations, however; one of these is that studies of children with ADHD mostly concentrate on older children. Research has not been done to explore the developmental differences in narrations between younger children and older children with ADHD. That is the purpose of this study. In addition, I compare the narrations of children with ADHD with narrations of children without ADHD. It is expected that the narrations of children with ADHD will have less organized, more concrete stories that resemble younger children's narrations as shown in previous research. It is also expected that even though there are deficits in narratives of those children with ADHD, there will still be developmental improvement in narrations. The extent of improvement is not known, but is hypothesized to be less than the developmental improvement between younger and older non-referred children.

68. Cheryl Gerde

Morehead State University

Faculty Sponsor: Gordon Nolen

Multivariate Analysis of Vehicle Safety

Vehicle safety affects our lives daily. There are many elaborate crash tests executed annually to test the safety of automobiles, however, the following research sets out to examine if there are simpler, less expensive (yet uncompromising) methods to determine a vehicles safety standing by using simple automotive measurements. Using the software program MiniTab along with the statistical methods of Principal Components Analysis and Discriminant Analysis, many popular cars are analyzed and then assigned a rating according to a derived classification rule. These multivariate techniques (PCA and DA) aim to reduce dimensionality of the variables and then to classify the automobiles into a rating category ranging from one star to five stars. This information could be very useful to both the automotive industry as well as the general consumer.

69. Maryalice Bighinatti

Murray State University

Faculty Sponsor: William Mulligan

Creating a Historical Archival System for an Active Military Division.

The Don F. Pratt Museum on Ft. Campbell, Kentucky keeps the 101st Airborne Division's triumphs and sacrifices alive, but holds an even greater responsibility to those serving the 101st Division. Through a proper archival system, the museum preserves artifacts and documents brought back from military operations. Beginning in October 2001 and ending August 2002, I had the honor of interning at the Pratt Museum. Originally assigned to learn various aspects of museum administration, my task narrowed to archiving all documents brought back from Operation Desert Shield and Desert Storm. Before Operation Anaconda, the database and archival system I was maintaining became a utilized source to find information on equipment that was to be used in desert conditions. Having first hand resources available for quick reference allowed those responsible for transporting equipment to alter shipments that would have otherwise been rendered useless upon arrival in Afghanistan. The database also became a quick reference tool for those in charge of soldiers on the battlefield to compare conditions and situations experienced during the Gulf War. While not yet a complete system, the database is now viewed as helpful tool for lessons learned in preparation for training and potential unit deployment.

70. **Alaji Bah**

Kentucky State University

Faculty Sponsor: Kazi Javed

Electrochemical Preparation of Tungsten Tips for Scanning Tunneling Microscope Probes

Scanning Tunneling Microscopy (STM) is widely used in a number of science and engineering fields including biology and biotechnology. The goal of the project was to demonstrate the viability of using an electro-chemical etching process to produce tungsten tips which will be used to fabricate a new type of STM probe. It will be composed of multi-walled carbon nanotubes attached to the tungsten tips. In this study, we used an electrochemical etching technique similar to the one proposed by Weinstein et al [Rev. Sci. Instrum. 66(4), April 1995]. The method is based on an electrochemical etching of the tungsten wire in 2N NaOH standard solution. We applied different voltages in the range of 6-10V and frequencies (range 50-5000Hz) to study the effect on the quality of the produced tungsten tips. We found that the tip diameter depends on the voltage and the frequency of the applied voltage and current. The smallest diameter of 300nm was obtained with the insulated wire when 6V at 800Hz was used. Results also indicate that for a particular voltage, the tip diameter decreases with in-creasing frequency until an optimum tip diameter of approximately 300 nm is reached. In conclusion, sharp tungsten tips can be obtain-ed by electrochemical etching and that the tip diameter can by controlled by varying the frequency of the alternating current and the applied voltage.

71. **Ryan Pigford**

Murray State University

Faculty Sponsor: James Hereford

Improved Image Compression Via Evolvable Wavelets.

This research describes a new approach to image and signal compression based on “evolvable” wavelet filters. Wavelet filters are used in many practical applications such as FBI fingerprint compression and the JPEG 2000 standard. In this research we want to find the wavelet filter which gives the best overall signal-to-noise ratio for a given compression ratio. To do this, a genetic algorithm is used to find the optimal wavelet for a given image. A genetic algorithm applies some of the principles of biological evolution to find the optimal solution to a problem. First, a population, or set of solutions, is selected. The best solutions are statistically selected and “mated” to form a new population of solutions. New solutions are also added at random via mutation. In our case, the mutation occurs by randomly changing bits of data. This new population of solutions is then tested and the cycle repeats. The idea is similar to the “survival of the fittest” concept with each generation (iteration) the population average gets better and eventually converges to the best solution. Thus, the optimal wavelet “evolves” over many generations to the strongest solution. What has made wavelets difficult to optimize in the past is that the wavelet coefficients must satisfy some specific constraints. We overcome this difficulty by using a recently discovered parameterized representation of wavelets. The results from the optimal wavelet found from the genetic algorithm will be compared against the results from the wavelet filter used by the FBI.

72. **David G. Riffe**

Morehead State University

Faculty Sponsor: Mark Blankenbuehler

New Potential Pharmaceuticals with Cyclopenta[d]pyridazines and the COX-2 (Cyclooxygenase-2) Connection.

The expanding need for new medical treatments for a variety of disorders has driven research to discover new organic compounds as potential pharmaceuticals. Many of the current compounds used include a heterocycle of sulfur, oxygen or nitrogen in the structure. Applications from possible anticancer treatments to "bleaching" herbicidal activity or non-steroidal anti-inflammatory drugs are being explored. The chemistry of the fused-pyridazine, cyclopenta[d]-pyridazine, is largely unexplored. The challenge is to synthesize cyclopenta[d]pyridazine based compounds that are similar to existing pyridazines or pyrazoles with known biological activity such as Celebrex. Celebrex selectively inhibits the COX-2 enzyme which allows for the reduction of inflammation without typical side effects from inhibition of the COX-1 enzyme. Parent pyridazine derivatives and fused-pyridazines are being synthesized. The synthesis and characterization of N-substituted cyclopenta [d]pyridazines structurally similar to Celebrex via reaction of an appropriate hydroxyfulvene with 4-hydrazinobenzenesulfonamide will be discussed.

73. **Melissa A. Petty, Gretchen E. Berryman, and Glenda H. Jones**

Western Kentucky University

Faculty Sponsor: Cathleen J. Webb

Arsenic Remediation of Drinking Water using Limestone.

The Environmental Protection Agency (EPA) has proposed lowering the Maximum Contaminant Level (MCL) for arsenic, currently set at 50 ppb, to 10 ppb or less. Current remediation technologies are expensive. This will result in increased economic pressure on rural communities with high levels of arsenic in their drinking water. The proposed lower MCL for arsenic has spurred the development of appropriate new technologies. Arsenic, at pH 8.0 and above, is known to be readily soluble and transports easily through ground water. Previous work indicates that arsenic has significant retention in contact with calcium and magnesium carbonates. This could be a result of adsorption on the limestone and dolomite mineral surfaces or precipitation. Adsorption batch tests with crushed limestone have been shown to reduce arsenic from 100 ppb to <5 ppb. Batch tests comparing the efficiency of arsenic removal using different types of limestone have been performed, including a low magnesium limestone (~3%) and a high magnesium limestone (~27%). Three grain sizes were tested (<0.589 mm, 0.5-1 mm, and 1-2 mm) to examine the efficiency of arsenic removal as a function of surface area. Scanning electron microscopy was used to determine surface morphology. The removal of arsenic in the presence of Fe₂O₃ mixed with limestone was also determined. Column studies have been initiated to examine the use of limestone as a practical method for removal of arsenic. The potential for bacterial growth on the limestone material in the columns under conditions of intermittent usage is being investigated.

**74. Gretchen E. Berryman, Melissa A. Petty,
Glenda H. Jones, and Stephen V. Hartman**

Western Kentucky University

Faculty Sponsor: Cathleen J. Webb

Occurrence and Distribution of Mercury in Mammoth Cave National Park-Phase 0

The fate and transport of mercury, a persistent neurotoxin, in Mammoth Cave National Park's (MCNP) aquifer system and its potential impacts on associated organisms will be examined. Atmospheric deposition of mercury is the largest single source of mercury at Mammoth Cave. With over twenty power plant applications under consideration in the Commonwealth of Kentucky, it is likely that mercury deposition will increase. Contaminant transport in a karst system can be quite rapid and extensive. Mercury's mobility in surface water and ground water are of great concern due to its toxicity and its ability to biomagnify up the food chain. Furthermore, a number of surface and subsurface organisms are endangered or declining in MCNP. Therefore, determining mercury levels in MCNP and the factors that affect mercury levels and distribution are important. Initial results of mercury levels in Green River water and sediments will be presented. Mercury samples are collected monthly. As expected, mercury levels in water are quite low (0-20 ppt) since mercury preferentially binds to sediments and organic material. Samples of the Asiatic clam, *Corbicula*, have been collected and analyzed for mercury bioaccumulation. Liver and muscle tissue from Drum fish, a long-lived bottom-feeding species, have been collected for analysis of mercury levels. This multiyear project began in late summer 2002 and will continue through the end of 2005. An overview of the entire project design plan will also be presented. The fate and transport of mercury in Mammoth Cave National Park impacts on associated organisms will be examined. Contaminant transport in a karst system can be quite rapid and extensive. Mercury may interact with limestone, thus impacting its mobility. Mercury's mobility in surface water and ground water are of great concern due to its toxicity and its ability to biomagnify up the food chain. Further, a number of surface and subsurface organisms are endangered or declining in MCNP. Therefore, determining mercury levels in MCNP and the factors that affect mercury levels and distribution are important. With over twenty power plant applications under consideration in the Commonwealth of Kentucky, it is likely that mercury deposition will increase. An understanding of the physical and geochemical processes that govern the fate and transport of mercury in a karstic aquifer system is, therefore, critical.

75. Stephanie Lehman and Nathan Lee

Northern Kentucky University

Faculty Sponsors: Andy Long

Forest Composition in the Himalayas

John Metz, professor of History and Geography at Northern Kentucky University, with the assistance of the Mathematical and Statistical Consulting Center of NKU, is exploring the environmental and human disturbance variables affecting species composition of temperate and subalpine forests in west central Nepal. The data were collected from 77 stands on the southeast flank of Dhaulagiri Himal. Stands were located in topographically homogeneous areas of minimally disturbed forest at 200m intervals between 2200m and 3600m elevations. Eight 125 square meter plots were sub-sampled randomly from the stand, for a total of 1000 m² per stand. For each tree and sapling, researchers recorded species, diameter at breast height, height, and the relative impact of human use. For each stand, elevation, aspect, slope position, slope shape, and soil conditions were also recorded. Over 20,000 trees were measured, representing 101 difference species. The goals of our study are to relate species distribution to environmental factors like elevation, aspect, and soil, and to identify the impacts of human disturbance patterns.

76. **James Armstrong**

Morehead State University

Faculty Sponsor: Ilsun M. White

Involvement of the Mesolimbic Dopamine System in Psychostimulant-Induced Hyperactivity

The mesolimbic dopamine system, which consists of the nucleus accumbens (NAc), the prefrontal cortex (PFC), and the ventral tegmental area (VTA), plays an important role in adaptive behavior in primates and rats. Although their precise role in behavior is not clear, previous studies suggest that NAc mediates hyper-locomotor activity induced by amphetamine (dopamine agonist). In the present study, we tested the hypothesis that NAc lesion would block amphetamine-induced hyperlocomotion. In addition, we examined effects of VTA and PFC lesions on amphetamine-induced hyperlocomotion. Wistar rats received either NMDA (10 $\mu\text{g}/\mu\text{l}$, 0.3 $\mu\text{l}/\text{site}$) or sham lesions (saline, 0.3 $\mu\text{l}/\text{site}$) in NAc, PFC, or VTA. A 14-day recovery period was allowed prior to testing in the open-field. Activity of the animal was measured by distance traveled. Data were recorded every 5 min for a 60 min period, spanning 3 days (baseline, vehicle, and amphetamine sessions). Baseline activity did not differ between lesioned rats and the controls. Following systemic amphetamine injection (1mg/kg, i.p.), rats with NAc lesions showed markedly suppressed locomotor activity compared to the control rats. Our hypothesis was supported by the present findings. VTA lesions produced a slight suppression of amphetamine-induced hyperlocomotion, whereas PFC lesion failed to do so. The present findings provide evidence that the NAc mediates amphetamine-induced hyperlocomotion. Given that NAc receives dopaminergic inputs from VTA, intact VTA may be required for expression of amphetamine-induced hyperactivity.

77. **Han-Yu K. Lee**

Murray State University

Faculty Sponsor: John Porter

Applications of Finite Topologies with Maple Software.

A topology T on set X is a family of subsets of X that satisfies the following conditions:

- i) T is closed under arbitrary unions,
- ii) T is closed under finite intersections,
- iii) X and the empty set are in T .

Let $T(n)$ denote the number of topologies on a finite set with n elements. The relationship of finite topologies to Boolean matrices, Boolean functions, and lattices is investigated with the use of Maple Software. Boolean functions, Boolean matrices, and lattice have many applications to computer science such as network design, decision theory, and coding theory. The relationship with these concepts and the seemingly unrelated topic of finite topologies is investigated with the use of Maple software.