

# **The Graduate Student Assembly**



**Proudly Presents:**

## **The 23<sup>rd</sup> Annual Research Symposium and Exposition**

**Wednesday, March 28, 2007  
Graduate Life Center**

### **Sponsors:**

- 1. Office of the Provost**
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## **Preface & Acknowledgements**

The Research Symposium and Exposition of Virginia Tech is a forum that provides graduate and undergraduate students a unique opportunity to showcase their scholarly pursuits and achievements in their respective academic fields. The symposium is intended to stimulate interaction and exchange of ideas among faculty, staff and students from a variety of disciplines and backgrounds.

This year's Symposium has two entry formats that allow all students of Virginia Tech to present in the medium that is appropriate for their work. The two entry formats are:

- Poster/Visual Presentation
- Lecture, Speech or Performance Presentation

Participants were able to choose from six entry categories for the 2007 Research Symposium:

- Advanced Undergraduate
- Agriculture and Animal Sciences
- Arts, Social Sciences and Humanities
- Engineering
- Natural and Earth Sciences
- Physical, Chemical, and Biological Sciences

I would like to congratulate all of the participants for their outstanding accomplishments and willingness to share their work with the Virginia Tech community. All of the research presented is truly impressive and serves as a testimony to the high caliber of academic and research programs at Virginia Tech.

There are many people to thank for their efforts and hard work in organizing and running this event. I especially want to thank our 38 judges. A total number of one-hundred twenty entries were received this year and without such a generous show of support from our faculty judging this number of entries would have been a monumental task. Likewise, a successful fund raising campaign allowed for five cash prizes in each of the entry categories. This is the first time separate awards will be given to the winners presenting their work in the form of lecture/oral presentation. I would also like to thank the Provost Office for their support for the sixth year in a row. We would also like to thank our other sponsors: College of Architecture & Urban Studies, College of Engineering, College of Liberal Arts and Human Sciences, College of Natural Resources, College of Science, and Virginia-Maryland Regional College of Veterinary Medicine. Without the support of our sponsors, the GSA would not have been able to put on such a high-caliber event.

I would also like to thank Roberto Mayorga and Monika Gibson of the Graduate School whose patience and support were invaluable to making this event a success. I also acknowledge help from Graduate Student Assembly Executive Board: Jory Ruscio, Laura Freeman, LaChelle Waller, Ntino Krampis, Marshaun Glover, James Freeman, Joe McFadden, and Burouj Ajlouni.

Thank you to everyone who helped make this year's symposium a success.

It has been a pleasure to serve as a chairperson of this year's Research Symposium

Sundar Narayan  
Chair, 23<sup>rd</sup> Annual Research Symposium and Exposition of Virginia Tech



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*\* In abstracts indicates Symposium Participant*



## **23<sup>rd</sup> Annual Research Symposium Schedule**

8:00 – 9.00 AM    Breakfast Served

9.00 – 10.00 AM   Setup of posters

10:00 AM           Symposium/Judging Begins – Session I

12:00 – 1.00 PM   Lunch

1.00 - 3.00 PM     Judging – Session II

4:00 PM             Symposium Ends



## Lecture Presentation Schedule

Presenter	Presenting Author	Title	Department	Session	Room
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### Session 1-1, 10 - 11 AM

6	David	Ramsey	Newly Licensed Teenage Drivers: A Naturalistic Study of Eye Glance Patterns	Industrial & Systems Engineering	1-1	Meeting Room C
8	Hui	Cheng	Using Biplot Display to gain insight into Systems Biological Data	Bioinformatics	1-1	
15	Andre	Crawford	On the Sustainability of Tacit Price Collusion under multi-regime product differentiation	Economics	1-1	
17	Meredith	Katz	The Invisibility of Race: Whiteness in America	Sociology	1-1	

### Session 1-2, 11 AM - 12 PM

3	Nastaran	Hashemi	A Dynamical Systems Approach for the Tapping Mode Atomic Force Microscopy	Mechanical Engineering	1-2	Meeting Room C
7	Sarah	Budischak	The effects of seed age on seed viability, seedling performance, and sex ratios in white campion ( <i>Silene latifolia</i> )	Fisheries & Wildlife Science	1-2	
13	David	Bieri	Foreign Exchange Reserves and the Trilemma: Mission Foreign Exchange Reserves and The Trilemma: Mission Impossible?	Public & International Affairs	1-2	
14	Carson	Byrd	The Impact of Administrative Offices and Positions of Diversity on the Structural Diversity of Student and Faculty Bodies	Sociology	1-2	

### Session 2-1, 1 - 2 PM

5	Jonathan	McGlumphy	Investigation of Subsonic Tandem Compressor Blades	Mechanical Engineering	2-1	Meeting Room C
11	Bisi	Velayudhan	Abundance of mRNA expression and nutritional regulation of somatotrophic axis genes in small intestine of prepubertal dairy heifers fed high-protein high-fat milk replacers	Dairy science	2-1	
16	Michael	Ferranti	The FAIR Act of 1996: Party, Production and Practicality in the Passage of the Farm Bill	Political Science	2-1	
19	Tamara	Savelyeva	Global learning environments: possibilities for educational transformation	Agriculture and Extension Education	2-1	



**Session 2-2, 1 - 2PM**

<b>2</b>	Gregory	Fitch	Toward Developing an Approach for Alerting Drivers to the Direction of a Crash Threat	Industrial & Systems Engineering	<b>2-2</b>	Meeting Room B
<b>4</b>	Hong-Sun	Lim	Design and Control of a Ropeless Elevator with Linear Switched Reluctance Motor Drives	Electrical and Computer Engineering	<b>2-2</b>	
<b>9</b>	Mike	Duncan	Factors Effecting Brook Trout Condition and Survival in Southerwestern Virginia Streams	Fisheries & Wildlife Science	<b>2-2</b>	
<b>18</b>	Tim	Lockridge	A Sky Of Cinders: Poems	English	<b>2-2</b>	

**Session 2-3, 2 - 3 PM**

<b>1</b>	Gaurav	Chaudhari	Cost-Time Profiling as a tool for Project Management	Industrial & Systems Engineering	<b>2-3</b>	Meeting Room B
<b>10</b>	Sarah	Orlofske	The effects of fluorescent powder application on respiration in two salamander species	Fisheries & Wildlife Science	<b>2-3</b>	
<b>12</b>	Tongli	Zhang	Exploring mechanisms of the DNA-damage response:p53 pulses and their possible relevance to apoptosis	Chemical & Biological Sciences	<b>2-3</b>	
<b>20</b>	Lisa	Updike	Telling the Real Story: Using Children's Literature to Address Social Justice With Preservice Teachers	English Education	<b>2-3</b>	



## **#6 Newly Licensed Teenage Drivers: A Naturalistic Study of Eye Glance Patterns**

David J. Ramsey, Sheila Klauer, Tom Dingus, Bruce Simons-Morton

*Industrial and Systems Engineering*

Currently motor vehicle crashes are the leading cause of death for 15-20 year olds accounting for over 40% of all fatalities for this age group. Previous research has shown that newly licensed teenage drivers (NLTD) have the highest crash risk within the first six months of driving with the highest crash risk occurring in the first month. While previous research efforts have been helpful in understanding what teen driver behaviors increase their crash risks, shortcomings exist with these methods. The purpose of this study is to use naturalist driving data to identify the teen driving behaviors most highly associated with crash involvement, specifically investigating eye scanning patterns in NTLDs. This is an instrumented vehicle study where 24 NTLDs local to the Montgomery County, Radford, Salem, and Roanoke area have agreed to have their personal vehicles instrumented with a data collection system for a period of 6 months. The parents of the teen drivers have also agreed to participate in the study and their data will be used for a comparison/control group. With data collected from these vehicles the study will compare glance patterns of NTLDs with those of experienced adult drivers.

## **#7 The effects of Seed Age on Seed Viability, Seedling Performance, and Sex Ratios in White Campion (*Silene latifolia*)**

Sarah A. Budischak, Patricia A. Peroni, and Jonathan G. Ripperton

*Fisheries and Wildlife*

In order for seed banks to be an effective evolutionary strategy, seeds must not only remain viable, but also be able to germinate, grow, and compete against conspecifics and other competitors after years of burial. Using white campion (*Silene latifolia*), a dioecious perennial that maintains a dormant seed bank, as a model species, we examined how age affects the viability and germination rate of seeds and the performance of seedlings. Seeds were collected annually from small isolated population fragments in southwestern Virginia over a 5-10 yr period and then stored under dry, laboratory conditions. Some seeds remained viable after 11 years, but percent viability varied among populations. Increasing seed age was associated with significant decreases and delays in germination. We took samples from three of the populations to examine variables associated with developmental rate and seedling size to assess seedling performance. Seedlings that originated from younger seeds emerged and produced true leaves significantly earlier than seedlings from older seeds. Seedlings from older seeds also tended to have significantly smaller leaves than those from younger seeds. The decreased and delayed initial growth of seedlings from older seeds may put them at a competitive disadvantage to those from younger seeds.

## **#8 Using Biplot Display to Gain Insight into System Biological Data**

Hui Cheng, Bharat Mehrotra and Pedro Mendes

*Virginia Bioinformatics Institute*

Time-resolved system biological data are becoming increasingly available, which provide a good opportunity to uncover the molecule-molecule relationships and to characterize the dynamic properties of the underlying molecular networks of various biological processes. Comprehensive visualization methods for exploring multivariate data are needed to gain insight into the physiological processes reflected in these molecular profiles. The biplot display is particularly useful for the visualization of these data as both molecules and samples can be plotted together, so that a vast amount of information can be obtained from the first glimpse of the high dimensional data including: which time points are intriguing for further investigation, times or molecules that have similar patterns in the time line, and segments of the time course when certain molecules peak. In this work, we demonstrate the utility of biplots by combining with either singular value decomposition (SVD) or non-negative matrix factorization (NMF) for the analysis of transcriptomics and metabolomics time course data. We propose that biplot is an extremely useful tool to reveal inter-molecule relationships and to discover unidentified molecules which have potential significant biological meanings.

## **#9 Factors Effecting Brook Trout Condition and Survival in Southwestern Virginia Streams**

Mike Duncan\* and Brian Murphy

*Fisheries and Wildlife Sciences*

Overfishing, habitat destruction, introduced species and climate change have caused declines in Virginia's only native trout species, brook trout, *Salvelinus fontinalis*. Recent models using current trends predict Virginia will lose most of its native trout waters within the next century. Although Virginia supports more brook trout streams than much of the east coast, the present range of brook trout within the state is only a fraction of the waters the species historically inhabited. This study sampled trout streams in southwest Virginia in an attempt to determine what factors had the greatest effects on brook trout growth and recruitment. The results indicate that the presence of nonnative salmonids had the greatest negative effect on brook trout. Increased water temperatures, distance from roadways and low elevation also appear to impact brook trout survival. This is consistent with other findings that demonstrate increased air temperatures, coupled with nonnative salmonids, may further reduce the range of brook trout. Decreased ranges and poor condition will leave these small populations even more susceptible to extirpation from many streams in Virginia.

#### **#10 The Effects of Fluorescent Powder Application on Respiration in Two Salamander Species**

Sarah A. Orlofske, Kristine L. Grayson, William A. Hopkins

*Department of Fisheries and Wildlife Science*

Fluorescent powder is gaining attention as an effective method for tracking terrestrial amphibian movements, particularly for species that are too small for conventional tracking equipment. The technique requires coating portions of the animal with fluorescent powder, releasing the animal, and following the trail of powder progressively lost during movement. Recent studies have shown fluorescent powder to have no short-term negative effects on survival. However, a substance which coats the skin, a major respiratory organ in most amphibians, may have sub-lethal effects on performance and consequently behavior. We aimed to test the effect of fluorescent powder application on the respiration rates of red-backed salamanders, *Plethodon cinereus* and terrestrial red-spotted newts, *Notophthalmus viridescens*. Respiration rates of both species were measured using a closed circuit respirometry system before and after fluorescent powder application and compared to controls without fluorescent powder. Preliminary data indicates small, but non-significant, effects of fluorescent powder on respiration in both species. Although this study provides evidence that the application of fluorescent powder to amphibian skin does not impact respiration, the trends of the preliminary data merit further investigation to verify the impacts of this research technique on salamander species.

#### **#11 Abundance of mRNA Expression and Nutritional Regulation of Somatotropic Axis Genes in Small Intestine of Prepubertal Dairy Heifers Fed High-Protein High-Fat Milk Replacers**

B. T. Velayudhan, K. M. Daniels, M. L. McGilliard, B. A. Corl, K. F. Knowlton and R. M. Akers

*Dairy Science*

Our study determined the mRNA expression of growth hormone receptor (GHR), insulin-like growth factor-I (IGF-I), IGF-I receptor (R) and IGF binding proteins (BP) -1 to -6 in different locations of small intestine to test the hypothesis that increased amounts of protein and fat in the diet alters gene expression in the mucosal layer. Holstein heifers (n=6) were fed high protein high fat milk replacer or control milk replacer. Intestinal tissues were sampled for RNA isolation at  $59 \pm 2$  d. Abundance of mRNA for GHR, IGFBP-3, -4, and -5 was greater ( $P \leq 0.05$ ) in high protein groups compared to the low protein group while GHR, IGFBP-2, -3 and -5 mRNA was greater ( $P \leq 0.05$ ) with high fat group. Abundance of mRNA expression for IGF-I, IGF-IR, IGFBP-3, -4 and -6 was greater ( $P \leq 0.05$ ) in duodenum than jejunum or ileum but IGFBP-2 mRNA expression was greater ( $P \leq 0.05$ ) in jejunum than duodenum or ileum. However, mRNA expression for GHR, IGFBP-1 and -5 was not different ( $P \geq 0.05$ ) between different intestinal locations. In conclusion, components of the somatotropic axis in prepubertal dairy heifers are differentially expressed in the small intestine and impacted by dietary protein and fat.

## **#12 Exploring Mechanisms of the DNA-Damage Response:p53 pulses and their possible relevance to apoptosis**

Tongli Zhang, Paul Brazhnik and John J. Tyson

*Genetics Bioinformatics and Computational Biology*

The transcription factor p53 plays a central role in maintaining genomic integrity. Recent experiments in MCF7 cells have shown that p53 protein level rises and falls in distinct pulses in response to DNA damage. The amplitudes of and intervals between pulses seem to be independent of the extent of damage, and some cells generate regular pulses of p53 over many days. Identifying the molecular mechanisms responsible for such interesting behavior is an important and challenging problem. This work describes four dual-feedback mechanisms that combine both positive and negative feedback loops, which have been identified in the signaling network responsible for p53 regulation. Mathematical models of all four mechanisms are analyzed to determine if they are consistent with experimental observations and to characterize subtle differences among the possible mechanisms. In addition, a novel molecular mechanism is proposed whereby p53 pulses may induce, at first, cell cycle arrest and, if sustained, cell death. The proposal accounts for basic features of p53-mediated responses to DNA damage and suggests new experiments to probe the dynamics of p53 signaling.

## **#13 Research Title=Foreign Exchange Reserves and the Trilemma: Mission Impossible?**

David Bieri

*School of Public and International Affairs*

In any open economy, the policymakers are often seen as constrained by the monetary policy trilemma, which imposes a stark tradeoff among exchange rate stability, monetary independence, and capital market openness -- sometimes referred to as the 'impossible trinity'. While it is mostly unchallenged that countries can still choose only two out of the three policy goals, increasing capital mobility appears to have changed the consensus about the relative weight given to each of them, namely that the exchange rate needs to adjust more flexibly than in the past. The sharp rise in central bank holdings of foreign exchange reserves, however, seems to tell a different story. This paper attempts to reconcile these contrasting observations and explore their implications for domestic monetary policy and global financial markets by analyzing the factors that determine how reserves are accumulated and by comparing different measures for the optimal level of reserves.

#### **#14 The Impact of Administrative Offices and Positions of Diversity on the Structural Diversity of Student and Faculty Bodies**

W. Carson Byrd

*Sociology*

The need for successful offices and administrative positions to assist institutions with promoting a positive and inclusive diversity climate has led to the creation of umbrella offices and positions of institutional diversity that serve as the headquarters for all diversity-related initiatives, employment and admissions policies, and discussions of campus diversity issues. This study analyzes whether these offices and positions are successfully fulfilling one of its roles of assisting the hiring of faculty of color and women and the admissions process of increasing the enrollment of underrepresented student groups at their respective institutions. Using the Integrated Postsecondary Education Data Systems (IPEDS) regression analysis was conducted on 50 institutions from around the United States to discern whether these offices and positions are impacting the faculty and student bodies and whether the length of time these offices and positions have been operating have any significant effect on the faculty and student bodies. The findings of the regression analyses are discussed and an approach to successfully assessing the diversity climate of an institution is presented along with several recommendations for institutions to consult when discussing the function and the necessity of these diversity offices and positions.

#### **#15 On the Sustainability of Tacit Price Collusion under Multi-Regime Product Differentiation**

Andre J. Crawford

*Economics*

This research is aimed at re-evaluating the relationship between product differentiation and collusion within a spatial duopoly market that embodies both polar forms of differentiation. Of particular interest is the overall impact of product differentiation on the (dis)incentives to form tacit collusive agreements within a market with trigger strategies. Three main findings emerge from the analysis. Firstly, in the absence of vertical differentiation, the collusive market outcome is shown to be less stable under a smaller firm dispersion; a familiar result within the broader literature on product differentiation and collusion. Additionally, under maximum horizontal differentiation, the set of discount factors supporting collusion as an optimal outcome widens as the degree of vertical differentiation diminishes. Therefore, despite the fact that both firms are already located at opposite ends of the product spectrum, more collusion may be facilitated when products are less differentiated in a quality sense. A similar result has been obtained by Häckner (1994) within a model of pure vertical differentiation. However, whereas Häckner (1994) discovered that the high-quality firm is more receptive to collusion when the quality disparity is reduced, it is the low-quality firm that behaves in this manner within the current model.

## **#16 The FAIR Act of 1996: Party, Production and Practicality in the Passage of the Farm Bill**

Michael Ferranti

*Political Science*

Much to the surprise most informed observers, American agricultural policy was revolutionized in 1996. Gone were the days where the federal government would restrict production to prop up prices and offer farmers payments when prices nevertheless went south. In the late winter of 1996, markets triumphed over centralized decision making and farmers were given the freedom to farm. While these revolutionary changes did not last very long, it is interesting to reflect on the processes that lead to them, especially as Congress begins debate on the latest farm bill. As with any historical analysis, in looking at the past, we may learn something about the future. I use a combination of quantitative and qualitative methods to assess two competing explanations of the passage of the FAIR Act of 1996. Both explanations are compelling yet neither seems to fully capture the importance of a number of competing influences, namely political party and production profile. Building on both studies, I offer an explanation of agricultural policy change that takes into consideration how party control and geographical agricultural production affected the Democrats and Republicans in alternative ways.

## **#17 The Invisibility of Race: Whiteness in America**

Meredith Katz

*Sociology*

This paper is both a theoretical and practical assessment of the failure for whites in America to confront issues surrounding their own race. Theoretical bases for this paper draw from the literature of both Whiteness Studies and Africana Studies. I argue that the concept of privilege is fundamental to understanding both historical and contemporary race relations in America. Only through an understanding of our racial history are we able to understand contemporary race relations in today. This paper is intended for those who are familiar with the sociological inquiry of race relations in America, as well as for those who are less-versed in the literature and discussions. The paper concludes with suggestions for introducing the concept of racial privilege to others, effective means of dealing with privilege once it's acknowledged, and empowering suggestions for social change.

## **#18 A Sky Of Cinders: Poems**

Tim Lockridge

*English*

I plan to read poems from my MFA thesis-in-progress, currently titled *A Sky of Cinders*. My creative scholarship attempts to find context in the introspection of the confessional poets and the avant-garde linguistic stylings of the New York School, specifically drawing influence from contemporary poets like James Tate, Rodney Jones, Stephen Dobyns, Tony Hoagland, and Dean Young. Poetry exists in a natural state of paradox—words attempting to say what words can't—and, as a poet, I try to use imagination as a vessel for realization, humor as the medium of sincerity. Then again, even now, I'm attempting to use words to tell you what my words might tell you. Poetry, it seems, is everywhere. Recognition for my creative work includes Virginia Tech's 2006 Emily Morrison Prize For Poetry, The University of Southern Indiana's 2003 Creative Writing Award, and three Ropewalk Fellowships. My poems have appeared in *The Aerie*, are forthcoming in *The Eleventh Muse*, and are currently under consideration at a number of prominent literary publications.

## **#19 Global Learning Environments: Possibilities for Educational Transformation**

Tamara Savelyeva

*Agriculture and Extension Education*

Globalization is a powerful force for a change in education; however, the long-term direction of educational thinking and practice caused by globalization remains unclear, and, therefore, definitions of global education and learning are still open to scientific exploration. Globalization has forced education worldwide to explore new practices designed to help educational systems meet the demands of a fast changing world economy and increasingly globalized culture. Using a case of the "Global Seminar project" (USA), I explored educational potentials and global attributes that reflect global changes in North American education. The research results revealed six key features of the project's "global learning environment" that might contribute to the transformative change in educational system worldwide.

## **#20 Telling the Real Story: Using Children's Literature to Address Social Justice with Preservice Teachers**

Lisa Stoneman Updike

*English Education*

This pilot study explored college students' reactions to literature presented in a children's literature course for preservice teachers seeking to expand existing knowledge on preparation of socially conscious teachers. Narrative analyses of four writing prompts from six participants were done to search for ties to social justice issues. Student interviews were conducted online or in focus group interviews. Group observations were conducted during class and field notes written regarding class interactions as a whole (23 class members) and discussion topics in particular, but no personally identifying data were collected on non-participants. Field notes were used to lay a foundation for the atmosphere of class and the peripheral discussions going on during production of the analyzed documents. Several themes emerged from the data: ambiguous feelings towards diversity, the positive and negative consequences of difference within a group, a tendency to categorize people, and the possibility of self transformation through interaction with difference. The findings are being used to construct the methodology of a larger, more complex study. It is hoped that the longer time frame, larger and more heterogeneous participant pool, as well as class access to more literature texts will lead to deeper, richer data.

## **Posters**

### **Advanced Undergraduate**

#### **#1 Electrostatic Analysis of the Nucleosome Stability**

*David Adams , Andrew Fenley, and Alexey Onufriev*

*Physics*

The wrapping and unwrapping of the DNA around the histone octamer of the nucleosome plays a vital role in many cellular processes, such as transcription, replication, and cell differentiation. The exact mechanisms underlying the associated transitions in the nucleosome are not well understood. In this work, we present a simple, two-state electrostatic model of the nucleosomal system that agrees with a number of experiments and predicts possible mechanisms that could initiate DNA unwrapping. We present a 2D phase diagram across changes in salt concentration and histone octamer charge and predict the free energy of nucleosome folding at physiological conditions. The stability of the system is strongly dependent on the charge of the histone octamer, inting at possible modes of control in in vivo (acetylation and/or pH changes). The model permits analytical solutions. The analyses of these solutions yield the simple physical reasons behind the observed folding and unfolding behavior at various solvent conditions.

#### **#2 Mixed-Mode Fracture Evaluation of Adhesively Bonded Wood Specimens using Dual- Actuator Load Frame**

*Abhijit Chakraborty, Hitendra K. Singh, Frazier Chip, David A. Dillard*

*Engineering Science and Mechanics*

This study focuses on developing a fracture envelope for adhesively bonded wood specimens. A dual-actuator load frame, capable of providing an infinitely variable mode mixity, was used to determine the adhesive fracture toughness of the wood specimens. Wood adhesion testing has traditionally relied on shear-mode strength tests. There has been substantial effort in mode I fracture testing, but little if any mode II analysis. We are not aware of any mixed mode testing of bonded wood specimens. Results obtained from mode I and mixed-mode testing will be presented. The test matrix involves mixed mode testing on bonded wood beams to generate a fracture envelope of the specimens.

#### **#3 Effect of Different Thawing Procedures and Supplementations on Frozen Boar Semen**

*S. Clark, Z. Crouse, W. Martin, K. Waters, and B.D. Whitaker*

*Animal and Poultry Sciences*

The effect of thawing procedures and incubation media supplementation on frozen boar semen motility and viability was studied. Frozen boar semen was thawed using a Percoll gradient or saline wash procedure. Supplements included the stimulant L-glutamate or the antioxidant N-acetyl-cysteine (NAC) and its synthetic derivative, N-acetyl-cysteine-amide (NACA). Motility was observed on a warmed microscope slide at 100x magnification every 30 min after thawing for 3 hr. Viability was determined by staining semen samples with eosin and aniline blue stain at 400x magnification every 30 min after thawing for 3 hr. The results showed that the saline wash procedure produced higher motility than the Percoll gradient procedure. The control and glutamate supplementation produced higher motility than that of the NAC and the NACA supplementation. As time progressed, the glutamate supplementation continued to have higher motility than that of the control group. Supplementation had no significant effects on the viability of the sperm. It is suggested that antioxidants decrease the activity of sperm, however, have no effect on the overall viability of the sperm.

#### **#4 Improving PEM Fuel Cell Performance: Optimization of the Microporous Sublayer**

*Shannon Barousse Geiger, Joshua Sole, Dr. Michael Ellis*

*Mechanical Engineering*

A common problem with modern proton exchange membrane fuel cells (PEMFC) is water transport within the gas diffusion layer (GDL). A method of improving the water transport within the fuel cell assembly is to treat the GDL with a microporous sublayer (MPL). Located between the GDL and the catalyst membrane layer, the MPL consists of carbon black and polytetrafluoroethylene (PTFE). Recent research has shown that the application of an MPL increases PEM fuel cell performance. The MPL has four main suggested functions: increasing reactant gas diffusion, reducing contact resistance, supporting the catalyst layer and aiding in water transport within the cell. This research explores the relationship between fuel cell performance and MPL loading for various GDL media (both cloth and paper) and an MPL loading ranging from 0 - 465 mg/cm<sup>2</sup>.

#### **#5 The Effects of Frustration and Novelty during Internet Use on Heart Rate and Heart Rate Variability**

*Michelle A. Patriquin, Michael M. Knepp, Anthony O. Wells, Angela Scarpa, Bruce H. Friedman*

*Psychology*

In a study of internet and computer usage, the U.S. Census Bureau (2005) found that college-aged adults (18-24 years) were the most likely of any age group to use computers (75%) and the internet (71%). Indeed, internet access has been generally available to this generation since their middle school and high school years. This generation has also witnessed the constant growth of and promise for faster computers and internet services. Furthermore, research has shown a positive relationship between the expectation of immediate information and higher frustration and stress levels in human-computer interaction (Timmel, et al., 2003; Scheirer, 2002; Ramsay, et al. 1998). Fifty-five undergraduate college students completed a measure of internet use and participated in an internet computer task. The internet use measure was used to divide the sample into low and high internet use groups. Participants from both groups were randomly assigned to slow and fast webpage download conditions. This study found that heart rate increased from baseline to task for all groups except for the low internet use, slow download condition. Heart rate variability decreased from baseline to task in the high internet use, slow download condition and low internet use, fast download condition.

**#6 Nylon Mesh Vitrification for Cryopreservation of Bovine Oocytes**

*V. M. Anchamparuthy, A. Dhali, S. P. Butler, R. E. Pearson and F. C. Gwazdauskas*

*Dairy Science*

Cryopreservation of oocytes is a challenge. The objective was to vitrify bovine oocytes obtained from follicles of different diameters,  $\leq 4$  mm (Small) and 4 to 10 mm (Medium). Before vitrification, oocytes were exposed to the cryoprotectant (40% (v/v) ethylene glycol, 18% (w/v) Ficoll-70, and 0.3 M sucrose). After equilibration, 15 to 20 oocytes were loaded onto nylon mesh and plunged into liquid nitrogen. Thawing was conducted with a series of 0.5, 0.25 and 0.125 M sucrose dilutions. Vitrified-warmed oocytes were in vitro fertilized using frozen semen from 2 bulls. Warming resulted in 97 % morphological survival with intact cumulus cells in both populations of oocytes. There was a significant difference in development rates between vitrified and control groups ( $39.6 \pm 0.02$  and  $59.8 \pm 0.02\%$ , respectively, for cleavage compared with  $6.5 \pm 0.01$  and  $21.2 \pm 0.01\%$ , respectively, for blastocysts). Cleavage and blastocyst rates in oocyte populations from Small and Medium follicles were significantly different ( $45.4 \pm 0.02$  and  $53.9 \pm 0.02\%$  for cleavage;  $11.6 \pm 0.01$  and  $16.1 \pm 0.01\%$  for blastocyst, respectively). Our results show that nylon mesh is a useful method for vitrification of large numbers of matured bovine oocytes.

**#7 Phenotypic Relationships between Mastitis and Lactation Persistency from Producer Recorded Health Data and Test Day Yields**

*J.A.D.R.N. Appuhamy, B.G. Cassell, and J. Cole*

*Dairy Science*

The objective of this study was to investigate the phenotypic relationships of mastitis in dairy cows to lactation persistency (P). Health data of 87555 Holstein lactations from 398 commercial herds were used to define mastitis only during the first 100 Days in milk (DIM) (MAST1), only after 100 DIM (MAST2) and at any stage of lactation (MAST). Each trait was defined as a binary variable distinguishing between lactations with at least one reported case and lactations with no cases. P of individual lactation was calculated as a function of test day (TD) yield deviations from a herd specific standard lactation curve and TD DIM deviations around 128 DIM. Effects of mastitis on P were investigated separately for first (FL) and later (LL) lactations. Effects of P on likelihood of mastitis in current and the next lactation were examined using odds ratios from a logistic regression model. Multiparous cows positive for MAST1 tended to have significantly higher P. MAST2 had a significant but negative impact on P while MAST tended to significantly reduce P. Probability of MAST and MAST2 decreased to approximately 0.2 times for each standard deviation unit increase in P of present and previous lactation.

## **#8 EPA Production by Mixotrophic Algae using Crude Glycerol**

*Sneha Athalye, and Zhiyou Wen*

*Biological Systems Engineering*

Omega-3 polyunsaturated fatty acids have proven health benefits for humans, and thus, are considered a necessary dietary supplement. Fish oil has been the main source of these, but has problems such as undesirable taste/odor and heavy metal contamination. Like humans, fish cannot synthesize omega-3 fatty acids by themselves; they obtain them by consuming marine microalgae, which are the primary producers of the fatty acids. Mass algal culture for producing omega-3 fatty acids has been limited by high production cost and low fatty acid yield. Research has shown that a mixotrophic culture can give higher yield than phototrophic cultures. Some algae can grow well on a glycerol substrate. In this project, we employed crude glycerol, derived from biodiesel production, as carbon source for mixotrophic algal culture. Currently, crude glycerol is a byproduct in the biodiesel industry with no easy routes for disposal; it poses a major hurdle for the rapidly growing biodiesel industry. In this project, we will address the above two problems by using the biodiesel-derived crude glycerol as feedstock to grow the microalgae. It is expected that a new disposal method for this waste glycerol can be found, along with a cost-effective omega-3 fatty acids production process developed.

## **#9 Electronic Nose Evaluation of Cabernet Sauvignon Fruit Maturity**

*Ahmad Athamneh*

*Biological Systems Engineering*

Electronic Nose Evaluation of Cabernet Sauvignon Fruit Maturity Authors=Ahmad Athamneh Abstract= The ability of an electronic nose to classify Cabernet Sauvignon (*Vitis vinifera* L.) fruit based on maturity was investigated over two seasons. Maturity of samples collected 18, 19, and 20 weeks post-bloom was evaluated by measuring berry weight, pH, Brix, titratable acidity, total phenols, color intensity, hue, total anthocyanins, and total and phenol-free glycosides. Results were compared, using discriminant and canonical discriminant analysis, with analysis of headspace volatiles via a hand-held electronic nose. The electronic nose was able to determine the difference among the three sample groups in both seasons. Additionally, electronic nose measurements were compared to chemical analyses of samples collected from east and west sides of the vine canopy. Results demonstrated the ability of the electronic nose to distinguish maturity levels on both canopy sides. Field measurements demonstrated the potential for the electronic nose as a rapid, non-destructive tool for evaluating grape maturity.

#### **#10 Effects of Anion Transport Blockers on Growth, Development and Survival of European Corn Borer, *Ostrinia nubilalis* (Hübner)**

*Dhana Raj Boina and Jeffrey R Bloomquis*  
*Entomology*

Anion transport (AT) blockers, 4,4'-diisothiocyanato stilbene 2,2'-disulfonic acid (DIDS), 5-nitro 2-(3-phenylpropyl amino) benzoic acid (NPPB), anthracene-9-carboxylic acid (9-AC), and indanyloxy acetic acid 94 (IAA-94), were tested against larvae of European corn borer (ECB), *Ostrinia nubilalis* (Hübner), for their toxicity using no-choice feeding bioassays. All AT blockers significantly reduced larval weight at  $\geq 12.5$  ppm and larval survival at  $\geq 25$  ppm compared to control when fed for 7 days on treated diet or fed for 7 days on treated diet + 14 days on untreated diet ( $P < 0.05$ ). Further, all the AT blockers at  $\geq 25$  ppm significantly increased developmental time (days for pupation) in surviving larvae compared to control ( $P < 0.05$ ). Midgut pH measurements of larvae fed on AT blocker treated diet indicated that AT blockers at 50 ppm reduced the larval midgut pH about 2 log units. A positive correlation between larval weight and midgut pH was observed in the larvae fed on AT blocker-treated diet at 50 ppm, suggesting that disruption of gut pH was responsible for effects on growth and survival. Results from the present investigation suggest the potential of AT blockers in ECB larval control.

#### **#11 Blood Metabolites, Behavior, and Performance of Beef Calves Under Different Pre-weaning Management Strategies**

*Holly Terry Boland, Guillermo Scaglia, William S. Swecker, Jr., Nathaniel C. Burke*  
*Animal and Poultry Sciences*

Strategies to reduce weaning stress and improve performance of calves were compared over 2 years ( $n=48$ ,  $n=54$ ). Steers were allotted to treatments 7 d pre-weaning (d -7): fence-line (FL, separated from dam by a fence), nose clips (NC, anti-suckling device), or control (CTRL, remain with dam). On d 0, steers were weaned and transported away from their dams. Blood collected on d -7, 0, 1, 7, and 42 was analyzed for NEFA, BUN, CK, and glucose. Pedometers recorded steps taken during pre and post-weaning. Steers were weighed on d -7, 0, 1, 14, 28, and 42. Within CTRL and NC groups, CK was highest ( $P < 0.05$ ) on d 1, while FL steers had similar levels of CK on d -7 and 1. On d 0, NC steers had the highest NEFA levels ( $P < 0.05$ ). Fence-line steers took more ( $P < 0.05$ ) steps than NC on d -7 and -6, while NC took the least number of steps overall. Post-weaning, CTRL steers took more ( $P < 0.05$ ) steps overall due to more steps on d 1 and 6. Overall, ADG was lowest ( $P < 0.05$ ) for NC steers. The use of nose-clips did not seem to benefit calves while FL strategies may be less stressful than abrupt weaning.

## **#12 Governmental Regulation of Transgenic Plants: How to Gain Approval for Peanuts with Enhanced Resistance to Sclerotinia Blight**

*Shanna M. Chriscoe, Darcy E. Partridge, Patrick M. Phipps, and Elizabeth A. Grabau*  
*Plant Pathology, Physiology, and Weed Science*

Sclerotinia blight, caused by *Sclerotinia minor* Jagger, is a devastating fungal disease of peanuts (*Arachis hypogaea* L.). Transgenic plants of three Virginia-type peanut cultivars have been engineered to express an oxalate oxidase enzyme from barley. The enzyme degrades oxalic acid, a major pathogenicity factor of *S. minor*, thereby suppressing fungal infection and increasing disease resistance. Oxalate oxidase, a member of the cupin superfamily of proteins, has been identified in all of the major cereal crops and is normally expressed during germination and fungal infection. Three years of field trials have been conducted and six transgenic lines have been identified to submit for governmental regulatory review. In 2006, these lines had 85% less disease and increased yields of 537 to 2491 kg/ha more than the parental lines, giving an added value of \$222 to 1043/ha. Before these peanuts can be marketed, they must be evaluated by the Animal and Plant Health Inspection Service, a division of the US Department of Agriculture, as well as the Food and Drug Administration and the Environmental Protection Agency. Individual petitions will be submitted to each agency to address various data requirements including allergenicity, toxicity, weediness, outcrossing, genetic characterization and transgene expression patterns, among others.

## **#13 Effects of Milk Replacer Composition on Selected Blood Metabolites and Hormones in Pre-Weaned Holstein Heifers**

*K. M. Daniels, S. R. Hill, K. F. Knowlton, R. E. James, R. E. Pearson, M. L. McGilliard, and R. M. Akers*  
*Dairy Science*

We investigated the effects of increasing dietary protein and energy on the concentrations of selected blood metabolites and hormones in Holstein heifer calves. Twenty-four heifers were fed one of four milk replacer (MR) diets (n=6): 20:20 (20% CP, 20% fat MR fed at 450 g/d), 28:20 (28% CP, 20% fat MR fed at 970 g/d), 28:28L (28% CP, 28% fat MR fed at 970 g/d), and 28:28H (28% CP, 28% fat MR fed at 1460 g/d). Serum and plasma aliquots from blood samples collected twice weekly after a 12 h fast were analyzed for insulin-like growth factor-I (IGF-I), growth hormone (GH), insulin, glucose, NEFA, and triglycerides (TRI). Calves fed 20:20 had the lowest overall glucose concentration (83, 103, 107, and 107  $\pm$  2 mg/dl for 20:20, 28:20, 28:28L, and 28:28H). Calves on treatments 28:20, 28:28L, and 28:28H increased linearly in blood IGF-I (53 to 126 ng/ml) and decreased in TRI (0.20 to 0.13 mmol/l) over time. Calves fed 20:20 however, demonstrated quadratic IGF-I and TRI responses over time. Change in insulin over time was quadratic; GH decreased linearly from 9.8 to 3.8 ng/ml. Plasma NEFA decreased over time in all calves (0.42 to 0.37 mmol/l). Overall, the blood parameters measured here did not depend on treatment diet composition.

#### **#14 Dietary Protein Quality and Feed Restriction Influence Abundance of PepT1 mRNA in the Small Intestine of Broiler Chicks**

*E. R. Gilbert, H. Li1, D. A. Emmerson2, K. E. Webb, Jr.1, and E. A. Wong  
Animal and Poultry Sciences*

The objective of this study was to evaluate the effect of dietary protein quality on chicken intestinal peptide transporter 1 (PepT1) mRNA abundance. Intestines were collected from broiler chicks at day of hatch (doh), and d 1, 3, 7 and 14 posthatch. At doh, chicks were assigned to corn-based diets containing 20% CP supplemented with either soybean meal (SBM), a higher quality protein, or corn gluten meal (CGM), a lower quality protein. Chicks were also assigned to the SBM diet at a quantity restricted to that consumed by chicks fed CGM (diet consumed the least). PepT1 mRNA abundance was assayed by real time PCR. PepT1 mRNA was highest on d3 (SBM), d14 (CGM), and d7 and d14 (restricted SBM) in chicks fed different diets ( $P = 0.005$ ). When feed intake was equal (CGM vs restricted SBM), a greater abundance of PepT1 mRNA was associated with the higher quality SBM ( $P < 0.04$ ). When feed intake was restricted (SBM vs restricted SBM), a greater abundance of PepT1 mRNA was associated with restricted intake ( $P < 0.04$ ). These data show that both dietary protein quality and feed restriction influence expression of PepT1 mRNA in broiler chicks.

#### **#15 WoodGro: A Renewable Alternative Plant Growing Media for the Horticulture Industry**

*Brian E. Jackson, Robert D. Wright, Jake F. Browder  
Horticulture*

Due to supply restrictions, rising costs, and increasing environmental concerns over the use of materials like peat moss and pine bark that are currently used to produce plant growing media, alternative materials are being researched. A new material, called WoodGro, has been developed here at Virginia Tech as an environmentally safe and economical growing media for the production of horticultural crops. WoodGro is produced from whole pine tree logs that are specially ground and amended with fertilizers and other components to promote optimal plant growth. Research conducted during 2005 and 2006 has shown that WoodGro can be manufactured at a third of the cost of other commercial media and have desirable physical properties that are needed by plants to grow properly. Plant growth results have shown that plants grown in WoodGro require a different fertilizer management program than plants grown in other media. When fertilized and irrigated properly, plants grow just as well in Woodgro than in traditional peat and pine bark media. Landscape evaluations of plants grown in WoodGro show no quality or performance differences than plants grown in other media. WoodGro can be a reliable, economical, and renewable growing media for plant production.

**#16 Life History and Secondary Production of *Goniobasis proxima* (Prosobranchia: Pleuroceridae) from Four Appalachian Headwater Streams in Western North Carolina**

*Nicholas Jeremiah and Fred Benfield*

*Biology*

The objective of this study was to investigate the life history and secondary production of *Goniobasis proxima*, an Appalachian stream dwelling snail. We measured snail density and size, algal biomass and physical and chemical stream variables monthly for one year. An instantaneous growth rate was measured in a lab colony and applied to field data to estimate production. Results indicate these snail populations have no appreciable grazing effect on the algal community, display seasonal variation in abundance we suspect to be temperature driven, and prefer rock and allochthonous material as a substrate over depositional. Secondary production was comparatively low compared to some aquatic insect species, ranging from 39 mg m<sup>-2</sup> y<sup>-1</sup> to 540 mg m<sup>-2</sup> y<sup>-1</sup> with turnover rates of 0.025 y<sup>-1</sup>. These low turnover rates indicate long development times which coincides with our data suggesting these snails can live close to 10 years. Production may be limited due to physical barriers preventing snail migration upstream, low quality and quantity of food sources, and low calcium concentrations.

**#17 Stink bug (Heteroptera: Pentatomidae) egg parasitoids and apparent host preference in southeast Virginia**

*Amanda L. Koppel, Virginia Tech, Dr. Ames Herbert, Tidewater AREC, Dr. Tom Kuhar, Eastern Shore AREC*

*Entomology*

Species complex surveys and parasitism rate studies of stink bug natural enemies have been conducted in many areas, but none have been conducted in Virginia. A survey of stink bug egg parasitoids was carried out in the 2005 and 2006 field seasons (May to August) in crops and several vegetables by monitoring and collecting egg masses. A total of 752 *Euschistus servus*, *Murgantia histrionica*, *Podisus maculiventris*, and *Acrosternum hilare* eggs were field collected and returned to the laboratory where emerging parasitoids were identified to species. In addition, 1,525 lab-reared *E. servus* eggs, and 230 *P. maculiventris* eggs from a commercial vendor were placed into crop fields. Masses were attached to plant stems or leaves and returned to the laboratory after 7 days, where parasitoid or stink bug emergence was recorded, and emerging parasitoids were identified. Almost all parasitoids were of the family Scelionidae (Hymenoptera). Further, the parasitoids seemed to exhibit a host preference; *Telenomus podisi* parasitized the eggs of *E. servus*, *Trissolcus basalis* emerged from *A. hilare* and *M. histrionica* eggs, and *Trissolcus euschisti* and *Trissolcus edessae* emerged from *A. hilare* eggs. Parasitism rates were highest in *E. servus*: 62.7% and 45.8% of egg masses and individual eggs parasitized, respectively.

## **#18 Growing Mahogany Sustainably in Partnership with the Weaver Ant, a Biological Control Agent of Mahogany Pests**

*Grace T. Lim, Loke T. Kok, Laurence G. Kirton, Scott M. Salom*  
*Entomology*

Mahogany is among the most valuable tropical hardwoods in the world and has been harvested to commercial extinction. Reforestation efforts worldwide have been foiled by the mahogany shoot borers (*Hypsipyla* spp., Lepidoptera: Pyralidae). Eight decades of research spanning 23 countries has yet to come up with a reliable, cost-effective and environmentally-sound solution to this problem. The weaver ant, *Oecophylla smaragdina* Fabricius (Hymenoptera: Formicidae), inhibits infestation of mahogany by the shoot borer, *Hypsipyla robusta* Moore. Entire colonies containing the leaf nests of this ant can be arvested for redistribution to mahogany plantations that need its protection. International collaborative research by Virginia Tech's Entomology Department and the Forest Research Institute of Malaysia focused on enhancing the performance of the weaver ant. Two-pronged strategic research addressed short- and long-term provision of food resources for relocated ant colonies. For the former, field studies showed that certain foods were preferred by the ants and supplemental feeding conserved newly-relocated colonies. For the latter, *Morinda citrifolia* (Rubiaceae) was identified as highly preferred by the ant, through a series of surveys and screening trials. Mixed-planting of *M. citrifolia* with mahogany could increase diversity and stability in the ant's food resources. These methods combined could provide a reliable approach to cultivating environmentally-friendly mahogany in partnership with the weaver ant.

## **#19 Humoral and Cellular Immune Responses in Sheep Infected with the Gastrointestinal Parasite *Haemonchus Contortus***

*K. M. MacKinnon and D. R. Notter*  
*Genetics, Bioinformatics and Computational Biology*

Among sheep producers, the parasitic nematode *Haemonchus contortus* is a major animal health concerns. Caribbean hair sheep are known to be highly resistant to these abomasal parasites. Our objective was to determine if hair sheep produce a stronger, faster immune response through differences in gene expression. To evaluate this hypothesis, resistant hair and susceptible wool sheep were infected with 10,000 *H. contortus* larvae and samples collected at 3 and 27 days post-infection. Gene expression was evaluated using a bovine cDNA microarray for both abomasal and lymph node tissue. A high percentage of immune genes were found to be differentially expressed between breeds. Selected genes for cytokines, antibodies and related receptors were validated for differential expression using real-time RT-PCR. Three days after infection, the cross-regulatory cytokines interferon-gamma and interleukin-4 were not significantly different between breeds in lymph node tissue. Although, significantly decreased ( $P < 0.005$ ) levels of interferon-gamma were observed in hair sheep 27 days post-infection in the same tissue. Results suggest immune responses to the parasite may be initiated at higher levels in infected hair sheep. Understanding these genes and mechanisms involved in parasite expulsion will help determine resistant animals, and provide opportunities for developing more effective parasite control strategies.

## **#20 Apple Scab Sensitivity to Myclobutanil in Virginia**

*S.C. Marine, D.G. Schmale III, and K.S. Yoder*

*Plant Pathology, Physiology, and Weed Science*

Apple scab, caused by *Venturia inaequalis*, is an economic threat to commercial apple production in the eastern U.S. Populations of *V. inaequalis* in VA orchards may be developing resistance to myclobutanil and other DMI fungicides. Little is known about the frequency, timing, and mechanisms of fungicide resistance in apple scab populations in VA. We evaluated fungicide resistance in a total of 71 single-spored *V. inaequalis* isolates collected in Winchester, VA in 2006. Percent growth suppression on agar containing 0 ppm, 0.1 ppm, 0.5 ppm, or 1 ppm myclobutanil showed that 22 of the isolates were sensitive, 16 were resistant, and 33 were moderately resistant to myclobutanil. The growth of isolates from treated trees was significantly greater than those from non-treated trees for all myclobutanil treatments in agar. High levels of fungicide resistance in populations of *V. inaequalis* suggest that replacement programs should be considered. Future research may rely on DNA-based methodologies to determine fungicide resistance and employ appropriate disease management strategies.

## **#21 Continuous Intravenous Infusion of Trans-10, cis-12 Conjugated Linoleic Acid (CLA) Acutely Inhibits Milk Fat Synthesis**

*Joseph W. McFadden, Davina E. Campbell, Joseph H. Herbein, Andrea J. Lengi, Michael L. McGilliard, Wendy A. Wark, and Benjamin A. Corl*

*Dairy Science*

A progressive decline in milk fat production is observed with minimal doses of trans-10, cis-12 CLA. In a cross-over design, 6 cows were milked every 4 h during the first 24 h and every 12 h from 24 through 96 h post infusion. Cows were continuously infused intravenously with an emulsion providing 15 g/d of trans-10, cis-12 CLA. Milk fat content of trans-10, cis-12 CLA increased throughout infusion peaking at 0.35 g/100 g FA; however, rate of CLA incorporation in milk fat was highest during the first 24 h. Infusion of CLA resulted in a significant reduction in milk fat content and yield, by 49% and 52%, respectively. Milk fat content was significantly reduced at 12 h and reached a nadir at 36 h (2.10% vs 4.28% at 0 h). Milk fat yield (g/h) progressively declined post infusion and was significantly reduced by 20 h (29 vs 53 at 0 h). Concentration of milk fatty acids containing less than 16 carbons was reduced by 8% at 36 h and by 17% at 96 h. Trans-10, cis-12 CLA was shown to have an acute regulatory role in the inhibition of fatty acid synthesis in the mammary gland.

## **#22 Inhibition of German cockroach (*Blattella germanica*) Acetylcholinesterase by Dimeric Tacrines**

*James Mutunga and Jeffrey R. Bloomquist*  
*Entomology*

In this study, we investigated the optimal conditions for acetylcholinesterase (AChE) activity from the German cockroach, *Blattella germanica*. We further investigated the inhibition profiles of AChE by dimeric tacrines A1A to A12A under optimal conditions. The AChE inhibition analysis was based on the Ellman method, adapted for a 96-well micro-plate assay. The pH of phosphate buffer and the concentration of Triton-X100 were observed to greatly affect AChE activity in vitro and were optimized at pH 8.0 and 1.5%, respectively. The effects of tether-length in tacrine dimers on cockroach AChE were also evaluated and comparisons made with existing data on *An. gambiae* and human AChE. Tether-length dependence provides insight to the interaction of the tacrine dimers (ligand) with the peripheral site and catalytic triad in the active site gorge. Comparisons of the cockroach responses to tacrine dimers to those obtained for human and *An. gambiae* AChE are discussed. Our results provide valuable information on the inhibitor cation- $\pi$  interaction with aromatic residues in the cockroach AChE active site gorge, which is important in the design of specific insect AChE inhibitors as insecticides.

## **#23 Can we Increase Nitrogen Capture in Dairy Cows as a Method of Reducing Nitrogen Excretion**

*Agustin Rius, Joby Cyriac, and Mark Hanigan*  
*Dairy Science*

Concentrated animal agriculture is a significant source of nitrogen export to surface water and ammonia emissions to the atmosphere (Anderson et al., 2003; James et al., 1999). The dairy cow is relatively inefficient at converting dietary nitrogen to milk operating at an average efficiency of 25% (Bequette et al., 2003). Even a modest increase in nitrogen efficiency from 25% to 30% would reduce the annual nitrogen release by Virginia's dairy cattle by 775 metric tons. The current work focuses on assessing energy requirements to improve nitrogen capture by the lactating cow. Failure to provide enough energy compromises animal metabolic activities leading to a loss of animal efficiency and production. However, NRC (2001) suggests that milk and protein synthesis does not improve when dietary energy is increased. Our objective was to test the validity of current NRC requirements. Animals were placed on diets with 18 or 14% crude protein with energy contents adequate to support 37.2 or 33.2 kg/d. Animal performance and nitrogen efficiency was significantly improved when the dietary energy increased regardless of the level of protein in the diet. Thus, lactating cows can use nitrogen more efficiently than predicted by the NRC when fed high energy diets.

## **#24 Growth Performance in Boars Fed Diets Supplemented with Organic Selenium**

*Susan M. Speight, Mark J. Estienne, and Allen F. Harper*

*Animal and Poultry Sciences*

The objective was to compare growth performance in boars fed diets supplemented with inorganic and organic selenium sources. Crossbred boars ( $n = 117$ ) weaned at 28 d, were placed in nursery pens (three boars/pen) and assigned to ad libitum dietary treatments: I. basal diet with no supplemental selenium (controls), II. basal diet + 0.3 ppm organic selenium (Sel-Plex) and, III. basal diet + 0.3 ppm sodium selenite (13 pens/treatment). Average daily gain, feed consumed and feed/gain were similar among groups. Blood Se was higher ( $P < 0.01$ ) for boars consuming Sel-Plex and selenite. After five weeks, boars were moved to a grower-finisher barn while continuing to receive the same ad libitum dietary treatments (11 pens/treatment). Average daily gain and feed consumed were similar among treatments. Feed/gain was affected ( $P = 0.02$ ) by treatment; Sel-Plex boars had lower ( $P < 0.06$ ) feed/gain compared to selenite or control boars. Backfat thickness and loin depth was not affected by treatment. Blood Se was higher ( $P < 0.01$ ) in boars consuming Sel-Plex than selenite or control boars. In summary, an organic source of selenium failed to alter ADG or feed consumption in growing boars, but enhanced feed conversion efficiency during the grow-finish production phase.

## **#25 Differential Effects of Brucella Spp. on Innate Immune Function in Susceptible Balb/c mice**

*Naveen Surendran, Sharon G. Witonsky, Heather S. Lawler, Stephen M. Boyle, Elizabeth M. Hiltbold, Nammalwar Sriranganathan*

*Large Animal Clinical Sciences*

*Brucella* spp. are gram-negative intracellular bacteria, which cause serious chronic infections in humans and livestock worldwide. Centers for Disease Control (CDC) categorizes *Brucella* spp. as category B pathogens because they are zoonotic and can be used as a biological weapon. The pathogenic strain of *B. abortus* is smooth strain 2308 whereas strain RB51 is a rough vaccine strain approved by USDA for livestock. Another rough strain RB51SOD, which overexpresses its own copper superoxide dismutase (SOD), is more efficacious. Little is known regarding how *Brucella* stimulate innate immunity, although subsequent Th1 and Tc1 cell mediated immunity are critical for protection. Therefore, it is important to mechanistically determine how these vaccine strains protect. In this study, we analyze the differential effects of *Brucella* spp. on innate immunity by assessing the dendritic cell (DC) activation and function using BALB/c mice. Mice were infected intranasally with either saline, RB51, RB51SOD or 2308 to model aerosol exposure. Samples bronchoalveolar lavage (BAL), spleen and mediastinal lymph node (MLN) were collected at days 3, 5, 7 and 14 post-infection. Vaccination with rough *Brucella* strains stimulates increased recruitment of activated DCs in multiple organs based on flow cytometric analysis.

## **#26 Blood Mineral, Hormone, and Osteocalcin Responses of Multiparous Jersey Cows to an Oral Dose of 25-Hydroxyvitamin D3 Prior to Parturition**

*M. S. Taylor, K. F. Knowlton, M. L. McGilliard, and J. H. Herbein*

*Dairy Science*

Increasing blood calcium (Ca) prior to parturition could attenuate the severity of periparturient hypocalcemia. Jersey cows tend to be susceptible to periparturient hypocalcemia, therefore our objective was to evaluate the effects of a prepartum oral dose of vitamin D3 (D3) or 25-hydroxyvitamin D3 (25-OH) on factors associated with peripartum blood Ca regulation in Jersey cows. Twenty-seven Jersey received one of three treatments, control, 15 mg of 25-OH, or 15 mg of D3 at 6 d prior to parturition. Jugular blood samples were collected at -14, -13, -5, -4, -3, -2, -1, calving, 1, 3, 5, 7, 9, 11, 13, 28, 56, and 84 d. Blood samples were analyzed for Ca, P, Mg, 25-hydroxyvitamin D3, and osteocalcin (OC) concentrations. Blood Ca, P, and Mg decreased around the time of calving. Serum OC was higher in second lactation cows. Serum 25-hydroxyvitamin D3 was higher for cows dosed with 25-OH (119.0 pg/ml) compared with those dosed with D3 (77.5 pg/ml) or control (69.3 pg/ml). Although results indicated a 60% increase in serum 25-hydroxyvitamin D3 due to a dose of 25-OH prior to calving, the amount administered in this study apparently was not sufficient for initiation of any improvement in Ca homeostasis at parturition.

## **#27 Improved Nutritional Intake Enhances Growth Hormone-Stimulated Production of Serum Insulin-like Growth Factor-I in Cows**

*M. Wu, R. M. Akers, R. Torres-Diaz, and H. Jiang*

*Animal and Poultry Sciences*

Growth hormone (GH) stimulates insulin-like growth factor-I (IGF-I) production, thereby stimulating growth in animals. We determined the effect of nutritional status on GH-stimulated production of IGF-I in cows and the underlying mechanism. Ten cows were fed hay and ten fed hay and corn. Each cow received a GH injection at the end of two-month feeding. GH stimulated a greater increase in serum IGF-I concentration in corn cows than in hay cows. This difference was not due to higher serum GH concentration or less serum IGF-I degradation in corn cows. Liver is the major source of serum IGF-I, but GH did not cause a greater increase in liver IGF-I mRNA in corn cows than in hay cows. GH caused greater increases in serum concentrations of IGF binding protein-3 (IGFBP-3) and acid-labile subunit (ALS), two proteins that can form ternary complex with IGF-I to decrease IGF-I clearance from the blood. In conclusion, GH stimulates a greater increase in serum IGF-I concentration under improved nutrition, and this greater increase appears to be mediated by a posttranscriptional mechanism that may involve improved translation of IGF-I mRNA in the liver and/or decreased clearance of IGF-I from the blood due to increased IGFBP-3 and ALS.

## **#82 Effect of Antioxidant Supplementation during Intracytoplasmic Sperm Injection of Porcine Oocytes**

*B.D. Whitaker*

*Animal and Poultry Science*

The present study compares the development of porcine embryos after different antioxidant supplementation and fertilization techniques. During fertilization, the oocytes and sperm were incubated in either the standard media or media supplemented with 1.0 mM N-acetyl-cysteine (NAC). The two fertilization methods were either in vitro fertilization (IVF), or Intracytoplasmic Sperm Injection (ICSI). The results showed that NAC supplementation to the ICSI media produced more embryos than NAC supplementation to the IVF media. The ICSI fertilization method was more successful during the early stages of embryo development; however there were no differences between fertilization techniques by the end of development. It is suggested that antioxidants decrease the success of IVF, however assist in alleviating stress during ICSI.

## Engineering

### **#28 Development and Simulation of a Parallel CFD Algorithm to Model Incompressible Canonical Flows**

*Imran Akhtar and Ali H. Nayfeh*

*Engineering Science and Mechanics*

The interactive fluid-structure phenomenon of flow separation and bluff body wakes has its fundamental significance in flow physics and its practical importance in aerodynamic and hydrodynamic applications. The flow over a circular cylinder has become the canonical problem for studying such external separated flows. As the Reynolds number exceeds a critical value, instability in the separated shear layers develops, and nonlinear interaction of these layers with feedback from the wake leads to vortex-shedding. A parallel three-dimensional computational fluid dynamics algorithm is developed to simulate the incompressible Navier-Stokes equations using curvilinear coordinates. Domain decomposition approach is employed to partition the grid into various processors. Direct numerical simulations (DNS) have been performed to simulate the flow past a circular cylinder. The proper orthogonal decomposition (POD) of the flow realizations of the DNS data provides optimum basis functions (modes) capturing most of the energy in the system. These modes are then used in a Galerkin procedure to project the Navier-Stokes equations onto a low-dimensional space, thereby reducing the distributed-parameter problem into a finite-dimensional nonlinear dynamical system in time. The reduced-order model can effectively be used for the estimation and control of the pressure forces (lift and drag) over the surface.

### **#29 Ontology development and utilization for knowledge management in product design**

*Xiaomeng Chang, and Janis Terpenny*

*Industrial and Systems Engineering*

In recent years, the concept of ontology has been used in the field of knowledge management and computer supported cooperative work. Ontology is a formal specification of domain knowledge and has been used to define a set of data and their structure for experts to share information in a domain of interest. It has advantages in information reasoning and retrieval. In product design, there is a large amount of different data related to each phase of the product life cycle. Based on the requirements of our NSF project, I have developed a DfM (Design for Manufacturing) ontology to represent knowledge in this field, and to capture various relations among concepts (such as mathematical cost relations, spatial logical relations, etc.). An ontology editor, Protégé, has also been extended and utilized to capture the DfM representation for product design. Based on the ontology, a management system has been built initially for designers to share information, reuse knowledge and make more accurate design decisions.

### **#38 A Framework for Supporting Software Performance Improvement at Runtime**

*Dong Kwan Kim*

*Computer Science*

Performance is a key aspect of non-functional software requirements with crosscutting elements such as throughput, response time, and resource utilization. This research proposes a framework to improve software performance using runtime reconfiguration. With this framework one can change the runtime configuration on the fly without human intervention. The three key components of the framework are the Performance Monitor, Performance Analyzer, and Configuration Manager. The Performance Monitor collects runtime data from a running application and notifies the Performance Analyzer when the performance degradation occurs. The hypothesis is that for the Performance Monitor, aspect-oriented programming (AOP) should be a suitable technique to characterize performance and instrument the source code from the analysis and design models to monitor and gather runtime data. The major role of the Performance Analyzer is to figure out which configuration is best among alternative configurations. A mathematical approach would be effective since the selection of new configuration needs to be made at runtime. The Configuration Manager applies the discovered configuration into a target application without halting it. The configuration of the running application changes and better performance is expected. Enterprise JavaBeans which is a component model based on Java technologies will be considered for a case study.

### **#39 Investigating Factors that Affect Increased Adoption of Public Transport**

*Mithilesh Kumar, Manas Tungare, Pardha S. Pyla, Yoon Suk Lee, and Gyuhyun Kwon*

*Computer Science*

The last few years have seen a steady rise in fuel costs, increasing discussion on the impact of vehicular pollution on the environment, and a stronger political rhetoric on the need for sustainable alternatives to our transportation needs. Traffic congestion and under-utilized public transport can cost local governments and businesses millions in expenses every year. We present the prototype of a system to increase the occupancy of a widely prevalent form of existing transportation personal automobiles. Our proposed design is based on our study of the transportation infrastructure in and around Blacksburg and an online survey conducted within the Virginia Tech community to understand their current usage of transportation modes, needs, and problems. A focus group was conducted to evaluate our proposed system and to identify potential problems. It was found during the focus group that "social networking" was a key issue to encourage ride sharing among community members. We used this idea to reinforce our design by incorporating more social networking features. Our system seamlessly integrates with a variety of everyday software applications to afford better adoption.

#### **#40 Driver Sitting Comfort and Discomfort: Relationships with and Prediction from Interface Pressure**

*Gyounghyung Kyung, and Maury A. Nussbaum*  
*Industrial and Systems Engineering*

Pressure at the driver-seat interface has been used as an objective method to assess subjective responses, yet existing evidence regarding its efficacy is mixed. The current study examined associations between three subjective ratings (overall, comfort, and discomfort) and 36 measures describing driver-seat interface pressure, and determined pressure levels and ratios that could yield improved subjective responses. Data were obtained during each of 162 driving sessions that involved 27 participants. Driving sessions involved six combinations of seats (from vehicles ranked high and low on overall comfort), two vehicle classes (sedan and SUV), and two driving venues (lab-based and field). Several pressure measures were identified as more effective for assessing sitting comfort and discomfort across a range of individual statures. Based on the results, specific approaches are recommended to improve the sitting experience: 1) lower pressure ratios at the buttocks and higher pressure ratios at the upper and lower back; and 2) balanced pressure between the bilateral buttocks, and between the lower and upper body. Finally, separate analyses supported that human-seat interface pressure was more strongly related with overall and comfort ratings than with discomfort ratings.

#### **#41 Performance of Stabilized Explicit Time Integration Methods For Parallel Air Quality Models**

*John C. Linford, Anurag Srivastava, and Adrian Sandu*  
*Computer Science*

Comprehensive air quality models (AQMs) describe the fate and transport of atmospheric chemical constituents associated with the gas and aerosol phases. Air quality studies involve multi-scale multi-physics simulations which follow the evolution of  $\sim 10^7$ ,  $10^8$  variables on relatively long time scales. AQMs are therefore computationally intense and require efficient parallelization to make them practical. In this work, we study the use of Runge-Kutta-Chebyshev (RKC) time integration of the advection-diffusion equations in AQMs. RKC are stabilized explicit time integration methods which are appropriate for the time integration of mildly stiff diffusion terms. We also assess the benefits of a tiled domain decomposition scheme for parallelization of AQMs. This approach is feasible due to the reduced data dependencies associated with explicit time stepping. Numerical results indicate that RKC methods have the necessary stability properties to handle turbulent diffusion, and that parallelization based on tiled domain decomposition shows a much-improved parallel performance when compared to the parallelization of implicit time stepping schemes. Our benchmarks also highlight a significant bottleneck in the I/O system of an AQM. This research demonstrates the viability of RKC time stepping methods and motivates future research into parallel I/O.

## **#42 Observing Personal and Society Creativity Behavior with Interactive Creativity System**

*Szu-Chia Lu*

*Computer Science*

This research constructed a creativity interactive system to explore creativity behaviors of individuals through the interaction between individuals and system assigned tasks. It adopted Csikszentmihalyi's Systematic view of creativity model, which takes cultural and societal contexture into creativity behavioral consideration. This creativity system also took Finke's inner cognitive process of creativity called Geneplore model to assist subjects in concentrating on creative imagery manipulation. With creativity interactive system, researchers can record and observe the creativity behaviors between individuals. With the analysis of individuals' creativity products of the two creativity assignments, this research discussed the influence of domain and field to individuals' creativity behaviors, and how individuals adjust their self-cognition and behavior to fit for the creativity criterion and expectation of specific group.

## **#43 Development of a Comprehensive Efficiency Measurement Framework to Evaluate Different Approaches to Road Maintenance using Data Envelopment Analysis**

*Mehmet Egemen Ozbek*

*Civil and Environmental Engineering*

The road maintenance performance measurement systems developed by researchers and state departments of transportation (DOTs) mainly focus on the effectiveness measures, e.g., the level-of-service. Such measurement systems do not elaborate on the efficiency concept, e.g., the amount of resources utilized to achieve such level-of-service, which is also a very essential performance measurement dimension. Not knowing how "efficient" state DOTs are in being "effective" can lead to excessive and unrealistic maintenance budget expectations. This issue indicates the need for a performance measurement approach that can also take the efficiency concept into account. The purpose of this research is to develop and implement a comprehensive framework that can measure the overall efficiency of road maintenance operations. It is challenging to measure the overall efficiency of a process when that process is a multiple input-multiple output process and when that process is affected by multiple uncontrollable factors (e.g., climate, traffic, etc.) To address this challenge, an innovative approach to efficiency measurement, Data Envelopment Analysis (DEA), is used in this research. The findings of this research will contribute new knowledge to the road maintenance domain by providing a framework that is able to differentiate effective and efficient maintenance strategies from effective and inefficient ones.

#### **#44 Using the Singular Value Decomposition to Reduce the Dimension of Remotely Sensed Data**

*R. D. Phillips, L. T. Watson, R. H. Wynne, and C. E. Blinn*

*Computer Science*

Data reduction in the discipline of remote sensing has always been necessary as the sensitivity of sensors has always outpaced the capabilities of computers that process the remotely sensed images. This work introduces the singular value decomposition (SVD), a well known matrix decomposition, as a method to reduce the number of bands present in images. Although the SVD has many applications in other disciplines, its use in remote sensing has been limited, likely a result of the large amount of computer memory and processing time required by the algorithm. This work proposes that by taking the SVD of the training data rather than the entire image, the SVD can be performed by a modest computer while not sacrificing quality. In fact, results are given to demonstrate that the SVD can not only reduce the size of the dataset without compromising ensuing classification accuracy, but it can actually improve the quality of the classification over using the raw data with no reduction and using another standard data reduction method, principal components analysis (PCA).

#### **#45 Evaluating Ripple: Experiences from a Cross Pollinated SE-UE Study**

*Pardha S. Pyla, H. Rex Hartson, James D. Arthur<sup>1</sup>, Tonya L. Smith-Jackson, Manuel A. Perez-Quinonez, and Deborah Hix*

*Computer Science*

The disciplines of software engineering (SE) and usability engineering (UE) have reached substantial levels of maturity, each now with its own well-established life cycle processes, activities, and techniques. The usability engineering life cycle process guides the design and evaluation of user interaction design of an interactive software system. The software engineering life cycle guides the development of the functional core (the non-user interface functionality) and the implementation of user interface according to the specifications created by usability engineers. Given that the user interface and the functional core are two closely coupled components of any system, one would expect close connections between the two development life cycle processes. Unfortunately, the two disciplines are practiced almost independently “missing opportunities to collaborate, coordinate and communicate about the overall design” often leading to project failures. In response, we created the Ripple framework that provides a development infrastructure to foster communication between software and usability engineers thereby connecting usability and software engineering life cycles in cooperative and complementary roles. This poster paper describes eight case studies from the evaluation of the Ripple Implementation Framework instantiated within an educational setting and the preliminary findings from this study.

#### **#46 Tempest: A portable Tool to Identify Hot Code Using Thermal Sensors**

*Hari Pyla, Kirk W. Cameron, and Srinidhi Varadarajan*

*Computer Science*

Compute servers are consuming more power at higher densities than ever before. This results in increased thermal dissipation, the need for powerful cooling systems, and ultimately a reduction in system reliability as temperatures increase. Over the past several years, the research community has reacted to this problem by producing software tools such as HotSpot and Mercury to estimate system thermal characteristics and validate thermal-management techniques. While these tools are flexible and useful, they suffer several limitations: For the average user such simulation tools can be cumbersome to use. These tools may take significant time and expertise to port to different systems. Lastly, such tools produce significant detail and accuracy at the expense of execution time enough to prohibit iterative testing. We propose a fast, easy to use, accurate, portable software tool called Tempest (for temperature estimator) that leverages emergent thermal sensors to enable user profiling, evaluating, and reducing the thermal characteristics of systems and applications. We illustrate the use of Tempest to analyze the thermal effects of various standard benchmarks. We also show how users can quickly analyze the effects of performance optimizations on system and application thermals.

#### **#47 Risk-Based Framework for Focused Assessment of System Dynamics Models**

*Michael Schwandt*

*Industrial and Systems Engineering*

Traditionally, the testing of system dynamics simulation models focuses on building credibility for the model from the perspective of decision or policy makers. The system dynamics methodology has relied on applying a battery of tests to achieve the credibility-building objective. However, the battery of tests is not universally defined, the methods for the tests are not well documented, and the application of the tests is highly variable. The lack of a consistent, rigorous testing methodology has contributed to system dynamics models often not being well received in traditional modeling circles or within the broader research community. This research project proposes the development and application of a risk-based framework for prioritizing the risk management requirements for modeling projects. The framework focuses around two classification schemes, one for system dynamics modeling risks and the other for modeling risk management techniques. The classification schemes are linked by assessments of risk probability and significance to recommend a modeling risk management plan. Modelers will utilize the framework to assess the sources of risk in their project, to identify the appropriate tests for reducing the risks, and then to apply only those tests that contribute the greatest value toward achieving the modeling project objectives.

## **#48 A Disciplined Approach to Adopting Agile Practices: The Agile Adoption Framework**

*Ahmed Sidky*

*Computer Science*

Many organizations aspire to adopt agile processes to take advantage of the numerous benefits that it offers to an organization. Those benefits include, but are not limited to, quicker return on investment, better software quality, and higher customer satisfaction. To date however, there is no structured process (at least in the public domain) that guides organizations in adopting agile practices. To address this problem we present the Agile Adoption Framework. The framework consists of two components: an agile measurement index, and a 4-Stage process, that together guide and assist the agile adoption efforts of organizations. More specifically, the agile measurement index is used to identify the agile potential of projects and organizations. The 4-Stage process, on the other hand, helps determine (a) whether or not organizations are ready for agile adoption, and (b) guided by their potential, what set of agile practices can and should be introduced.

## **#49 Reconfigurable FPGA-based Clusters: Next Step in Supercomputing**

*Vivek Venugopal and Kevin Shinpaugh*

*Electrical and Computer Engineering*

The demand of computational horsepower has increased with today's highly intensive computational applications such as genome sequencing, fluid mechanics modeling and astrophysics simulations. Cluster computing has evolved to offset this computational bottleneck. These clusters consist of single or multi-core processors with fast interconnections and high speed memory access. While building clusters, it is necessary to cater to a huge range of problems, some of which require large number of floating point calculations with less access to high speed interconnection busses. Some problems stream large amount of data with just bit manipulation instead of floating point. The current multi-core processors are not well suited for all problems due to their fixed hardware blocks, bus interconnections and the rate at which data is available for processing. In this context, FPGAs are an effective solution as the interconnection and the processing hardware can be configured to match the requirements of different algorithms. A wide array of such architectures are readily available from high-performance computing vendors such as Cray and SGI. This research addresses the requirement of a reconfigurable framework for these systems by using integrated formal models for computation, communication and reconfiguration along with existing C-based tools.

## **#50 Sapphire-Fiber-based Optical Temperature Sensing System for Harsh Environment Applications**

*Yizheng Zhu*

*Electrical and Computer Engineering*

This Ph.D. research presents the complete development of an optical temperature sensing system from initial concept to final industrial field test. This system is the first optical approach applied successfully in the extremely harsh and corrosive environment of coal gasifiers, core of the next generation power plant, where temperature could top 1600°C and pressure reaches beyond 400 psig. The key development is a sapphire-fiber-based optical temperature sensor with high-temperature capability and superior corrosion resistance. Detailed laboratory evaluation confirmed its excellent performance with  $\pm 0.2\%$  accuracy and 0.4°C resolution up to 1600°C limited only by the test furnace. A complete system was built around the sensor for temperature monitoring inside a coal gasifier at Tampa Electric Company's 250-Megawatt Polk Power Station in Florida. It consists of three major components: 1) Sensors and their packaging, 2) Optical interrogation system for sensor signal detection, and 3) Signal processing unit for demodulating temperature information. The system successfully operated for seven months, delivering readings more consistent and reliable than electrical thermocouples, which had been the only technology available before. To optical sensing technology, this prototype system and the field demonstration is one firm step ahead toward product development and real-world deployment.

## Natural and Earth Sciences

### **#51 The Efficacy of Tree Stabilization Systems and Their Effect on Tree Growth and Establishment**

*Alexis A. Alvey and Eric Wiseman*

*Forestry*

Various forms of staking and guying are used to prevent tree destabilization, but little scientific evidence exists to support this practice. In this experiment, the efficacy of three generic tree stabilization systems (TSS) was tested and their effect on tree growth and establishment. In spring 2006, 48 balled and burlapped, 2 caliper, white ash (*Fraxinus americana* Autumn Purple) were transplanted to a field site in Blacksburg, VA. At planting, one of four TSS treatments (staking, guying, root ball anchoring, or control) was installed on each tree. After five weeks, destabilization tests were conducted on half the trees using a cable winch mounted to a skid-steer loader. After one growing season, growth measurements were taken on the 24 remaining trees. Destabilization tests were then conducted on these trees using the same method. The five week tests showed that destabilization was significantly greater for control trees (mean of 160 from vertical) than for trees with TSS (all means less than 30 from vertical). After one growing season, there were no significant differences among any treatments in destabilization. TSS may not be necessary for similar trees growing under similar conditions, and no one system was better than the others in preventing tree destabilization.

### **#52 Combining theoretical ecology and endangered species management to identify mechanisms driving complex community interactions**

*Lori. A. Blanc and Jeffery R. Walters*

*Biological Sciences*

Species interactions within ecological communities can play a strong role in influencing community structure. These interactions pose a major challenge to predicting ecosystem responses to environmental change because predictive frameworks require identification of mechanisms by which community interactions arise. Cavity-nesting communities are well suited for mechanistic studies of species interactions because cavity-nesters interact through the creation of and competition for cavity nest-sites. In this study, we examined interactions between cavity-nesting birds in northwest Florida. Using 4 years of nest data, we generated a nest-web and identified a potential indirect interaction between the Red-cockaded Woodpecker and large secondary cavity-nesters, mediated by the Northern Flicker. We modeled this interaction with path analysis, using cavity excavation and enlargement as mechanisms which drive the relationship between these species. Through experimental manipulation of cavity availability, we blocked pathways within this model, confirming the role of cavity creation and enlargement as processes that influence community structure. We also found that a single-species management technique for the endangered Red-cockaded Woodpecker can disrupt this indirect relationship by affecting Northern Flicker behavior. Our findings highlight the need to develop a better understanding of how mechanisms underlying species interactions influence community structure and subsequently complicate ecosystem responses to environmental change.

### **#53 Impact of Chemical and Microbiological Oxidation and Reduction of Manganese in Drinking Water Systems**

*Jose M. Cerrato, Joseph O. Falkinham III, and Andrea M. Dietrich*  
*Civil and Environmental Engineering*

Worldwide, corrosion and build-up of scales on the interior pipe wall impacts both the quality and quantity of drinking water delivered to consumers. This research investigated the role of chemical and microbiological factors on pipe corrosion and manganese oxidation and reduction in water systems. Water samples were collected from locations in the treatment plant and distribution system of Tegucigalpa, Honduras. Chlorine, pH, dissolved oxygen, and total and soluble manganese and iron concentrations were measured. Particulate manganese was dislodged from PVC leading to more severe black water problems compared to iron pipes. Manganese was incorporated into iron pipes where it contributed to corrosion. Mn-oxidizing and -reducing bacteria were recovered from biofilm samples collected in the treatment plants of Tegucigalpa, and Newport News and Blacksburg in Virginia. Biofilms from PVC and iron pipes, and sand filter media from Tegucigalpa were suspended and shown capable of both Mn -oxidation and -reduction. The obtained results suggest that that biofilms in the sedimentation basin, filtration basin and distribution system could contribute to manganese release in drinking water. Results of this study indicate that both microbial and chemical processes are important to limiting corrosion and that pipe type will influence scaling, biofilm growth, and water quality.

### **#54 Influence of Soil Amendments and Microtopography on Rooting in a Created Tidal Freshwater Swamp in Southeastern Virginia**

*Sarah Dickinson, J. Roger Harris, W. Lee Daniels, and P. Eric Wiseman*  
*Horticulture*

Wetland creation practices often recommend addition of organic matter and microtopography to the soil to expedite the development of valuable wetland functions. The purpose of this study was to determine the effects of microtopography and soil amendments on root growth and distribution in a created tidal freshwater swamp. Minirhizotrons were used to obtain these root data on three dates (spring, summer and fall) during the 2006 growing season. Root count, length, and diameter were recorded to a depth of 40cm at the study site in Charles City County, VA. Mean root length, count, and diameter were compared between four soil treatments: 1) yard waste compost (1x), 2) local topsoil (TS), 3) 1x + TS, and 4) control; and three microtopography treatments: 1) pit, 2) mound and 3) level. Root length and diameter was affected by microtopography in the spring ( $p < .0001$ ), ( $p = .05$ ) and summer ( $p = .0491$ ), ( $p = .053$ ), with mounds having the longest root length and widest diameter. Root count was affected by microtopography in the spring ( $p < .0001$ ) with mounds having the highest root count. Soil treatment affected root length and count during the summer ( $p = .0116$ ), ( $p = .0397$ ) and fall ( $p = .0203$ ), ( $p = .0353$ ), with the control having the longest root length and highest root count.

## **#55 Do Fine Root Defenses Control Interactions Among Root Feeding Insects and Their Natural Enemies in Appalachian Forests? Linking Belowground Trophic Interactions with Fine Root Carbon Flux**

*Matthew Dittler and Robert H. Jones*

*Biological Sciences*

Plants can attract the natural enemies of their herbivores via volatile organic compounds (indirect defense), setting the stage for complex interactions and coevolution. Ecologists who study belowground ecosystems are interested in how this affects patterns of root consumption by herbivores. This is important because fine root turnover represents a substantial carbon flux in terrestrial ecosystems. This project takes a three-phase approach to assess how indirect defense affects belowground carbon dynamics in Appalachian, oak-dominated forests. 1) Characterize the volatile emissions from fine roots of oak trees after inducing defensive responses. 2) Test for attraction of natural enemies to both insect-damaged tree roots and synthesized volatile compounds identified from defense induction. 3) Quantify effects of indirect defense on fine root turnover in the field by using root ingrowth cores. A pilot study has already demonstrated that root feeding insects are sufficiently abundant to affect fine root dynamics in this system. Future results will reveal new knowledge about belowground plant defenses, root herbivory, fine root dynamics, and the trophic interactions which link them together. This will advance our understanding of a little known, but important biological system, providing data of practical importance in the study of global carbon cycling and climate change.

## **#56 Acid Deposition Effects on Forest Composition and Productivity in the Monongahela National Forest**

*Patricia Elias, James Burger and Mary Beth Adams*

*Forestry*

Acid deposition (AD) from air pollution is a chronic stress on forest ecosystems in the northeast and mid-Atlantic regions of the U.S. The goal of our work is to determine if AD has caused changes in forest composition and productivity, and, if so, determine how to monitor and manage the effects of AD. U.S. Forest Service Forest Inventory Analysis plots within the Monongahela National Forest (MNF) in West Virginia are being used as a sampling network of plots with long-term data. A hypothesized AD site sensitivity index based on parent material, soil depth, soil mineralogy, slope, aspect and elevation has been mapped across the MNF. Data for parent material were obtained from the MNF, soil depth and mineralogy from USDA soil data-bases, and slope, aspect, and elevation were calculated using USGS digital elevation models. Change in basal area growth during the period 1987-2004 was determined for 95 plots across the MNF. Mapping growth over the site sensitivity is expected to show that forest productivity has declined more dramatically on highly sensitive sites. An analysis of relationships between productivity and site indicators will be made to test the efficacy of the sensitivity index and its usefulness as a management tool.

**#57 The Influence of Stream Acidification on Nutrient Immobilization by Microbial Decomposers: Implications for Whole-Stream N Processing**

*Damon T. Ely, Daniel Von Schiller, H. Maurice Valett*

*Biological Sciences*

Stream acidification due to acid precipitation has numerous detrimental effects on lotic communities; however, pH influence over stream function is less understood. In addition to increasing surface water hydrogen ion concentration, acid precipitation mobilizes toxic forms of aluminum and simultaneously loads nitrogen (N) as nitric acid onto receiving systems. Based on findings of slower leaf decomposition in acid streams, we hypothesized that chronic acidification reduces the potential for N uptake because elevated concentrations of hydrogen ions and inorganic aluminum impair primary biotic uptake compartments. We tested this hypothesis by measuring respiration and N uptake rates on leaves collected from six streams spanning a pH gradient from 5.1 to 6.7. We exposed leaf discs to three treatments (pH 6.5, pH 4.5, and pH 4.5 + 15M Al<sup>3+</sup>) under two levels of N availability (25ppb, 100ppb) over 24 hours. pH and aluminum treatments had little influence on response variables while positive responses were observed with increased N. Respiration and N uptake rates were significantly positively related. Most notably, respiration and N uptake rates displayed significant positive relationships with ambient stream pH. We suggest greater importance of chronic stream acidity than acute changes in chemical conditions on these microbially-driven functions.

**#58 Identification of Genetic Variation among Red Maple and Yellow Poplar Populations in Forests of the Southeast United States**

*Katherine Kovach, Shepard Zedaker, Javed Iqbal and Ulrika Egertsdotter*

*Forestry*

This study will identify genetic variations in red maple and yellow poplar populations in the Southeast United States. Field techniques will be utilized to characterize sites by physiographic region, management intensity, latitude/longitude and to collect tissue for genetic analysis. Field sites are located in North Carolina, Virginia, Tennessee, Georgia, West Virginia, and Kentucky. Amplified fragment length polymorphism techniques will be applied to assess the degree of genetic variation between sites. The strongest variations are expected between the sites of highest latitude and those of lowest latitude. Both red maple and yellow poplar are prolific throughout this region. Knowing more about the genetic structures of these species and how they vary throughout the Southeast will initiate other exploratory studies into uses and ways to maximize the value of these species. The Sustainable Engineered Materials Institute at Virginia Tech has been pursuing research on these species and goals of economic benefits for the region are rapidly being approached.

### **#59 Comparison of Methods for Measuring Streambank Retreat**

*J. P. Resop and W. C. Hession*

*Biological Systems Engineering*

Nationwide, numerous public agencies are expending significant funds and effort to control streambank erosion as a means of reducing sediment and nutrient loads. However, data concerning streambank erosion and retreat rates are scarce and range greatly. In addition, the actual measurement of streambank retreat rates over time and space can be extremely time consuming and are often characterized by large measurement uncertainties. In this study, we compare and contrast four techniques for measuring streambank retreat rates: 1) typical surveying methods with an electronic total station; 2) bank erosion pins; 3) ground-based digital camera with three-dimensional photogrammetry; and 4) a portable, laser-based imaging and digitizing system (or Light Detection and Ranging - LIDAR). We have conducted re-surveys of a retreating streambank on Stroubles Creek in Blacksburg, Virginia using all four techniques. Our results will contrast and compare the four methods in terms of time and effort, cost, spatial and temporal resolution, and uncertainty.

### **#60 Integrated Wetland Filtration for the Removal of Nutrients from Eutrophic Water**

*Shawn Rosenquist, Cully Hession, and David Vaughan*

*Biological Systems Engineering*

One of our most significant water quality issues is the eutrophication of various water bodies. The focus of my research is a subsurface wetland studied with field scale lysimeters that will simulate a filtration system for removing excess nutrients in eutrophic conditions. The lysimeter study, which provides environmental control and approximates real field conditions, will also enable dosing the water input to the system with various levels of nutrients along with other background conditions to determine the capacity and performance of the engineered system. The lysimeters will also allow for the monitoring of many other factors that may be correlated to the nutrient uptake measurements, such as evapotranspiration, infiltration rates, and temperatures. Results may include an optimal soil media and structure, total capacities and rates of nutrient removal, efficiencies over various input concentrations, and the effects of vegetation. Applications for this filter may include wastewater treatment and filtering urban runoff before it is released to streams, and mitigation for hypereutrophic lakes and ponds.

### **#61 Forest-Related Ordinances in Virginia: A Case Study in Regulatory De-evolution**

*Lauren Stull, Michael Mortimer, Stephen Prisley, and David Slack*

*Forestry*

An inventory of Virginia's counties and incorporated cities was conducted in 2005 to detect the presence of forest-related ordinances. Comparative inventory results suggest that the number of ordinances appears to have increased from 44 in 1992 to 377 in 2005. Local governments in Virginia have enacted forest-related ordinances addressing erosion and sediment control, the use of prescribed fire, forestry in floodplains and wetlands, scenic limitations, timber harvesting, and the use of pesticides. Nearly all (97%) local governments have been involved in the regulation of forestry to some extent. Study observations include inconsistent regulatory standards among municipalities, potential conflicts with state mandates, and concern for the uncertain effects on the management of private forestland. Policy implications might include state action to provide greater uniformity in local standards, clarification of the relationship between state-level requirements and local implementation, refining the definition of terms such as *silviculture*, and state reaction by amending Virginia's *Right to Practice Forestry* statute.

## **#62 Effects of Nutrient and Organic Matter Manipulation on Carbon Pools and Fluxes in a Young Loblolly Pine Stand**

*Michael C. Tyree, John R. Seiler, and Chris A. Maier*  
*Forestry*

Harvesting of a Southern pine plantation generates large amounts of unutilized organic carbon and nutrients in the form of logging residue. The manipulation of site organic matter through incorporation of this material into the soil could lead to improved soil physical properties, increased site productivity, and perhaps in the longer term increased soil carbon storage and nutrient cycling. The objective of this research is to monitor various short-term carbon pools and fluxes in a two-year-old loblolly pine stand located on the Lower Coastal Plain of South Carolina, which has undergone soil organic matter and nutrient manipulation. We hypothesize these manipulations will result in changes to Soil CO<sub>2</sub> efflux, microbial biomass carbon, total soil carbon, and plant biomass. Alternatively, nutrient immobilization could result in reduced plant growth and disrupt carbon dynamics. A second objective is to determine how these pools and fluxes are influenced by differences in nutrient use efficiency and carbon allocation patterns between two superior loblolly pine clones. This research utilizes treatment plots from a larger field study (USDA Forest service Cross Carbon Study) located in Summerville, SC, which is a collaborative effort between US Forest Service and MeadWestvaco.

**#63 Plasmonically Enhanced Second-Order Nonlinear Effects from Ionically Self-Assembled Multilayers (ISAM) Materials**

*Kai Chen, Cemil Durak, J.R. Heflin and Hans D. Robinson*

*Physics*

We have fabricated a new class of second order nonlinear optical materials by combining ionic self-assembled multilayer (ISAM) films with silver nanoparticle arrays in non-centrosymmetric geometry. These hybrid films exhibit second-harmonic generation (SHG) efficiencies as much as 1600 times larger than unmodified, conventional ISAM films, which makes a three bilayer hybrid film perform at the same level as a micron thick, 700-1000 bilayer film. This was accomplished by using nanosphere lithography to deposit silver nanoparticles on the ISAM film, tuning the geometry of the particles to make their plasmonic resonances overlap the frequency of optical excitation. Even though the enhancement is already large, we suggest that further refinements of the techniques are expected to lead to additional enhancements of similar or larger magnitude.

**#64 Characterization of Hepatitis E Virus Detected in Commercial Pig Livers sold in Local Grocery Stores in the United States**

*A. R. Feagins, T. Opriessnig, D. K. Guenette, P. G. Halbur, and X. J. Meng*

*Biological Sciences and Pathobiology*

Hepatitis E virus (HEV) is a zoonotic pathogen. To determine the presence of HEV RNA in commercial pig livers sold in local U.S. grocery stores, 127 packages of commercial pig liver were tested by RT-PCR. Fourteen (11%) were positive for HEV RNA. An animal study was subsequently conducted in pigs to determine if 3 of the selected PCR-positive pig livers still contain infectious virus. Results showed that pigs inoculated with 2 of the 3 PCR-positive pig liver homogenates (n=5, each) became infected, as evidenced by fecal virus shedding, viremia, and seroconversion. To determine if the HEV-contaminated pig livers could be inactivated by traditional cooking methods, a second animal study was conducted. Group 1 negative control pigs (n=5), group 2 positive control pigs (n=5), groups 3, 4 and 5 pigs (n=5, each group) each with a pool of two HEV-positive liver homogenates incubated at 56°C for 1 hr, a pooled homogenate of two HEV-positive livers stir-fried at 375°F for 5 min or boiled in water for 5 min, respectively. The data demonstrated that commercial pig livers sold in local U.S. grocery stores are contaminated by infectious HEV, however the contaminating virus can be inactivated if the pig livers are cooked properly.

## **#65 Analytical Solutions of the Poisson-Boltzmann Equation: Biological Applications**

Andrew Fenley, John Gordon, and Alexey Omufriev

Physics

The ability to compute the electrostatic properties of a molecule is often essential in understanding the mechanism behind its function. An approximate, analytical solution to the (linearized) Poisson-Boltzmann equation is proposed that is suitable for realistic biomolecules of virtually any size. A comparison with the accepted numerical approaches on a large test set of biomolecular structures shows that the proposed method is considerably less expensive computationally, yet accurate enough to be considered as a possible alternative. The usefulness of the approach is demonstrated by computing and analyzing the electrostatic potential generated by full capsid of the tobacco ring spot virus (half a million atoms) at atomic resolution. The details of the potential distribution on the molecular surface sheds light on the mechanism behind the high selectivity of the capsid to the viral RNA. These results are generated with the modest computational power of a desktop PC.

## **#66 An Archaeal Homolog of the Human p53 Related Protein Kinase**

January D. Haile, W. Keith Ray, M. Ben Potters, Peter J. Kennelly

Biochemistry

Open reading frame (ORF) *sso0433* encodes a protein kinase, SsoPK5, in *Sulfolobus solfataricus* P2. The protein kinase has 33% sequence identity to the *Homo sapiens* p53 related protein kinase (PRPK) and 26% sequence identity to the *Saccharomyces cerevisiae* Bud32. Both kinases phosphorylate targets involved in cell cycle regulation. For example, PRPK phosphorylates p53. While there is no p53 homolog in *S. cerevisiae*, Bud32 does phosphorylate human p53 *in vitro*. Moreover, the knockout of Bud32 exhibits a slow growth phenotype. Given the evolutionary distance between the Archaea and Eukarya, the degree of sequence similarity is unexpectedly high. Therefore, we are exploring whether the function of the archaeal protein kinase is similar to its counterparts in humans and yeast. We hypothesize SsoPK5 targets similar proteins and processes. SsoPK5 phosphorylates several exogenous and endogenous substrates *in vitro*. These include casein and PCNA1, a sliding clamp. We are also evaluating protein products from ORFs *sso0432*, a homolog of *S. cerevisiae* HamI, and *sso0434*, *S. cerevisiae* endopeptidase, as potential targets of SsoPK5. Sso0432 and Sso0434 are of particular interest because they along with SsoPK5 appear to be encoded by an operon. In the future we will determine if the activity of target proteins is altered as a function of the phosphorylation state.

## **#67 FTABLE Generation Method Effects on Instream Fecal Bacteria Concentrations Simulated with HSPF**

*Kyle M. Hall, Rebecca W. Zeckoski, Kevin M. Brannan, and Brian L. Benham*  
*Biological Systems Engineering*

The Hydrological Simulation Program-FORTRAN (HSPF) represents discharge using function tables (FTABLES) that relate stream stage, surface area, volume, and discharge. In this study, five FTABLE scenarios were compared to assess their effect on various outputs predicted using HSPF. Four “field-based” FTABLE scenarios were developed using detailed cross-sectional surveys. A fifth “digital-based” FTABLE scenario was developed using digital elevation data and Natural Resources Conservation Service Regional Hydraulic Geometry Curves. Pair-wise Student’s t-tests were used to compare long-term average instream fecal bacteria concentration, instream fecal bacteria die-off, and rate of violation of the Virginia single-sample water quality criterion using the five FTABLE scenarios. The digital-based FTABLE scenarios produced significantly higher long-term average instream fecal bacteria concentrations, significantly lower instream fecal bacteria die-off, and significantly higher water quality criterion violation rates. These differences are function of FTABLE generation method and are an artifact of differences in the digital- and field-based volume-discharge relationships that HSPF uses to compute hourly discharge rates.

## **#68 Biomedical Applications of Cellulose Nanocrystals: Targeting Brain Endothelial Cells**

*Anjali A. Hirani, Shuping Dong, Maren Roman, and Yong Woo Lee*  
*School of biomedical Engineering and Sciences*

Targeted drug delivery to brain microvascular endothelial cells (BMEC) has become an important area of biomedical research in the development of therapeutic strategy against neurological disorders such as Alzheimer’s disease, Parkinson’s disease, and stroke. Cellulose nanocrystals are rod-like nanoparticles of cellulose with average dimensions of 100 to 150 nm in length and 3 to 5 nm in width. Cellulose nanocrystals have several properties that render them attractive for targeted drug delivery applications, such as optimum size, hydrophilic surface chemistry, and inherent biocompatibility. In the present study, we determined cell viability using a standard MTT assay to examine whether cellulose nanocrystals result in cytotoxic effects on BMEC. The cell viability was not affected by treatment with cellulose nanocrystals at 50 ug/ml for up to 72 h. To investigate the direct effects of cellulose nanocrystals on expression of pro-inflammatory mediators in a diseased state in BMEC, cells were exposed to increasing concentrations of cellulose nanocrystals (0, 10, 25 and 50 ug/ml) for 4 h. Quantitative real-time reverse transcriptase-polymerase chain reaction showed a marked decrease in overexpression of pro-inflammatory mediators in cells treated with cellulose nanocrystals. These data provide evidence to indicate that cellulose nanocrystals may be beneficial in use as targeted drug delivery systems.

### **#69 Mechanistic Studies on Memory of Chirality Deprotonation/Alkylations of 1,4- Benzodiazepin-2-ones**

*Danny C. Hsu and Paul R. Carlier*  
*Chemistry*

1, 4-benzodiazepin-2-ones are among the most important scaffolds in medicinal chemistry. Most of the them investigated to date have been prepared from proteinogenic amino acid derivatives or their enantiomers, and thus carry the proton from its parent amino acid. Consequently, enantiopure benzodiazepines possessing quaternary chiral center are quite rare. We have previously reported the enantioselective synthesis of quaternary 1, 4- benzodiazepin-2-ones via memory of chirality. The high enantiomeric excess realized in the retentive synthesis has been attributed to the formation of enantiopure, conformationally chiral (M)-enolate, and subsequent concave-face, contra-steric alkylation. However, another possibility is that deprotonation of (S)-benzodiazepine affords the enantiomeric (P)-enolate, followed by convex-face, sterically controlled alkylation. In this paper we report mechanistic studies on the enantioselective alkylations of 1,4-benzodiazepin-2-ones with retention of configuration.

### **#70 Detecting a Rate Increase Using a Bernoulli Scan Statistic**

*Michael D. Joner, William H. Woodall, Marion R. Reynolds*  
*Statistics*

Scan statistics are used in public health applications to detect increases in rates or clusters of disease indicated by an unusually large number of events. Most of the work has been for the retrospective case, in which a single set of historical data is to be analyzed. A modification of this retrospective scan statistic has been recommended for use when incidences of an event are recorded as they occur over time (prospectively) to determine whether the underlying incidence rate has increased, preferably as soon as possible after such an increase. In this poster we investigate the properties of the scan statistic when used in prospective surveillance of the incidence rate under the assumption of independent Bernoulli observations. We show how to evaluate the expected number of Bernoulli observations needed to generate a signal that the incidence rate has increased. We compare the performance of the prospective scan statistic method with that obtained using the Bernoulli-based cumulative sum (CUSUM) technique. We show that the latter tends to be more effective in detecting sustained increases in the rate.

## **#71 Dynamic Properties and Ordering of Magnetic Flux lines in Type-II Superconductors**

*Thananart Klongcheongsan*

*Physics*

We have conducted the 3D Monte Carlo simulation on the ordering of driven magnetic vortex lines in type-II superconductors with strong pinning potential of defects. Characteristics of the voltage noise in various configurations of defects have been used to distinguish ordered phases from disordered phases. Broadband noise associated with onset of plastic phase is observed due to the domination of strong pinning potential. Washboard signal, associated with ordered phase, with higher harmonics and large amplitude is observed in the system with planar defect. Sharp peak of the noise occurs just above the critical currents at which the superconductivity is destroyed. The effects of different defect configurations on the characteristic of current-voltage (I-V) curves have been studied. Results from the simulations show that vortices interacting with correlated disorders have the higher critical current.

## **#72 Perspectives on the Biophysics of Lipid Bilayer as a Mean to Understand Cellular Processes**

*Sukit Leekumjorn and Amadeu K. Sum*

*Chemical Engineering*

Phospholipid bilayers constitute the primary structural element of biological membranes, and as such, they play a central role in biochemical and biophysical processes at the cellular level. Due to the complexity and vast number of processes simultaneously occurring in cells, one must be selective and model specific processes by isolating their behavior and function. Although experiment observations reveal much of the macroscopic functions and properties of biological membranes, insight into specific mechanisms at the molecular level are seldom accessible by conventional methods. To obtain a better understanding of these processes at the molecular level, we apply molecular simulation methods using atomistic models to investigate two specific biological processes. First, we detail a comprehensive study of lipid bilayers near the main phase transition. In this study, we investigate the transformation process of lipid bilayers between the ordered (gel) and disordered (liquid-crystalline) phases, which is involved as part of many signaling processes, such as protein transport, membrane sorting, and pathogens/toxins binding sites. Second, we describe the protective role of a stabilizing agent, trehalose, on modeled cell membrane to elucidate its role against the toxicity induced by fatty acids. Experimental measurements and our simulations results expose the preventive mechanism linking trehalose to possible cures for obesity-associated diseases.

### **#73 Polysiloxane-Magnetite Complexes for Use in Eye Surgery**

*Thompson Mefford, Michael Vadala, Raquel Mejia-Ariza, Matt Carroll, Annette Tyler, Richey Davis, Tim St. Pierre, Robert Woodward, J. P. Daily, and Judy Riffle*  
*Macromolecules and Interfaces Institute*

Biocompatible ferrofluids show promise as materials for the restorative treatment of retinal detachment. These ferrofluids are comprised of magnetite nanoparticles stabilized by polydimethylsiloxane. To understand how these materials respond to external magnetic fields and gradients, an experimental technique was developed that demonstrates greater accuracy in measuring the magnetophoretic mobility of the ferrofluid droplets than previously reported. In addition, the surface coating of polysiloxane stabilizers must be sufficiently dense to prevent aggregation of the particles both within, and in the absence of, an external magnetic field. If the thickness of the polymer coatings and the variation its density away from the surface of the nanoparticle are known then it is possible to use a suitably modified DLVO calculations to calculate the steric potential and estimate the stability of the coated nanoparticle system. By altering the molecular weight of the stabilizer one can affect the overall stability of the complex. Finally, because we are striving for a material that could be easily administered in the surgical setting, the flow properties of the material in and out of shear are critical. Rheological studies of the materials were conducted to determine the effect of surface modification on the shear thinning of the ferrofluid.

### **#74 Cell Culture in 3-Dimensional Micromachined Silicon Structures**

*Mehdi Nikhah, Masoud Agah and Jeannine S. Strobl*  
*Mechanical Engineering*

In this study, we report design and fabrication of three dimensional silicon micromachined cell culture dishes to investigate the effect of geometry and surface morphology on proliferation and growth of human cells. The silicon has been etched under different conditions in order to form an array of flat and rough surfaces with variety of geometries. The overall dimension of each dish is including channels with depth/width in the range of 30-200  $\mu\text{m}$ . These devices allow direct visualization of the cell growth while aims to help to quantify the parameters affecting it. Our results show that HS68 normal human foreskin fibroblast cells attach and spread when plated and proliferate with typical cell growth kinetics on silicon chips in a static cell culture medium. The results also confirm that the cells take the shape of the dish geometry and deform to avoid movement into rough surfaces on the chips. Our findings are the proof-of-principle that our proposed microchannel silicon chips provide a new and versatile way to study cell growth, deformation and migration.

## **#75 Genetic and Biochemical Characterization of IscA and its S104C Variant in *Azotobacter vinelandii***

Ina P. O'Carroll, Deborah C. Johnson, and Dennis R. Dean  
*Biochemistry*

Fe-S clusters are inorganic prosthetic groups that often confer their associated proteins with essential redox, catalytic, sensory, or structural properties. In *Azotobacter vinelandii*, the *iscRSUAhscBAfdxiscX* operon gives rise to the "housekeeping" biosynthetic machinery of Fe-S clusters. Due to the essential nature of the majority of these genes, we have developed a genetic strategy, via which *isc* genes can be manipulated genetically with the concomitant expression of a second copy of the *isc* operon placed under the inducible transcriptional promoter of the sucrose catabolism region in the *A. vinelandii* chromosome. Using this strategy, we have established that deletion of the *iscA* gene results in a null growth phenotype under elevated oxygen conditions, suggesting the involvement of IscA during oxidative stress. Moreover, a variant strain where S104 is substituted by a cysteine exerts a null-growth phenotype even when sucrose is present in the media, indicative of negative dominance. Initial biochemical characterization of the poly-histidine tagged IscA and IscAS104C indicates that a Fe-S cluster is associated with both the variant and the wild type proteins, although the cluster occupancy is higher in IscAS104C. Current and future work will hopefully assist in pinpointing a clearer role of IscA in the biogenesis of Fe-S clusters.

## **#76 Characterization of prion gene expression in bovine tissues**

O. A. Peralta, W. R. Huckle and W. H. Eyestone  
*Large Animal Clinical Science*

Characterization of prion gene expression in bovine tissues Authors=O. A. Peralta, W. R. Huckle and W. H. Eyestone Abstract= The cellular prion protein (PrPC) is a 29- to 35-kDa host-encoded, GPI-anchored membrane glycoprotein. The function of PrPC is unknown; however, its pathogenic isoform (PrPSc) is believed to be the infectious agent in transmissible spongiform encephalopathies. Tissues expressing PrPC are potential sites for conversion of PrPC to PrPSc. Therefore, the aim of this study was to examine relative PrPC expression in bovine tissues. Angus cattle (n=4) were slaughtered and tissue samples were collected from obex, cerebellum, spinal cord, lymph node, thymus, duodenum, pancreas, liver, kidney, spleen and skeletal muscle. Sectioned tissues were probed with anti-PrP (SAF 32) followed by biotinylated antibody complexed to horseradish peroxidase. Total protein was extracted and separated by SDS-PAGE in a 12% gel and blotted onto a PVDF membrane. SAF 32 and anti-GAPDH antibodies were used for membrane incubation followed by fluorescent IgG, screened by an Odyssey Infrared Imaging System. PrPC was widely immunolabelled in the parenchyma of obex, cerebellum, spinal cord, thymus, lymph node and kidney. A cellular-specific PrPC staining was found in pancreatic langerhans islets, duodenal mucosa, and spleen white pulp. The central nervous and lymphatic tissues showed highest levels of PrPC; however, moderate levels were also found in the urinary and digestive tissues.

## **#77 Production of Omega-3 Fatty Acid-rich Algae from Biodiesel Waste for use as Animal Feed Supplements**

Denver Pyle and Zhiyou Wen

Biological Systems Engineering

As oil prices reach historical highs, there is a broad interest in producing renewable biodiesel from domestic agricultural products. Glycerol is the major byproduct from biodiesel production, but it is prohibitively expensive to purify the crude glycerol into materials that can be used in industry. Therefore, biodiesel producers must either dispose of it or give it away. In this work, crude glycerol was used to grow the microalga *Schizochytrium limacinum*, which can produce high levels of docosahexaenoic acid (DHA), an omega-3 polyunsaturated fatty acid with medically established therapeutic capabilities against several diseases. It was found that the alga had a similar highest cell dry weight concentration (ca. 18 g/L) when growing in medium containing 9% glucose, 9% pure glycerol or 9% crude glycerol. The crude glycerol medium produced approximately 3 g/L of DHA. The above results indicate that crude glycerol is an ideal carbon source for omega-3 fatty acid production. Once the algal biomass is obtained, omega-3 fatty acids can be extracted and used as ingredients in omega-3 fortified foods. The biomass may also be used as an animal feed ingredient. The omega-3 fatty acids will then be incorporated into the final animal products such as fish, eggs, or milk.

## **#78 Identification of Endogenous Substrates for a Protein Kinase from *Sulfolobus solfataricus* P2 by Screening a Genomic Expression Library**

Ruth Ann Redbird [1], W. Keith Wray, Dustin Hite, Richard Dunham, and Peter J. Kennelly

Biochemistry

Protein phosphorylation and dephosphorylation events are one way cells actuate molecular responses. We are tracing the origins of protein phosphorylation events through the study of the extremophilic archaeon *Sulfolobus solfataricus* P2. A novel method for identifying potential substrates for protein kinases was developed to facilitate these studies. A genomic library was constructed using a  $\lambda$ -phage vector placing gene expression under *lac* promoter control. Membrane-bound recombinantly-expressed proteins were incubated with purified kinase, PK4 (ORF *sso3182*) and  $[\gamma]$ - $^{32}$ P-ATP. Genomic DNA phage inserts expressing  $^{32}$ P-labeled proteins were sequenced, the proteins identified by searching the *S. solfataricus* genome, and the corresponding ORFs were cloned. Their protein products were expressed, purified, and assayed with PK4 to confirm identity. The protein product of the ORF *sso0563*, the catalytic A-type ATPase subunit A, was phosphorylated *in vitro* by PK4. Additional subunits of the ATPase (AtpB, AtpG, AtpE) were also overexpressed and ATPase activity was reconstituted *in vitro*. Current studies focus on the effects of phosphorylation of the ATPase subunits and the ability of the ATPase complex to hydrolyze ATP. Ultimately studies will be performed *in vivo* to determine interactions between PK4, ATPase, and phosphorylation effects.

### **#79 Ligand Diffusion in Myoglobin: Multiple Pathways?**

*Jory Z. Ruscio, Curtis Dahn, T.M. Murali, and Alexey Omufriev*  
*Genetics, Bioinformatics & Computational Biology*

Myoglobin, the "hydrogen atom" of structural biology, is a small globular protein involved in oxygen storage in muscle cells. The oxygen binds to an internal heme iron. For several decades there has been significant interest in identifying the pathway of ligand (CO, Oxygen, etc.) diffusion in myoglobin. Does the ligand travel through myoglobin along a single dominant pathway, or is it able to reach the heme group by many different routes? Our study provides strong support for two distinct channels, with smaller portals breaking off near the surface. This conclusion is based upon the analysis of over 3 microseconds of room temperature molecular dynamics simulations of two native forms of myoglobin. The multiple pathways are identified by 1) the pattern of transient cavities that connect the iron atom to the surface of the protein; and 2) diffusion of ligand (CO, in our simulations) both in and out of the protein. Channel 1 connects Xe1, Xe3 and Xe4 to the distal pocket; Channel 2 is reached by a couple small points connected to Channel 1 and encompasses Xe2 as well as another observed Xe binding cavity. While multiple exit/entry portals into the protein exist, our simulations clearly show portals in Channel 1 are dominant.

### **#80 Fate and Transport of Pathogen Indicators from Pasturelands**

*Michelle Soupier and Saied Mostaghimi*  
*Biological Systems Engineering*

Pathogens are the leading cause of surface water impairments in Virginia. Currently, Nonpoint Source (NPS) pollution models are used to determine the maximum allowable loading rates of bacteria from identified sources and they typically simulate bacterial transport to surface waters as a planktonic or free pollutant. Very few models attempt to partition between the planktonic and attached phases primarily because data on bacteria partitioning are currently not available. A field study was conducted to evaluate the partitioning of *E. coli* and enterococci between the planktonic and attached phases in runoff from pasturelands. Transport plots were constructed on pastureland with high vegetative cover to simulate well managed pastureland and bare box plots containing three different soil types were used to simulate bare or overgrazed pasturelands. Partitioning ratios were calculated for both studies and used to compare fecal indicator attachment in runoff from different pastureland conditions, from three soil types and between *E. coli* and enterococci. The average partitioning ratio in runoff from the plots with high vegetative cover was 0.06 for *E. coli* and 0.30 for enterococci. Partitioning ratios were much higher from bare soil box plots, ranging from 0.38 to 0.55 for *E. coli* and 0.42 to 1.79 for enterococci.

## **#81 Model R gene evolution by meiotic recombination in Arabidopsis**

*Jian Sun*

*Plant Pathology, Physiology and Weed Science*

Plants acquire the ability to resist against pathogens by possessing and expressing corresponding R (disease resistance genes) genes. Closely related R genes (paralogs) organized as gene clusters can recombine during meiosis, giving rise to novel chimeric genes with potential new functions, thus encode proteins required for recognition of invading pathogens. In this study, I constructed a reconfigurable synthetic RPP1 gene (for resistance to *Parasitica*) cluster (synthRPP1) and transformed into Arabidopsis CW84. After reconfiguration in vivo to generate two alternative alleles, lines containing the reconfigured synthRPP1 alleles will be crossed to allow meiotic homologous recombination to form chimeric RPP1 genes. The chimeric RPP1 genes will be identified by a gain-of-Luciferase phenotype (luc+). Luc+ plants will be isolated and characterized for chimeric RPP1 gene structure and function. Studies will include determining the frequency of several distinct types of meiotic recombination, mapping of recombination resolution sites, and determining whether chimeric RPP1 genes confer altered or novel downy mildew recognition profiles.

## Arts, Social Sciences, and Humanities

### **#83 Conversations on Henry Street: Place as Discursive Space**

*Christine Calorosso*

*EDP/landscape Architecture*

Places exist not only in physical space but also in narrative or discursive space. Although a given place is often understood as the sum of its physical characteristics, the stories people tell about the places they inhabit are equally revealing. Indeed, stories not only describe an understanding of a place but also actively construct place in the minds of narrator and audience. These discursive constructions, in turn, influence how individuals interact with their environment. This research explores discourse as an alternative means of understanding physical place and place attachment through a study of Henry Street, the Main Street of Roanoke's historically African-American Gainsboro community. Although Henry Street's physical environment has deteriorated dramatically since segregation ended, it remains a vibrant discursive space. Conversations about Henry Street's past, present, and future permeate the community. This research focuses on public debate over a proposal to site a Social Security building on Henry Street. Discourse analysis of public documents and key informant interviews reveals the multiple discursive constructions of Henry Street that influence individual's support for or opposition to the development proposal. The study suggests that sensitivity to discursive constructions of place can help designers and planners work more effectively with communities.

### **#84 The Influence of Cultural Health Beliefs on Mental Health**

*Elise Cole*

*Human Development*

Beliefs about health are influenced by culture; psychological phenomena are interpreted and dealt with in diverse ways across cultures. Cultural health beliefs are especially important in the area of mental health where there is often an aversion towards seeking help, especially outside of the family, and client behavior is often regarded as problematic (Williams & Healy, 2001). Guided by the Health Beliefs Model, we explored the influence of cultural health beliefs, gender, ethnicity, and physical health on self-reported general mental health and the use of mental health services in a racially diverse sample (African American N=56, Non-Hispanic Caucasian N= 140) of adults aged 65 years or older. The sample was obtained from a rural, economically disadvantaged county in Southwest Virginia in 2005. Analyses included the influence of gender, ethnicity, physical health and cultural health beliefs on self-reported general mental health as well as the use of mental health services. Results from the multivariate regression analyses are reported, followed by theoretical and applied recommendations.

### **#85 High School Dropout Experiences: A Social Capital Perspective**

*Julie A. Drewry*

*Educational Leadership and Policy Studies*

The purpose of this study was to record and analyze students' experiences with dropping out of high school within a social capital framework. This phenomenological study took a narratological research approach that focused on collecting lived experiences of high school dropouts within a social capital framework. The participants were five high school dropouts who speak English as a primary language and were a part of the general education population at the high school. Triangulation of data sources included field notes, interviews with the participants, and archival documents. A three-iteration code mapping procedure was used for data analysis to provide an audit trail. Narrative descriptions of the life histories of each participant were written. The overarching themes resulting from the analysis across the narratives were that none of the students had relationships with members of their families or communities who had the capacity to assist them in their endeavors to complete school; students had the desire to complete school or obtain a GED, but did not have a relationship with any person outside of the school setting who was persistent with encouragement and knowledge; and the students had access to social capital, but did not understand how to use it effectively.

### **#86 An Examination of Goal Orientation Patterns and Task-Specific Self-Efficacy**

*Patrice L. Esson and John J. Donovan*

*Psychology*

Research has traditionally examined the three dimensions of goal orientation, learning goal orientation (LGO), performance-prove goal orientation (PGO) and performance-avoid goal orientation (AGO), independently of one other. Although researchers have suggested that these dimensions may interact, there has been little work examining the impact of such interactions on motivational variables. The present study remedied this deficiency in the literature by investigating the effects of goal orientation on self-efficacy using a pattern approach. Results indicate that certain goal orientation patterns were associated with higher levels of self-efficacy, and that examinations of the independent effects of these dimensions may be misleading.

### **#87 The Development of a Hybrid Scoring Key for a Situational Judgment Test Designed for Training Evaluation**

*Rolanda Findlay and Neil Hauenstein*  
*Psychology*

As a low fidelity work simulation, Situational Judgment Tests (SJTs) are an affordable and practical way of empirically linking training and on-the-job performance, thereby providing a viable means of evaluating training effectiveness. An issue, when utilizing SJTs, is deciding the appropriate manner in which the SJT should be scored. Traditional SJT scoring methodologies, while successfully utilized for selection and prediction, pose specific challenges when applied to a SJT designed to evaluate the effectiveness of a training program. This study discusses the shortcomings of traditional SJT scoring methodologies when used in the evaluation context. To overcome these challenges, an innovative scoring methodology, the Hybrid methodology, is presented. This study provides the detailed description of the Hybrid scoring key creation, and compares the Hybrid scoring key with two traditional scoring keys (Subject Matter Expert (SME) and Respondent-based scoring keys). Responses from a military training program are utilized to illustrate the distinctive effects of using the three different scoring approaches. The superiority of the hybrid scoring key, due to increased confidence in the keys accuracy, and findings regarding training evaluation are discussed. Future research directions and practical applications of the research are also discussed.

### **#89 Teacher Perceptions of Post No Child Left Behind Elementary Teacher and Student Test Anxiety**

*Elizabeth V. Heath, Penny L. Burge, Lisa G. Driscoll, Thomas H. Ollendick, & Lois M. Atkins*  
*Educational Leadership and Policy Studies*

The once elusive relationship between teacher empowerment and student test anxiety has become more evident since the passage of No Child Left Behind (NCLB). The purpose of this study was to examine teachers' perceptions of the post NCLB elementary classroom, the perceived changes, and the implications for teachers' feelings of empowerment and student test anxiety. The participants were eleven elementary teachers from grades three through five with experience before and after NCLB enactment who taught core academic subjects. Utilizing semi-structured interviews, teacher's perceptions of the classroom testing experience, its impact on their own anxiety levels, and the test anxiety of their students were explored. A Hermeneutic narratological analysis of interviews revealed both positive and negative perceptions of intended and unintended NCLB consequences for teachers and students. The majority of teachers reported increased stress, pressure, frustration, and professional struggles that have had a negative impact on their self-confidence and sense of empowerment to help their students achieve success, and a negative impact on student test anxiety. Member checks of the interview transcripts and data analysis enhanced the credibility of these reports. The reflections of these teachers indicate their need for improved teacher empowerment to reduce teacher stress and student test anxiety.

## **#90 “If you don’t take care of it, it don’t take care of you”: Older Women’s Perspectives on the Natural Environment**

*Erica K. Husser*

*Liberal Arts and Human Sciences*

Older adult’s voices are frequently silent in research on issues concerning the natural environment. The limited empirical research is generally based on quantitative investigations that include older adults as part of a larger sample; little is known about how today’s older adults think about and value nature. Using a mixed methods approach, investigators from the Center for Gerontology at Virginia Tech met face-to-face with older women ( $N = 36$ ) living in Southwest Virginia to explore (a) the importance of the natural environment in their lives and (b) their concern about the state of the global environment. On a 6-point scale, the average rating of the importance of nature was 5.46 ( $SD = .78$ ), and the average concern for the global environment was 4.82 ( $SD = 1.36$ ). Qualitative analysis of responses to open-ended questions revealed diversity in the ways older women explained the importance of nature, from aesthetic beauty, to feeling closer to god, to nature’s affect on their mood. The women also gave a variety of explanations about their concern, or lack of concern, about the state of the global environment, including issues of stewardship, food production and health, and the impact of natural disasters.

## **#91 Family Characteristics of Children with ADHD and Anxiety**

*Matthew Jarrett and Natoshia Raishevich*

*Psychology*

Although family characteristics of children with anxiety have been studied for years (Last, Hersen, Kazdin, Orvaschel, & Perrin, 1991), only recently has research on family factors associated with anxiety been applied to children with Attention-Deficit/Hyperactivity Disorder (ADHD) and anxiety (Kepley & Ostrander, 2007; Piffner & McBurnett, 2006). Research on children with anxiety has found that these families often exhibited two types of parenting styles: being overprotective or being insufficiently responsive to the child (Chorpita & Barlow, 1998). Recent studies of family factors in children with ADHD and anxiety have replicated these findings (Kepley & Ostrander, 2007; Piffner & McBurnett, 2006). In order to extend upon these findings, the current study will compare three groups: ADHD + Anxiety, Anxiety Only, ADHD Only, and a No Diagnosis control group. Groups will be defined based on clinical diagnoses obtained from a sample of clinically-referred children evaluated at an outpatient clinic in Southwestern Virginia. Descriptive analyses will compare the groups on various demographics factors (e.g., age, gender, IQ). In addition, analysis of variance (ANOVA) will be used to compare the groups on parenting variables. Finally, recommendations will be made for future research on the co-occurrence of ADHD and anxiety.

## **#92 Family Capacity Model: A Strengths Perspective**

*Bryce L. Jorgensen and Jay A. Mancini*

*Human Development*

The ability of families to reduce risks that threaten them while concurrently increasing internal assets that contribute to their cohesion is amenable to professional prevention and intervention efforts. Resilience is a core element in understanding the ecology of the family, and is defined as the capacity to rebound from adversity strengthened and more resourceful. Resilient families are: happier, wealthier, healthier, live longer, less depressed, and less likely to experience domestic violence. Children in resilient families do better in school, socially, have fewer drug problems, are mentally stronger, and are less likely to be delinquent or abused. Unfortunately far too few families have sufficient levels of resilience. Our Family Capacity Model is a framework that elaborates the numerous elements that influence what families experience, and highlights leverage points, those areas where positive changes can be made to support families. The model accounts for factors over which families have little control to those where families can exercise a great deal of control. It also accounts for multiple in-roads for supporting families, including national policies and local initiatives.

## **#93 Situational Judgment Tests and Training Evaluation**

*Julie Kalanick, Rolanda Findlay, Patrice Esson, and Neil Hauenstein*

*Psychology*

Rigorous studies of the effectiveness of training interventions are rare, in spite of the fact that such evaluation studies are viewed as “best practices” in training research. The primary obstacle to such research is that there is little access to measures of trainee performance in the organizational setting after the training intervention. The current study proposes the use of post-training work simulations as a remedy to this dilemma. Specifically, this study describes the ongoing development and implementation of a Situational Judgment Test (SJT) for the purpose of training evaluation. Data are presented from two different training cohorts where a SJT was utilized for training evaluation. Trainee responses to the SJT demonstrated positive training effects and illustrate that the SJT was sensitive enough to capture trainee improvement at different points in time across the training program. Overall, the results support utilizing the SJT to confidently evaluate the effectiveness of training. The success we have found utilizing SJT scores as criteria for evaluating training provides a template for how training evaluation of organization-wide training programs might be accomplished in the future.

#### **#94 Wellness programming for diverse older adults: Benefits and Implications**

*Audrey J. Kemp*

*Education: Learning Sciences & Technologies – Health Promotion*

As the aging population increases, functional disability and physical impairment become prevalent, and efforts regarding disease prevention and health promotion among older adults (aged 60+) are warranted. The present study was designed to explore the benefits of wellness program participation among diverse (i.e., culturally, religiously, functionally) older adults (N = 103) using social cognitive theory as the primary theoretical framework. Consistent with previous research, participants in a wellness program reported higher levels of life satisfaction, quality of life, and overall strength and endurance than nonparticipants. Additionally, wellness program participants rated their current level of functioning higher and were less likely to receive professional/informal assistance than nonparticipants. Interestingly, low-income older adults did not rate their financial status, but rather their lack of transportation, as the major barrier to participation in a wellness program. Wellness programs should strive to maximize independence and successful aging in older adults, while providing a variety of activities to meet the individual needs of the increasingly diverse senior population. It is crucial that wellness programs provide a stimulating environment for older adults to be actively engaged in health-promoting physical activities, as well as provide an outlet for social interaction and maximization of functional autonomy in daily life.

#### **#95 Trait Worry and its Relationship with Daily Habits, Previous Negative Physical, and Mental Health Events**

*Michael Knepp and Bruce Friedman*

*Psychology*

Female undergraduates participated in an online survey containing the Penn State Worry Questionnaire (PSWQ) and a health questionnaire. Analyses of these questionnaires indicated that mental but not physical health factors were related to trait worry. Individuals diagnosed with an anxiety disorder scored higher on the PSWQ, but those with high PSWQ scores did not show more current physical health problems. There was a trend toward those with both physical health problems and anxiety disorders to have high PSWQ scores. Previous hospitalization or major medical problem as well as concussions were not related to the PSWQ. Individuals who reported having GAD had significantly higher PSWQ scores than individuals without, suggesting that the PSWQ might serve as a proxy measure for GAD in non-clinical samples. Concerning daily life habits, smoking and body mass index were not linked to PSWQ score. There was also a lack of relationship between alcohol use and worry, yet there was a significant relationship for caffeine and worry. These data, through use of the PSWQ, support the notion that current trait worry is related to previous psychological distress and psychopathology. However, the PSWQ does not seem to be sensitive to previous or current physical health issues.

## **#96 Clay, Geometry, Light**

*Hooman Koliji*

Architectural history has significant exemplar masterworks in which materiality joins immateriality in certain constructions. Of these masterworks is the construction of the domes in oriental architecture in which the earthy material “clay” in a geometrical order becomes a means to reveal the light coming to the dome space. The “clay” finds itself in a basic modular unit called brick and the bricks constitute the unit measure for space creation. In other words, constructional structure, geometrically, creates certain ornamental patterns which are revealed only when the light touches them. While culturally the patterns are meaningful to the audience society, they function as actual structure system in terms of load bearing. Such dome has a spiritual presence to its community, for the whole pattern is centralized around the light coming into the dome from the top center and appreciates the light as a symbolic and metaphoric material. This poster will discuss fundamental beliefs underlying such spiritual construction and will demonstrate significant examples of such structures in imagery and drawing materials. Additionally, this research will depict the symbolic aspects of geometrical patterns and ornaments in relation to their cultural belief system.

## **#97 Walking and Nordic Walking: A comparison**

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*Learning Sciences and Technologies*

These days we are bombarded by the temptations of quick and fad-fixes, empty weight-loss promises, and dueling celebrity fitness experts. The energy balance seems to be not working any longer. The result is lack of movement. Therefore, the easy motor activity provided via walking and Nordic walking is perfect. Never has a walking trail been as popular as it is today in Europe. The literature lists various health benefits for everyone with minimal basic physical requirements and low risk of side effects. Nordic walking combines the positive training effects of walking with the total-body exercise advantages of cross-country skiing. The present study was designed to examine why these sports are so popular, and how the different groups (i.e., walkers, Nordic walkers, and those engaging in both), differ from each other. Is the media justified in supporting the advantages of physical strain in favor of Nordic walking? How do participants in the different groups rate the effects of Nordic walking? Is there a suggested order regarding the level of walking sports that are more appropriate for a novice to initiate?

### **#98 Activity Policies in Resident Handbooks of Assisted Living Facilities in Virginia**

*Sung-jin Lee, Rosemary Carucci Goss, and Kathleen Parrott*

*Apparel, Housing, and Resource Management*

This study examined activity policies in resident handbooks of assisted living facilities to recommend consistent policies. The policies were associated with resident activities both inside and outside of the facilities. The researcher analyzed each resident activity policy from eight (of 12 contacted) assisted living facilities in Virginia and compared policies to determine which activity policies to include in resident handbooks. Policies with similar content were categorized together. The study employed the content-analysis method. The framework for analyzing resident activity policies was divided into three sections: 1) public and common areas, 2) communication, and 3) volunteer opportunities. Findings revealed that currently, insufficient and inefficient handbooks with respect to activity policies are provided to residents and prospective residents. Activity policies are critical to resident handbooks in that policies are related to social, physical and psychological aspects of the aging process. Recommendations of this study for resident activity policies can help staff to manage assisted living facilities efficiently, and offer prospective residents clear information as they make decisions among various assisted living facilities. Moreover, current residents will benefit from lucid and consistent resident handbooks in that they will provide explicit information about activity policies.

### **#99 Exploratory Study of College-Licensed Apparel Purchase Behavior: Comparison of the U.S. and Korean College Students**

*Hyejune Park and Jihyun Kim*

*Apparel, Housing, and Resource Management*

The purpose of this exploratory study was to examine the college-licensed apparel purchase behavior between the U.S. and Korean college students. Two theories, organizational identification theory (Mael & Ashforth, 1992) and the theory of planned behavior (Ajzen, 1991) were served as frameworks for this study. A convenience sample of 37 college students in the U.S and 20 college students in Korea participated in the study. We examined the factors that influenced the U.S. and Korean college students' attitude toward college-licensed apparel consumption and purchase intention of college-licensed apparel. The influence of cultural differences between the U.S. and Korean college students on the attitude toward college-licensed apparel consumption and purchase intention of college-licensed apparel was examined as well. The result provided the predictors of attitude toward college-licensed apparel consumption and purchase intention of college-licensed apparel, and also revealed the differences between the U.S. and Korean college students' college-licensed apparel purchase behavior. Future study may adopt our proposed model to test the cross-cultural difference in apparel purchase and consumption behavior, especially apparel with organization identification such as school uniforms.

## **#100 The Relationship Between Phobia Subtypes, Physiologic Symptoms, and Overall Functioning in Phobia Youth**

*Natoshia Raishevich and Matthew Jarrett*

*Psychology*

To date, few studies have examined physiological characteristics of specific phobias (Antony, Brown, & Barlow, 1997; Ritz et al., 2005; Rowa, McCabe, & Antony, 2006). Moreover, the demonstration of physiological symptoms in specific phobias in children is even more limited (Milne et al., 1995). Milne and colleagues (1995) reported that over half of a sample of community adolescents with phobia endorsed four or more physiological symptoms; however, the relations of physiological symptoms to phobia subtypes and global functioning in youth were not explored. Thus, the purpose of the current study was to explore the relations between the specific phobia subtypes, psychophysiological symptoms, and global functioning in a clinical sample of phobic children and adolescents. Preliminary analyses indicated that the most commonly reported physiologic symptoms in the sample included heart palpitations (59.1%), shaking/trembling (52.9%), and nausea (38.8%). The average number of physiological symptoms endorsed was 3.63 (sd = 3.20). Chi squared analyses revealed that younger children were more likely to experience sweating than older children ( $p < .05$ ); however, gender differences in symptomatology were not found. Future analyses will explore the relationship between global functioning in phobic youth who report physiologic symptoms. Implications of the study will be discussed.

## **#101 Are Family-Controlled Firms Responsive to Pressures for Diversity?**

*Manisha Singal and Virginia Gerde*

*Management*

Past research has found that family controlled firms have superior financial performance and greater growth when compared to non-family controlled firms. At the same time, empirical evidence suggests that there is a positive correlation between corporate social performance (CSP) and firm financial performance. This study examines diversity as one aspect of CSP and explores whether family firms have better diversity indicators like representation of women in top management teams, minority representation on Board of directors, minority contracting, and family benefits, than non-family firms. Theoretically, we expect non-family firms to have better diversity indicators due to clan control, and possible entrenchment of family elites within the family firm. Our research design consists of evaluating family and non-family firms in the S&P 500 index for performance on diversity criteria using the Kinder, Lydenburg, Domini, and Co., CSP ratings. Although we find that non-family firms have better performance on the diversity indicators than family firms, this difference in social performance does not explain the difference in financial performance.

## **#102 Creation of a Standardized Set of Emotion Elicitation Music Excerpts for Investigations of Emotion**

*Chad Stephens, Michael Knepp, Bruce H. Friedman*

*Psychology*

Music is an interesting and oft-explored method of emotion elicitation (e.g. Etzel et al, in press; Krumhansl et al, 1997; Ng & Eich, in press; Nyklicek et al., 1997). Although a standardized set of film excerpts covering a wide-range of emotions has been created no such standard exists for music induction. The purpose of this study was to empirically validate music excerpts such that there are at least two musical pieces which reliably induce each of the six discrete emotions. In this study, 62 undergraduate students (non-depressed; non-alexithymic) were presented with 37 excerpts of classical music, orchestral scores, white noise, or silence. The music excerpts/sounds were presented on a desktop computer through headphones using PowerPoint such that the procedure was self-paced. Following the presentation of each musical piece/sound the subject rated on how much they felt each discrete emotion during the presentation. The scores on all of the self-report variables differed significantly between the discrete emotion categories: Hotelling's  $F$  ( $df = 7,55$ ) ranging from 11.08 for indifferent to 52.3 for amusement (all  $P$ s  $<.001$ ). The results of this study represent an effort to establish a standardized set of music excerpts to be used for emotion elicitation in the affective sciences.

## **#103 Development of Trust in Leaders: Exploring a Cognitive Process Model**

*Corrie Whitmore*

*Psychology*

This thesis explored the cognitive, character-inference process which Dirks & Skarlicki (2004) assert contributes to trust development. Self-reported transformational leadership, leader integrity, organizational justice, and leader prototypicality were all positively correlated with cognitive trust in this sample of 81 employees (63% female, mean age 20.5) of a large south-eastern university. Leader prototypicality, a cognitive evaluation process, partially mediated the relationship between leader integrity and trust. This study's prime contribution was the longitudinal, empirical test of a model of trust development in interdependent leader-follower dyads. Future research may explore other antecedents of trust, assess how the cognitive process of trust development occurs, or investigate the relationship-based social exchange mechanism Dirks and Skarlicki (2004) suggest contributes to the development of affective trust.

**#104 South Korean Female Consumers' Benefits Sought, Brand Loyalty, and Choice of Distribution Channel: A Study on Consumer Behavior in Fashion Luxury Goods Purchase**

*Yang, J. H*

*Apparel, Housing, and Resource Management*

In many newly industrialized Asian countries, such as South Korea, female consumers' interest on fashion luxury goods is increasing. Fashion luxury goods include clothes, handbags, shoes, and small accessories of the brands of which the price and quality are much superior to the brands that target large population in the apparel market. Nowadays, consumers are more accepting of different channel of distribution other than department stores, such as duty free shops, internet shopping malls, discount stores, and catalogues, in purchasing fashion luxury goods. The purpose of the research is to investigate whether consumers who have different characteristics in terms of benefits sought and brand loyalty buy fashion luxury goods from different type of stores. The results of this study will help the marketers to understand what specific benefits consumers seek and if consumers are brand loyal, and if these two variables will influence consumers' choice in the channel of distribution. This study may also benefit marketing and fashion merchandising researchers by increasing the understanding of fashion luxury goods purchaser as a specific market segment, known that research on fashion luxury goods is limited.