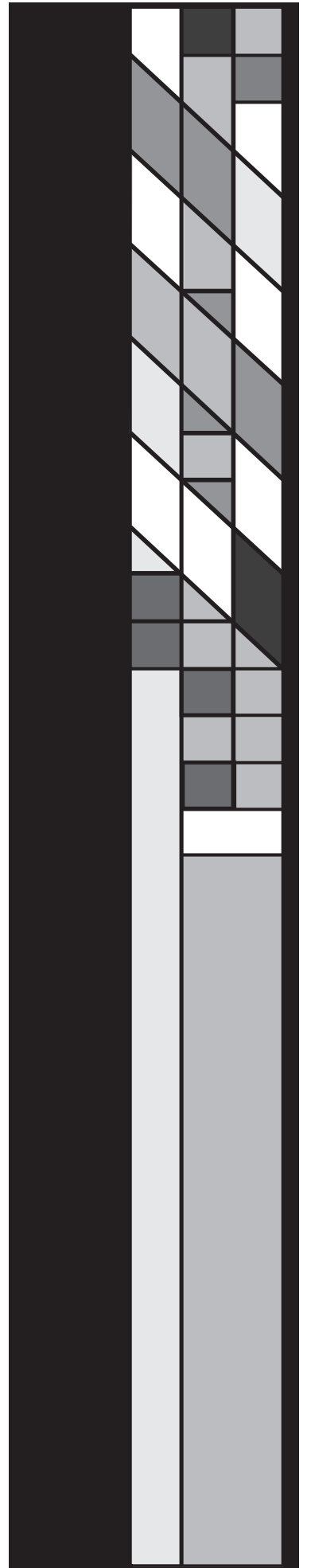


# FACULTY ABSTRACTS

SCHOLARS WEEK  
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## Is the Love of Money a Root of Corruption? A Cross-Level Study of 30 Geopolitical Entities around the World

Thomas Li-Peng Tang (faculty, Career Achievement Award, 2008), Management and Marketing, [ttang@mtsu.edu](mailto:ttang@mtsu.edu), 615-898-2005

This study tests the three-way interaction effect involving money attitude, pay satisfaction (Level 1), and entity affluence (Level 2) on managers' unethical behavior intention (corruption). We collected data from managers in 30 geopolitical entities across six continents around the world (N = 5,272). Our cross-level analyses suggested that for managers in affluent entities (GDP per capita > \$20,000), the relationship between love of money and corrupt intent was significant and positive for those with low pay satisfaction, but non-significant for those with high pay satisfaction. Managers with low pay satisfaction had significantly higher corrupt intent than those with high pay satisfaction. For managers in less affluent entities (GDP per capita < \$2,000), the relationship between love of money and corrupt intent was similar: As the love of money increased from low to high, their corrupt intent increased significantly, regardless of pay satisfaction. Results are discussed in light of the effects play in dissatisfaction and love of money on corrupt intent across entities around the world.

## Effect of Environment on the Elasticity of Human Erythrocytes

Taylor Barnes (undergraduate), URSCA, Honors College, Physics; Daniel Erenso (faculty), Physics  
Mentor - Daniel Erenso, Physics, [derenso@mtsu.edu](mailto:derenso@mtsu.edu), 615-494-8853

Laser tweezers are directly used to study environmental effects on the mechanical deformability of human red blood cells (RBCs). We have measured the deformations of RBCs suspended in a phosphate buffered saline (PBS) solution, newborn calf serum, and unborn (fetus) bovine serum. PBS solutions are often used in similar studies to replicate the natural physiological environment of RBCs, and by comparing the results in the PBS solution with those of the more biological natural calf serums, we are able to assess the validity of using a PBS solution for performing studies of RBC deformability. Unborn bovine serum primarily differs from newborn bovine serum by its lack of antibodies, and a comparison of the mechanical deformability of RBCs in these two environments could prove useful in medical research. The most likely application is in the development of better treatments for diseases caused by abnormal elasticity of RBCs, such as sickle cell anemia. Our measurements have found that the deformability of human RBCs in the newborn calf serum is not statistically different from the elasticity of the cells in the PBS solution; however, we observe that the cells are significantly more elastic in the unborn calf serum. This suggests that antibodies in the born calf serum might be binding to the antigens on the human RBCs, thus damaging their cell walls and reducing their elasticity.

## Pricing and Hedging Exotic Options

Abdul Khaliq (faculty, Distinguished Researcher 2008), Mathematical Sciences, [akhaliq@mtsu.edu](mailto:akhaliq@mtsu.edu), 615-898-2669

Financial markets are becoming more and more complex with trading not only of stocks, but also of numerous types of financial derivatives. Options and derivative securities account for more than half the modern market and the basic tools for risk hedging in any portfolio management. The development of mathematical models to understand the relationship among complicated financial instruments has enabled the proliferation of these instruments that enhance the efficiency of worldwide capital markets. With the rapid increase in sophisticated quantitative and computational techniques employed in financial firms, it then follows that development of new mathematical and computational techniques for the accurate evaluation of complex financial models have considerable financial worth in addition to constituting cutting-edge research. Valuation of exotic options, such as options with multiple strike prices, complex digital options and barrier options is particularly challenging for traditional computational techniques that can perform inaccurately due to the discontinuities in the payoff functions or its derivatives. Large errors may also occur in estimating the hedging parameters such as delta and gamma values, even though the prices appear to be correct. The non-smooth data can further lead to serious degradation in the convergence of the numerical schemes. In this presentation, we address the current state of research in pricing and hedging these challenging problems.

## CLEAR Water Institute

John P. DiVincenzo (Special Projects Foundation Award, 2008) [jdivince@mtsu.edu](mailto:jdivince@mtsu.edu)

The CLEAR (Collaborative Education And Research) Water Institute is an interdisciplinary group of scientists from biology, chemistry, economics, environmental toxicology, education, sociology, and concrete industry management that addresses social, economic and environmental issues related to water quality. The expertise and capabilities of the CLEAR Water Institute are in the areas of environmental sampling and analysis, economic impact and benefit analysis, environmental education, and sociological education and research.

## RELATIONSHIP BETWEEN 5-MINUTE WALK DISTANCE AND PEAK AEROBIC POWER IN YOUTH WITH CEREBRAL PALSY

D.W. Morgan, E.A. Holbrook, S.L. Stevens, K.B. Emison, J. Hutchens, G.A. Mencio, E.E. Argo, D.L. Damiano. Center for Physical Activity and Health in Youth and Department of Health and Human Performance, Middle Tennessee State University; Departments of Orthopaedics and Rehabilitation and Rehabilitation Services, Vanderbilt University Medical Center; Functional and Applied Biomechanics Section, National Institutes of Health.

Peak aerobic power (Peak  $\dot{V}O_2$ ) reflects an individual's ability to maximally transport and consume oxygen and is a key parameter influencing physiological stress experienced during sustained ambulation in children with motor disorders. Because the measurement of peak  $\dot{V}O_2$  requires specialized protocols and equipment and can be cumbersome, it is often impractical in clinical settings. Against this backdrop, the purpose of this study was to quantify the relationship between distance covered in a 5-minute overground walk and peak  $\dot{V}O_2$  in youth with cerebral palsy (CP). Following initial accommodation to treadmill walking and two subsequent treadmill walking sessions performed at submaximal intensities, 18 children with CP who were independent ambulators (11 males, 7 females; mean age =  $10.7 \pm 2.8$  yrs) performed two walking tests. In the first test, each child walked for 5 minutes around a marked gymnasium floor. Prior to testing, participants were instructed to cover as much distance as possible during the allotted time period. A calibrated measuring wheel was used to determine the total distance traversed during the walking test. Within a week after completing the overground walk, peak  $\dot{V}O_2$  was measured during treadmill walking. Walking speed, established initially on the basis of  $\dot{V}O_2$  and heart rate responses obtained in previous submaximal trials, was adjusted during the first minutes of testing, if necessary, to elicit an appropriate exercise intensity for each child. Treadmill grade was raised 2.5% every 2 minutes until volitional exhaustion ensued. During the latter stages of testing, 1-min samples of expired air were collected in meteorological balloons and analyzed to obtain serial measures of  $\dot{V}O_2$ . Results indicated that mean values for 5-min walk distance and peak  $\dot{V}O_2$  were  $392 \pm 73$  m and  $29.9 \pm 6.4$  ml·kg<sup>-1</sup>·min<sup>-1</sup>, respectively. Pearson product-moment correlation analysis also revealed a significant ( $r = .60$ ;  $p < .01$ ) positive association between walking distance and peak  $\dot{V}O_2$ . Findings from our study demonstrate that a moderately strong relationship exists between 5-minute walk distance and peak  $\dot{V}O_2$  in children with cerebral palsy who are independently mobile. These data suggest that a simple test of walking endurance can be used as an indirect measure of cardiorespiratory fitness and may potentially reflect training-related improvements in endurance capability in youth with CP.

## Abandoning Quasi-Public Environs for Familiar Spaces in Spiral of Silence

Ken Blake (faculty), Journalism, [kblake@mtsu.edu](mailto:kblake@mtsu.edu), 615-898-2226; Jason Reineke (faculty), Journalism

The most commonly investigated aspect of Elisabeth Noelle-Neumann's "Spiral of Silence" theory of public opinion formation asserts that fear of social isolation drives people to refrain from publicly expressing an opinion that they perceive as incongruent with the opinion most other people hold. Typically, this aspect of the theory has been tested by asking poll respondents whether they would express an opinion among strangers in some quasi-public setting if they sensed that the opinion contradicted the opinion most of the strangers held. Yet tests of the theory under these conditions have produced weak and inconsistent results. Following up on earlier studies which found that congruence and fear of isolation were significant predictors of willingness to speak out in the imagined condition of passing the time with friends or family but not in the imagined condition of passing the time with strangers in a waiting room, this study carried the analysis a step further by using statewide poll data to probe whether fear of isolation and congruence interacted as predictors of willingness to speak out in settings involving friends and relatives. Results indicate that they did. Specifically, willingness to speak out declined as fear of isolation rose, and the decline occurred at a faster rate among the incongruent than among the congruent. Furthermore, the interaction persisted despite controls for factors including basic demographics, the issue topic, and whether the setting involved either friends or relatives. Considering that these relationships indicate a spiral of silence process occurring in familiar settings, we call for renewed attention to the role that reference groups such as friends and families might play in the spiral of silence, even though classic spiral of silence theory considers public encounters with strangers to be the normative scenario.

## Does Tourism Promote Economic Growth? Evidence from Latin American Countries.

Bichaka Fayissa (faculty), Economics and Finance , bfayissa@mtsu.edu, 615-898-2385; Christian Nsiah (faculty), Black Hills State University, South Dakota; Bedassa Tadesse (faculty), Economic, University of Minnesota, Duluth

From 1995-2007, worldwide tourist arrivals increased about 68.2 percent (or an average annual growth rate of about 5.2 percent) from 534 million to 898 million (United Nations World Trade Organization, 2008). Over the same period, Latin America countries (Central and South America) have experienced a rise in tourist arrivals from 14.3 million to 27.9 million (about 49 % growth) and tourist receipts growth from \$2.3 billion to \$3.7 billion (about 61 % growth), respectively. The tourism industry in Latin American countries (LAC) has experienced a sizable increase in annual market share growth rate of 8.7 percent in 2004. Despite this fact, there are only few empirical studies that investigate the contributions of tourism to economic growth and development for Latin American economies. Using a panel data of 17 Latin American countries for the years that span from 1995 to 2004, this study investigates the impact of the tourism industry on the economic growth and development Latin American countries within the framework of the conventional neoclassical growth model. The empirical results show that revenues from the tourism industry positively contribute to both the current level of gross domestic product and the economic growth of LACs as do investments in physical and human capital. Our findings imply that Latin American economies may enhance their short-run economic growth by strategically strengthening their tourism industries while not neglecting the other sectors which promote growth.

## Update: Diuretic Therapy in Acute Renal Failure: A Clinical Case Study

Lita Warise (faculty), School of Nursing, [lwarise@mtsu.edu](mailto:lwarise@mtsu.edu), 615-898-2444

According to current research, diuretics may actually increase mortality in acute renal failure. Although multiple research studies support this, loop diuretics and dopamine are still widely employed in the hospital setting. This presentation will describe a clinical case of such treatment to arm nurses with essential information to promote patient safety and advocacy.

The learning objectives of the study are to:

1. Discuss the basic pathophysiology of renal failure.
2. Recognize factors that are associated with the development or worsening of acute renal failure.
3. Describe the mechanisms of action of various drug treatments for acute renal failure.
4. Recognize the attributes and limitations of current and potential treatment modalities in acute renal failure.

### Clinical Case Study

S.W. age 69, presents to the emergency room in respiratory failure, decompensated heart failure, volume overload, hypertension, and hyperglycemia. History reveals congestive heart failure, hypertension, long-term insulin dependent diabetes mellitus, hypothyroidism, morbid obesity, and a new onset of pneumonia. Arterial blood gas reveals pH-7.31, pCO<sub>2</sub>-59.3, HCO<sub>3</sub>-30, pO<sub>2</sub>-6. Chest x-ray reveals bilateral consolidation in all lobes. The ventilatory decline resulted in endotracheal intubation and subsequent sedation. On hospital day 45, suddenly, without warning S. W. goes into acute renal failure during the night. She received Furosemide 40 mg IV without response and four hours later began Dopamine therapy infusion at 2 mcg/kg/min. Again, the anuria continues with notable decline in mental status. Dopamine therapy continues for ten hours with a total urinary output of 25 mL. The primary nurse after much prompting from the other staff calls the physician to report the clinical assessment findings. The patient begins a new treatment regime consisting of Lasix/Diuril drip at 2 mg/mL infusing at 15 mL/hr. Despite the newest interventions, the patient continues to have anuria.

## Does Your Church Have Padded Pews?: Market Structure & Competition in the Market for Religion

Adam Rennhoff (faculty), Economics and Finance, [rennhoff@mtsu.edu](mailto:rennhoff@mtsu.edu), 615-898-2520; Mark Owens (faculty), Economics and Finance

In this paper, we study the impact that competition has on the decisions made by what is arguably the most commonly-found type of nonprofit organization: churches. We focus our attention on examining decisions that may be considered “marketing” or “advertising” choices. These are strategies that church members and potential members may find appealing or attractive when selecting a church. We hope to answer, in part, the question of whether the presence of rival churches makes churches more likely to engage in marketing activities. Similarly, we examine whether churches seem to match some of the “amenities” that other nearby churches offer. To conduct our study, we construct a unique data set of all Christian churches in two suburban Nashville, TN counties. We supplement data collected using online resources by making physical inspections of each church. We use this data to estimate a model of strategic interaction based on empirical models of firm entry (discrete games). Our results, though preliminary at this time, support the idea that a church’s decisions are affected by the decisions of other geographically close churches.

## Tennessee in Motion: A-B-C-1-2-3 Healthy Kids in Tennessee - Addressing Cancer Prevention through Preschool Programs

Cynthia Chafin (staff/administration), Center for Health and Human Services, cindychafin@comcast.net, 615-847-3081; M. Jo Edwards (faculty/administration), Adams Chair of Excellence

### Objectives:

To reach preschool children, their parents, and caregivers with important information on cancer prevention and healthy lifestyles through interactive, educational activities

To build lifetime healthy habits in preschool children and their families, ultimately reducing the burden of cancer in Tennessee.

### Setting:

A year-long project, extensive training for caregivers was conducted spring 2007; the program launched in the fall of 2007 at seven pilot centers – serving more than 5,000 caregivers, children, and families.

### Methods:

The Tennessee Comprehensive Cancer Control's "Centers of Excellence" program brings cancer prevention to daycare centers. Health education experts and coalition members have created a six-unit interactive curriculum - "A-B-C-1-2-3 Healthy Kids in Tennessee." Program materials are provided free to daycares, along with training and an on-going coalition volunteer mentor to help with implementation. Centers completing the program receive "Center of Excellence" status, local media attention, and may be eligible for continuing education credits.

Curriculum modules - Active Play, Nutrition, Sun Safety, Environment, Secondhand Smoke and Childhood Cancer - each feature activities for children, take-home materials for families and an evaluation component.

### Results:

#### Initial training:

- 92% of respondents indicated an 'excellent' or 'very good' understanding of modifiable behaviors related to cancer risk and how to avoid or mitigate them for practicing cancer prevention behaviors, after completing the training program vs. 27% of respondents who indicated 'excellent' or 'very good' pre-training.
- 100% of respondents indicated 'excellent' or 'very good' probability that information from the program would be used in their professional activities/practice.

### Conclusion:

Coalition volunteers facilitate meaningful and fun cancer prevention activities. The program puts health messages in the little hands of the next generation of Tennesseans to take home to their families. Knowledge of healthy lifestyle behaviors and awareness of the preservation of a safe environment foster adoption of behaviors for prevention of cancer.

## Reducing the Risk of Sudden Infant Death Syndrome in Rutherford County

Carol Smith (staff/administration), Center for Health and Human Services, cmsmith@mtsu.edu, 615-; M. Jo Edwards (faculty/administration), Adams Chair of Excellence

Sudden Infant Death Syndrome Education: Reducing the Risk in Rutherford County provides SIDS education to at risk parents, and risk reduction strategies to day care providers throughout the county. The 2005 American Academy of Pediatrics Guidelines indicate that there continue to be several independent risk factors for SIDS including prone sleep position, sleeping on soft surfaces, maternal smoking during pregnancy, late or no prenatal care, bed sharing, and overheating, among others. In addition, 20% of SIDS deaths nationwide occur while an infant is with a non-parent caregiver, highlighting the need to educate day care providers as well as families of infants. In Tennessee, the number of SIDS deaths is up from its lowest numbers in 2001; between 1997 and 2004, Rutherford County reported more SIDS deaths than all but 3 counties within the state. Since our program began in May 2008, the project has provided education to over 75 prospective and new parents utilizing health department services, and to 75 daycare providers operating within low income communities within the county. Pre- and post-surveys have been completed to determine knowledge of risk reduction strategies before and after classes and these results will be shared in the poster presentation. It was our expectation to increase knowledge by 20% and we have exceeded that in both populations. The March of Dimes Tennessee Chapter provides funding for this project.

## STOP Tobacco Use Prevention and Cessation Program

Jill Thomas (staff/administration; Dr. Jo Edwards (faculty), Center for Health and Human Services.), Center for Health and Human Services, [jthomas@mtsu.edu](mailto:jthomas@mtsu.edu), 615-494-8685

MTSU's Center for Health and Human Services (CHHS) is working with Local Education Agencies (LEA) in nine designated Tennessee Counties, the Department of Health, and the Tennessee Higher Education Commission (THEC). THEC has allied the University of Tennessee Knoxville, Middle Tennessee State University, and East Tennessee State University to provide specific elements of the STOP Program (Student Tobacco Outreach Program). The goal of this coalition is to support county schools and local communities in establishing programs for tobacco use prevention and cessation among youth and their families. The nine counties of the coalition are Campbell, Cocke, Grundy, Hardeman, Johnson, Lake, Meigs, Union, and Wayne. Students in each county will take a pre/post tobacco use survey in schools which will be evaluated by UT Knoxville. Each county will implement the same five core components of the program with flexibility on implementation. The county coordinator will receive training on strategies for implementing the five core components and additional activities that could also meet community needs. The five core components are:

1. Community collaboration model to engage all appropriate stakeholders
2. Review of the school tobacco-free policy including comprehensiveness, enforcement, and possible alternatives to suspension
3. Student engagement/discussion with others about whom they are concerned about tobacco use cessation
4. Student-designed marketing campaign to encourage tobacco use cessation/prevention
5. Student-led public relations efforts about tobacco use cessation/prevention

Training for local and regional coordinators will be provided by CHHS and coordinated by Jill Thomas, regional project manager. Each training session will address the five core components and strategies for addressing them, building community coalitions similar to those constructed by GEAR UP TN, project budget management, project surveys and evaluations, and program sustainability planning.

## The Psychology Of Risky Behavior

Donald Kendrick (faculty), Psychology, [psyskip@mtsu.edu](mailto:psyskip@mtsu.edu), 615-898-2134

Risky behavior is defined as that behavior that puts the participant in harm's way. Often called "Adrenaline Junkies," these men and women risk their lives to participate in activities that most people avoid at all costs. What makes them tick? What is it that motivates them to put their lives on the line? For the past ten years we have been collecting data on Sensation-Seeking personality types, to identify how they differ from the normal population in various personality characteristics. We have discovered some fundamental differences, but perhaps the more exciting recent trends are in the area of stress and panic control. Risk takers and Sensation-Seekers appear to be immune to the anxiety and panic that most people would experience in similar situations. Discovering the basis of this immunity to panic may help reveal behavioral training methods to reduce unwanted anxiety, tension, and panic-attacks among sufferers of clinical anxiety.

## Effects of e-CRM Value Perceptions on Website Loyalty

Wen-Jang (Kenny) Jih (faculty), Computer Information Systems; Su-Fang Lee (faculty), Taiwan, [kjih@mtsu.edu](mailto:kjih@mtsu.edu), 615-898-5181

Web-enabled customer relationship management, or e-CRM, holds the promise to simultaneously achieve the conflicting goals of strategic flexibility and operational efficiency in developing and executing innovative e-commerce marketing strategies. A fairly new multi-disciplinary field involving such diverse areas as marketing, information systems, and consumer behavior, e-CRM seeks to strengthen customer relationship via a portfolio of trust-building practices with the support of powerful information technologies. While most literature in e-CRM has focused on how firms formulate and implement e-CRM initiatives, there is a dearth of literature on viewing the overall quality of an e-commerce firm's e-CRM practices from the consumer point of view. This research proposes such a consumer-oriented concept, e-CRM value, based on existing e-CRM research literature, and examines the effect of e-CRM value on website loyalty. It was found that customers' perception of e-CRM value has a positive causal effect on their website loyalty. The implications of this finding for the theory-building of e-CRM and marketing practices of e-commerce firms are discussed.

## What Can We Learn from Education Production Studies?

E. Anthon Eff (faculty), Economics and Finance, [eaeff@mtsu.edu](mailto:eaeff@mtsu.edu); Christopher C. Klein (faculty), Economics and Finance, [eaeff@mtsu.edu](mailto:eaeff@mtsu.edu), 615-898-2387

The results of a Becker/Peltzman/Stigler model of local school district decision-making yields biased or inconsistent efficiency measures when some school outputs are not measured. Empirical investigation of data for 95 Tennessee counties in the 1999-2000 academic year finds that Data Envelopment Analysis efficiency measures, and efficiency rankings based on those measures, are highly sensitive to changes in the number of output measures used. An artifact of the Data Envelopment Analysis process causes increasing correlation of efficiency scores with the inverse of per pupil expenditures as outputs increase. Hence, high-stakes policy initiatives should not be based on such scores.

## Senior Capstone in Organizational Communication

Janet McCormick (faculty), Speech & Theatre; Sharon Smith (faculty), Speech & Theatre, [jmmcormi@mtsu.edu](mailto:jmmcormi@mtsu.edu), 615-904-8208

Students in the Senior Capstone in Organizational Communication demonstrate competencies in teamwork, research and communication auditing, and consulting. In this culminating experience, they assess organizational life through selection of an organization, identification of a mentor/contact, thorough data collection, analysis, and recommendations for improvement of communication. This is an EXL (Experiential Learning) course.

Research shows that students are more engaged in learning when they can learn by doing and that these types of learning opportunities will provide experiences that students can include on their resumes and will assist them in gaining employment and/or gaining acceptance into graduate programs. Experiential learning plays a critical role in teaching students about organizational communication.

## Optimal Harvesting of Fish Populations with Age Structure

Wandi Ding (faculty), Mathematical Sciences, wding@mtsu.edu, 615-494-8936

Fish is a vital food source for mankind, but the fishery industry has driven many fish stocks to near extinction. It is therefore necessary to develop strategies which guarantee an optimal sustainable harvesting of fish. Mathematical models are suited ideally for this purpose. In this proposal, a discrete fishery harvesting model with age structure is presented. The goal is to maximize the profit of fishing and explore the optimal harvesting strategies: i.e., the harvesting efforts (the number of boats, the size of the equipment, etc.) and a fixed harvesting policy (the size of fishing nets) for each class: larvae, juvenile and adult fish. New tools of optimal control theory for discrete systems are being developed. Specific cases will be illustrated

## The Use of Microsoft Flight Simulator by Instrument-Rated Pilots

Wendy Beckman (faculty), Aerospace, wbeckman@mtsu.edu, 615-494-8755

The Microsoft Flight Simulator (MSFS) software series began production in 1980, and since that time ten versions of the package have been released. In the early editions, the program did not portray flight in a very realistic manner, which caused pilots to view the software as simply an entertaining game. In the last decade, however, the software has improved to the point of providing a fairly realistic flight experience. This evolution has led pilots to use the package for both initial instrument training and for continuing proficiency purposes. In order to determine how pilots currently use the MSFS package, a nationwide survey was conducted of instrument-rated pilots, with over 1300 survey responses received.

The responses indicated that 48% of all respondents used MSFS during initial instrument training. For those pilots who earned their instrument rating since 1995, 75% used MSFS during initial training. The primary areas practiced during instrument training included instrument approach procedures, basic attitude instrument flight, holds/hold entries, enroute navigation, and avionics set up and usage. Pilots continued to use the package after obtaining their instrument rating, with 69% of respondents reporting using MSFS to increase proficiency after becoming instrument-rated. An average MSFS use of 5.5 hours per month was reported, with instrument approach procedures, holds/hold entries, basic attitude instrument flight, and enroute navigation being most frequently practiced. Finally, 86% of the respondents who use MSFS for proficiency reported using the software to preview instrument approaches at unfamiliar airports, prior to an actual flight. These findings indicate that, although it is still not recognized as a training device by the Federal Aviation Administration, MSFS has evolved to the point of being a useful training and proficiency aid for pilots.

## Interaction of Lactoferrin with MMP-2 and Pro-MMP-2

Michael Thompson (faculty), [mthompso@mtsu.edu](mailto:mthompso@mtsu.edu), 615-494-7621; Biology; Rebecca Seipelt (faculty), Biology

Recent data demonstrate multiple interactions between the anti-inflammatory protein lactoferrin (LTF) and matrix metalloproteinase-2 (MMP-2). In one instance, LTF is capable of inactivating the 42 kDa form of MMP-2 lacking the hemopexin domain through a zinc chelation interaction. *In vivo* experiments demonstrated that administration of LTF to cultured trophoblasts resulted in the release of full-length active MMP-2 into the media. To further dissect these and other interactions between the two proteins, LTF and various forms of MMP-2 were subjected to immunoprecipitation experiments. These studies indicate that LTF forms a physical protein-protein complex with Pro-MMP-2, and suggest that this interaction may occur between the hemopexin domain of Pro-MMP-2 and LTF. Furthermore, it is postulated that the interaction of LTF with Pro-MMP-2 may disrupt its interaction with TIMP-2, releasing Pro-MMP-2 from the pericellular compartment where activation may take place. These data further suggest that LTF may regulate both the activation and inactivation of MMP-2 during the inflammatory response.

## Arginyl aminopeptidase-like 1 (RNPEPL1) is an Alternatively Processed Aminopeptidase with Specificity for Methionine, Glutamine, and Citrulline Residues

Rebecca Seipelt (faculty), Honors College, Biology; Karen Beasley (graduate student), MSPS Biotechnology

Matthew Schmidt, Honors College, Chemistry; Michael Thompson (faculty), Biology

A previously uncharacterized member of the M1 family of zinc metallopeptidases, arginyl aminopeptidase-like 1 (RNPEPL1), was cloned and expressed, and the recombinant enzyme characterized. RNPEPL1 was a broad specificity aminopeptidase with preference for a P1 methionine, glutamine, or citrulline residue, and exhibited a broad pH preference, with maximal activity observed between pH 6.6 and 8.0. The enzyme was inhibited by calcium ions but unaffected by chloride ions, and was insensitive to specific inhibitors of the closely-related arginyl aminopeptidase, indicating similarity to leukotriene A4 hydrolase. RT-PCR analysis of RNPEPL1 expression revealed a ubiquitous tissue distribution, consistent with a general housekeeping function, but also revealed alternative splicing of the mRNA in all tissues examined. The inclusion of intron 5 was predicted to result in a truncated protein product, while an alternative 3' splice site of exon 9 of the reference sequence was predicted to result in the omission of a conserved eleven amino acid stretch from the C-terminal domain.

## Preparing the Next Generation of Tennesseans to be Financially Literate Using Online Course Delivery

Dr. Sandra Poirier (faculty), Department of Human Sciences, Family & Consumer Sciences Education, spoirier@mtsu.edu, 615-898-2093; Leann K. White (undergraduate), Department of Human Sciences, Family & Consumer Sciences Education; Elowin Harper, Siegel High School, Family & Consumer Sciences

Each year more than one million people declare bankruptcy, and Americans lose more than \$1.2 billion in fraudulent investments. Both of these common difficulties result from poor personal financial planning. Currently, Tennessee is only the third state to require at least a one-semester course in personal finance for graduation. This new reform legislation will not only prepare students to become better managers of their own finances, but will also equip them with relevant skills to operate successfully within the global economy. This educational presentation will showcase the new online, dual-enrollment personal finance course now available in Tennessee.

## Positioning the University for the Future: Promoting Learning in Larger Classrooms Using Clickers

Gary Wulfsberg (faculty), Honors College, Chemistry, [wulfsbe@mtsu.edu](mailto:wulfsbe@mtsu.edu), 615-898-2070

The use of University-sanctioned TurningPoint™ clickers (student response systems) was tested in large (50-student), long (85-minute) sections of General Chemistry 1110 (for science and pre-health majors) in the springs of 2008 and 2009. At the beginning of Spring of 1908 the clickers were used in three ways: (a) to reward attendance; (b) to promote student peer-led discussion of concepts just covered in lecture followed by a multiple-choice Clicker question; (c) the next day, to give solo quizzes based on the homework assignments to give credit for those who did homework. Results were not satisfactory at this point: only about 22% of the students read the text or tried the homework. Subsequently the use of Clickers was broadened to attempt to increase student-centered learning by providing an in-class substitute for the weekly Student Recitation sections which are common in five-credit science courses in large universities, but which are not possible at MTSU due to classroom and staffing shortages. In addition to the above three ways, Clickers were subsequently also used the next day: (d) to see which assigned homework practice problems needed answering by the instructor; (e) immediately after the solo quizzes, again to promote student peer-led discussions of the quiz topics to clear up misconceptions. In order to make time for the increased number of student-centered activities, a number of sections of the textbook were assigned as “Read-Only,” meaning that I would not summarize the section of the text for the students. At the current time only around half of the class time is used for lecture. A new set of Clicker-administered survey question results will be reported. The last of these is whether students prefer to learn chemistry via comprehensive lectures, via online homework and tutoring, or via discussion with their peers in Clicker-administered ConcepTests.

## Using Foraminiferal Communities to Assess Pollution from Pulp Mills in Florida

Melissa Lobegeier (faculty), Geosciences, mlobeg@mtsu.edu, 615-898-2403; Eric Coburn, Matt Young, Jordan Graw, Holly Baker, Jessica Tonish, Marjorie Gombert (undergraduates, Geosciences)

Pulp and paper mills are dumping pollutants into two rivers in the panhandle region of Florida. In 1954 the Buckeye Mill began discharging wastewater into the Fenholloway River in Taylor County and since then environmental problems, such as the masculinization of female mosquitofish, have been observed. The first observation of masculinized female mosquitofish was from Elevenmile Creek in Escambia County. A paper mill, now owned by International Paper Company, began discharging wastewater in 1941 into Elevenmile Creek, which empties into Perdido Bay near Pensacola. Single-celled organisms known as foraminifera have been documented from sediment samples taken from both streams. Foraminifera are microscopic organisms that are very responsive to environmental change and are excellent indicators for monitoring pollution. Foraminifera can be used as indicators of pollution through the quantitative analysis of population density, species diversity, assemblage structure, shell morphology and level of shell deformation. These foraminifera live on or in the seafloor sediment and on marine plants including seagrasses and seaweeds. The composition of the foraminiferal communities in the two streams will be compared with communities taken from control sites unaffected by the wastewater so that the composition of these communities can be used to assess the effects of the wastewater on the organisms within the sediment and living on seagrasses. Three locations, Econfina River, Eightmile Creek, and St. Andrews Aquatic Preserve, will serve as control sites. Econfina River is located northwest of Fenholloway River and Eightmile Creek lies to the east of Elevenmile Creek. These two streams have drainages similar to those of the wastewater-dominated streams under consideration. St. Andrews Aquatic Preserve is located in Bay County on the Florida panhandle between the two stream systems. All three are areas unaffected by effluent from a pulp and paper mill and can therefore serve as control sites.

## Hurricane Ike vs an Atomic Bomb

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The energy and destructive potential of one of nature's most destructive forces, the hurricane is compared to one of man's most destructive devices, an atomic bomb. Both create near absolute devastation at "ground zero." However, how do they really compare? This presentation compares the energy, the power, and the power per unit volume of Hurricane Ike with the smallest of the two atomic weapons used during World War II, "Little Boy." By far, Hurricane Ike wins on the basis of energy comparison. However, on both power and power density, Little Boy wins BIG TIME. The details of the calculations mentioned above are presented and the tremendous redistribution of energy that is accomplished by evaporation and condensation of water is dramatically illustrated.

## The Effect of Human Factors in Aviation Maintenance Safety

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Even with the ever-increasing rate of technology innovation, the ultimate responsibility for the safety of a flight lies with human beings. The study of how humans can most efficiently interact with technology is known as human factors. According to Boeing, the world's largest aircraft manufacturer, human error accounts for 70% of commercial airplane accidents. In order to decrease the number of maintenance-related accidents, awareness and training in the field of human factors is critical. This research aims to qualitatively investigate the type of human factors that exist in aviation maintenance as well as the extent to which these factors affect safety performance. By utilizing the National Transportation Safety Board (NTSB) online accident database, the researcher reviewed accidents between 1996 through 2006 caused by maintenance-related errors. The results indicate the top three maintenance errors with the highest number of fatalities were: a) failure to properly complete tasks, b) improper maintenance, and c) improper installations. In addition, the human factors most prevalent among the attitudes of both Aviation Maintenance Technicians (AMT's) and the Federal Aviation Administration (FAA) officials were demanding deadlines, environmental and personal distractions, and lack of proper use of maintenance manuals or instructions.

## Contemporary Issues in Science. A new SENCER Course.

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Kathy Patrick, Mathematics

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We are developing a new general education and multi-disciplinary course called "Contemporary Issues in Science." The objective is to enable non-science majors to investigate science associated with current civic issues. Students participate in a case study in which they investigate a specific energy issue, similar to topics that arise in civic forums. Students practice their role as citizens, by writing a letter expressing and supporting their position on this issue using correct science, to their state or federal representatives. Students also present their opinion in a "public forum" held during a class period. Other student activities include group problem-solving using instructor-designed computer modules and lab activities that illustrate energy-related concepts.

We have posed the following research question: Will students' attitudes change about science using a SENCER approach in a general education physical science course? We use the Test of Scientific Related Attitudes (TOSRA) as a pre and post measure in our class and in a corresponding, yet traditionally taught general education science course. Our initial results show that students in the SENCER course do not dislike science any more than at the beginning of the class. Students in the traditional course, have a stronger dislike of science at the end of their studies than at the beginning. We are also using the SENCER SALG where preliminary anecdotal evidence indicates more student interest in the course topics.

## Transfer of Skills from Microsoft Flight Simulator X to an Aircraft

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In the spring of 2008, with funding from the Aircraft Owner's and Pilot's Association, Middle Tennessee State University performed a study to evaluate the transferability of skills from Microsoft Flight Simulator X (MSFSX) to an aircraft for novice flight students. Nine students practiced the MSFSX Flight Lesson modules on straight and level flight, level turns, climbs, descents, slow flight, power-off stalls, and steep turns until the modules were successfully completed. The number of iterations required for students to accomplish each module satisfactorily, as evaluated by the MSFSX program, was recorded. After completing these Flight Lesson modules the nine students, along with nine others which comprised the control group, began flight training. The 18 participants received identical instruction in a DA-40 aircraft regarding how to perform the six maneuvers of interest, and were subsequently evaluated on the number of attempts required to perform each maneuver successfully. A metric known as the Transfer Effectiveness Ratio was utilized to calculate the transfer of training from MSFSX to the aircraft for each maneuver. In five of the six tasks, a positive transfer of training was observed. In summary, our data suggest that the MSFSX packaged Flight Lesson modules originally developed to teach users how to "fly" MSFSX instead of an actual aircraft, has the capability to improve novice student performance in an aircraft.

## The Starr Gennett Discography

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A piano-manufacturing company (Starr Piano) based in Richmond, Indiana that branched into recording between world wars, Gennett Records captured some of the earliest recordings of American music. They were, for example, the first to record King Oliver's Creole Jazz Band, which included a young Louis Armstrong. Jelly Roll Morton, Hoagy Carmichael and Gene Autry all recorded music on the Gennett record label. Gennett intended to use recording to supplement Starr's piano manufacturing business. However, Victor Talking Machine Company monopolized the patents for the industry standard 78 rpm shellac disk. The Starr/Gennett label fought Victor in the courts and came out victorious, putting the technology for the 78 rpm into the public domain. Still facing stiff competition from major labels like Victor and Columbia, however, Gennett began recording music the majors weren't recording: jazz, blues, spiritual, country, hillbilly, and bluegrass. They made as many recordings as they could, using some of the cheapest materials available to insure cost efficiency and profit. However, they suffered the same fate as the majority of the labels in the 1930s and were forced out of business by the dawn of radio, the Great Depression and the rationing of shellac during World War II. What is left of the rich historical artifacts of the label and studio are scattered throughout various collections across the country or remain undiscovered. Dahan, along with T. Malcolm Rockwell, have been compiling from various sources the complete discography and history of the Starr Piano / Gennett Company and Studio. To date they have over 25,000 annotated entries and Dahan has been given extraordinary access to many primary documents from the Institute of Jazz Studies. They have received grants from the Association of Recorded Sound Collections, Ford Foundation and The Starr Gennett Foundation. They have written articles about their work and discoveries for 78 Quarterly, The ARSC Journal, All About Jazz and The Starr Gennett Newsletter. The Starr-Gennett Foundation continues to fund this project and will publish the book upon completion.

## STEPping Up Undergraduate Research (STEP-MT)

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The STEP-MT project goal is to increase the number of STEM graduates at MTSU through an emphasis on undergraduate research and STEM curriculum. STEPMT funds undergraduate research both during the summer and the academic year – and 2009 is the final year of the grant. Academic year grants are awarded at two levels: Assistants for students new to research and Awards for experienced undergraduates. Discovery-learning is being encouraged in the freshman courses for STEM majors, and STEPMT has funded curricular innovations and faculty development to increase active learning in STEM areas. A unique feature of STEPMT is the summer research teams consisting of a faculty mentor, upper-division research student, lower-division research student, high school student and high school teacher. This mix of different skill levels and knowledge has worked quite well and resulted in numerous national presentations and publications. Curriculum reform and creating sustainable research positions in industry have offered challenges. We have tried several approaches to creating research experiences for students in area industries and have met with modest success. One model has the student working full-time and mentored by an industry partner. A second model has a student mentored by a faculty member who creates the partnership and assists the industry mentor. In the curriculum area we initially met resistance from faculty and departments who feel there is not enough time to include discovery activities in freshman classes for STEM majors. Another challenge has been creating a community of scholars in our largely commuter campus. We have hosted weekly luncheon seminar series, monthly laboratory tours, national speakers on important STEM topics and even a YouTube type video competition for STEM student clubs. In this presentation, we provide data about the effectiveness of STEP-MT over 4.5 years of activity.

## Independent Interactive Inquiry-Based Learning Modules Using Audio-Visual Instruction in Statistics

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This paper describes the implementation and evaluation of the Independent Interactive Inquiry-based (I<sup>3</sup>) Learning Modules, which use existing open-source Java applets, combined with audio-visual instruction. Research has shown that using online simulations can improve student understanding, but that students must be guided in the use of these simulations. Modules were created to address this issue by combining a simulation with audio-visual instruction in its use and with questions that guide the students to construct meaning in the topic at hand. These modules cover important ideas in statistics, such as the binomial distribution, confidence intervals, randomization, and statistical significance. Pretests and posttests for each module show that this format can be used independently by students. We found that the number of students answering correctly on posttests was larger than that for pretests, for three of the four modules in this project. This lack of improvement on one module demonstrates that the format alone is not enough for student learning, that the questions and audio track should be carefully constructed using sound pedagogical techniques. It was also shown, not surprisingly, that the previous preparation of the students affected how well they learned the concepts in the modules.

## PeerSpace: A Social Networking Environment that Promotes Peer Learning

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Excellence in computer science (CS) education is adversely affected by student attitudes. Studies have revealed an unfortunate culture among students in introductory CS courses that is characterized by: combativeness towards the opinions of peers, unwillingness to support or aid others, procrastination on assignments, disdain for working in groups, and a lack of motivation, persistence, and passion towards the course material. As a result, high dropout and failure rates, sometimes as high as fifty percent, have been a common phenomenon in introductory CS courses (i.e. CS1 and CS2) nationwide. Education research provides evidence on what could be done to enhance student motivation, persistence, and passion towards their studies; on how to increase willingness to work collaboratively, to be supportive of and accept the suggestions and opinions of others; and on how to foster a positive CS student culture. The key is to help students develop a network of support provided by their peers, which is especially important during the first year of study when many freshmen suffer from social isolation, especially among female students and under-represented students. We discuss a virtual learning environment, PeerSpace, that tackles this problem by providing a suite of Web 2.0 tools for students to interact with each other synchronously and asynchronously on course-related materials as well as social matters. The ultimate goal of PeerSpace is to help students build their networks of support, especially support provided by their peers, which may serve as a vehicle through which academic involvements such as class attendance and participation are engaged. The development, experimental results, and lessons learned from this environment are presented.

## Sound Mixing for Multimedia at a Distance

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Technological advancement has brought significant change to the sound recording industry and, as seen in this demonstration, sound-for-picture post-production. With the competitive pricing of Digital Audio Workstations (DAW) comes the availability of established members of the profession to utilize creative tools to balance their professional and non-professional lives. Through high-bandwidth data transfer (internet) and low cost delivery mediums, professionals not practicing in major entertainment markets can retain relationships with clients utilizing these tools. This demonstration will show how distance can be overcome with regards to mixing sound in the recording studio, and how communication can be achieved equally as well with a client in one city and a sound mixer in another. Using a television show sound mixing session as an example, we will see how the required mixing results can be achieved even though the client and mixing engineer are not in the same location. While this approach can be applied to novice industry personnel, developing and sustaining creative relationships with clients tends to lend itself better to this practice since an established mixing approach will have been developed through multiple, traditional mixing sessions.

## A Tool for Promoting Algorithm Development in Introductory Computer Science Classes

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Beginning students in the Computer Science curriculum frequently do not appreciate the value of the design phase of any programming project. In addition, when asked to develop an algorithm for a given problem, they have difficulty distinguishing between a general solution and a completed program. As with other skills, what is needed is a way to practice applying the basic concepts of algorithm design. To that end, we have developed AlgoTutor (The Algorithm Tutor). An online, graphical tool for practicing algorithm development. AlgoTutor is an interactive tool that provides automatic assessment of student designed algorithms. It supports both top-down and bottom-up design methodologies. In addition to the student algorithm design interface, there is an instructor interface that allows the teacher to create/edit problems and their solutions, manage student accounts, and analyze student grades as well as student activities.

## Improving Student Performance by Enforcing Algorithm Development

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Having the ability to design algorithms for simple problems is one of the most important learning outcomes of introductory computer science courses. Unfortunately, teaching algorithm design has been a challenging task, and most students ignore this step due to a variety of reasons when they are solving problems. To address this challenge, we developed a web-based tutoring system to train students to develop algorithms prior to coding. In this paper, we present the results of experiments that were conducted to analyze the effectiveness of enforcing algorithm development prior to programming. The experimental results show that by using the web-based tutoring system, both the student overall performance and the student attitudes regarding the importance of algorithm development are improved. In addition, the students find the tutor to be