GRADUATE STUDENT ASSEMBLY

PROUDLY PRESENTS

18th ANNUAL
RESEARCH SYMPOSIUM
OF VIRGINIA TECH

APRIL 2, 2002
COMMONWEALTH BALLROOM
SQUIRES STUDENT CENTER

The 18th Annual Research Symposium of Virginia Tech

The Graduate Student Assembly (GSA) is proud to host the 18th Research Symposium. The Research Symposium of Virginia Tech is an annual event devoted to showcasing, documenting, discussing, and reporting accomplished research conducted at Virginia Tech. It provides an opportunity for both undergraduates and graduate students campus-wide to present their research in a professional poster format.

We congratulate all the participants of the 18th Annual Research Symposium of Virginia Tech for their excellent research. We would also like to express our gratitude to the judges for their time and commitment. The following sponsors have made this event possible and we appreciate their contributions as well.

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Monday, April 1, 2002
Kick off event at drillfield

Tuesday, April 2, 2002
18th Annual Research Symposium
10:00 AM-3:00 PM
Location: Commonwealth Ballroom, Squires Student Center

Keynote Speaker: Dr. Harriet Fulbright
"The Globalization of Education"
6:30 PM Reception, 7:00 PM Talk
Location: 2150 Torgerson Hall

Wednesday, April 3, 2002
"Preparing the Future Professional"
Workshops and seminars sponsored by the Graduate School and Career Services.
Academic Track, 9:30 AM-12:30 PM & Business and Industry track 1:00 PM-4:00 PM
Location: Brush Mountain Room, Squires Student Center

Thursday April 4, 2002
Graduate Student Award Banquet at 6:00 PM, Owens Dining Room

Friday, April 5, 2002
Graduate Student Appreciation Day

For more information visit the Graduate Student Appreciation Week website:

http://www.grads.vt.edu/framed/framedgradweek.html

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AGRICULTURE AND ANIMAL SCIENCES

1. Improved Synthesis of N-substituted Maleimides with Terminal Dimethyl Amine Group and their Application to Polyene Macrolide Antibiotics (E.Suloff)
2. Inducible Expression of GFP as a Tool to Study Protein Movement across the Host-Broomrape (Orobanche aegyptiaca Pers.) Interface (N. Hamamouch)
3. Field isolates of swine hepatitis E virus from pigs in different geographic regions of the United States are genetically heterogenic (F.F. Huang)
4. Plum Curculio and Wolbachia (M. McClanan)
5. Reduced Mammary Development in Ovariectomized Heifers is Associated with Decreased Epithelial Proliferation and Increased Expression of Estrogen Receptor (S. Berry)
6. Establishment and Potential Productivity of Forages in Partially Reclaimed Soils (R. Lemus)
7. Effect of Clomipramine on the Canine Hypothalamic-pituitary-thyroid Axis (K. Gulikers)
8. Construction, and In Vitro & In Vivo Characterization of an Infectious Molecular DNA Clone of Type II Porcine Circovirus (M. Fenaux)
9. Characterization of a new, putative signal-terminating gene from Arabidopsis: At5PTase11 (M. Ercetin)
10. Effects of Transplant Season and Size on Landscape Establishment of Mountain Laurel (A.M. Hanson)
11. Using strain RB51 tp provide protection against anthrax and brucellosis in a single vaccine (S. Poff)
12. Generation of a recombinant RB51strain expressing antigens from M. avium ssp. paratuberculosis (A. Contreras)
13. Efficacy of Synthetic Gonadotropin Releasing Hormone Analogs for Control of Ovulation during Estrus Synchronization Protocols (M. Cline)
14. Effect of Reserpine on Body Weight, Feed Intake, Catecholamine and Indoleamine Levels in High- and Low-Body Weight Selected Chickens (A. Kuo)
15. Effect of two pharmacological agents, reserpine and glibenclamide, and the pesticide rotenone on dopamine release in the ICR mouse (K. Jinghong)
16. The Expression and Characterization of Human Cystic Fibrosis Transmembrane Conductance Regulator (CFTR) in Tobacco (W. William)

ENGINEERING

17. Vibration Control of an Inflated Torus Using Smart Materials (J. Akhilesh)
18. Mechanistic Life-Prediction Methodology (T. Bandorawalla)
19. Creating a Methodology for the Design of Timber Frame Structures (D. Carradine)
20. Electro-Optic Properties of Self-Assembled Optically Non-Linear Polymer Thin-Films (R. Duncan)
21. Digital Library Network for Engineering and Technology (S. Mahadevan)
22. Visualization of Multidimensional Functions (S. Jayaraman)
23. Strength and Life Predictions for Advanced Structural Composites (M. Hayes)
24. Characterizing Lane Changes with a Slow Lead Vehicle Present (E. Olsen)

SOCIAL SCIENCES AND HUMANITIES

45. A Descriptive Analysis of the Perceived Effectiveness of Virginia Tech's Faculty Development Institute (C.Banks)
46. Leader Emergence and Gender Roles: A Contextual Examination (A. Gershenoff)
47. Green Entrepreneurship: Adding Value to Local Livelihoods (A case of the Bhanjada community in India (A. Bhardwaj)
48. Psychosocial correlates of self-reported anxiety in adolescents: results from a four-year school-based prospective study of adolescent functioning (H. Blier)
49. Family environment and children's self-reported anxiety and depression: The independent contribution of parent and child characteristics (H. Blier)
50. Rationality and Choice: Towards an Alternative Theory of Choice (S. Mousavi)
51. Specialized clothing product development focused on business clothing for women with physical disabilities (K. Carroll)
52. The Effects of Emotional Labor on Employee Work Outcomes (K.H.L. Chu)
53. Effects of Gender on Risky Driving (H. Sewell)
54. Gains and Losses from Household Formation (R. Kheirandish)
55. Pattern Classification of a Stimulus-Response Specificity and Individual Response Stereotypy: Implications for Reactivity Research (I. Christie)
56. An Investigation of Companion Animals in Animal Shelters: Behavioral Determinants of Relinquishment (A. K. Fournier)
57. Negative Outcomes and Front-Loading (M. Stuart)
58. Assessing the Effect of Relationship Status on Alcohol Consumption (S. Rayne)
59. Reliability of the Factor Structure, Internal Consistency, and Divergent Validity of the Multidimensional Anxiety Scale for Children (MASC) in a New Community Samples of Children (A. Grills)
60. The Prediction of Internalizing Symptoms and Victimization Experiences in Adolescents: A Longitudinal Study (A. Grills)
61. Development of a brief body dysmorphic questionnaire (H. Littleton)
62. The Working Conditions of Domestic Helpers in the Philippines (J. Amado)
63. Economic valuation of Bhoj Wetland, India, for sustainable use (N. Bakshi)
64. Now I'm Really Angry, Just Look at My Brain! (P. Foster)
65. Cardiovascular and Affective Responses to Laboratory Tasks (A. Santucci)
66. Why are some people intolerant to pain? (S. Daugherty)
67. Effects of Music on Brain Activity: Music vs. Verbal Script Induction of Self-Generated Emotion (S. Daugherty)
68. An Ordering of Secondary Display Attributes (C. Chewar)
69. A Theoretical Information System Designing for the Tourism Destination Management (Y. J. Chang)

UNDERGRADUATE STUDENTS

70. Growth Performance and Bone Characteristics of Female Broilers as Influenced by dietary Nickel (E. Wilson)
71. Localization of the At5PTase1 Protein and Analysis of At5PTase1 Expression (J. Butler)
72. Supporting the Construction of Real World Interfaces (D. Bussert)
73. Probing the Function of the At5PTase1 Signal Terminating Gene in Arabidopsis thaliana (M. Pauls)
74. Luteinizing hormone response after administration of three synthetic gonadotropin releasing analogs in the ewe (S. Umbarger)
75. Synthesis and Characterization of Polystyrene Homopolymers Via Dinitroxide Mediated Radical Polymerizations (S. Anderson)
76. What Effect Do Silphinenes Have On Drosophila CNS (C. Hild)
77. Test-Retest Reliability of a Dangerouse Driving Measure (D. Ramsey)

VIRTUAL

78. "Multi-tech Tennis" Technology of Tennis for Teaching & Learning in 21st Century (F. Konukman)
79. A Measure of Design Readiness: Using Patterns to Teach Object-Oriented Design (T. Lewis)
80. Learning and Reuse in Visual Programming Environments: Simulation Builder for Teachers (C. Seals)

AGRICULTURE AND ANIMAL SCIENCES

1. Improved Synthesis of N-substituted Maleimides with Terminal Dimethyl Amine Group and their Application to Polyene Macrolide Antibiotics
E.Suloff

A three step synthesis of *N*-substituted maleimides with a terminal dimethyl amine group was accomplished. This method allows for the use of widely available starting materials and produces maleimides in high purity and yield. The maleimide precursors are of interest for their ability to form water soluble derivatives of polyene macrolide antibiotics.

2. Inducible Expression of GFP as a Tool to Study Protein Movement across the Host-Broomrape (Orobanche aegyptiaca Pers.) Interface
N. Hamamouch

Orobanche aegyptiaca (Egyptian broomrape) is a parasitic angiosperm that subsists on the roots of many dicotyledenous plants. The parasite lacks photosynthetic capacity and thus is unable to develop independent of a host plant. Instead, it develops a haustorium, a unique structure of parasitic plants that acts as a physiological bridge to the host, from which it draws photosynthates and water. This process may cause significant reductions in yield and quality of host crops (Sauerborn, 1991). As part of a project to engineer parasite resistance via a host-produced toxin protein, we are investigating possible routes of protein movement across the host/parasite interface. The green fluorescent protein (GFP) has been widely used as a marker for monitoring gene expression and protein movement in living cells. Our objective is to fuse the gene encoding GFP to an *O. aegyptiaca* inducible promoter to allow visualization of protein movement from host cells to *O. aegyptiaca* cells. The *HMG*2 promoter, which has been shown to be inducible by *O. aegyptiaca* ingress (Westwood et al., 1998), was linked to the GFP coding region with and without a signal peptide sequence that will allow the study of two potential routes for protein movement. The *HMG2:GFP* gene construct will result in GFP localized to the cytoplasm and reflect protein movement to *Orobanche* through plasmodesmata connections. An *HMG2:SP:GFP* construct will target the GFP protein to the secretory pathway and ultimately to the extracellular space to allow monitoring of protein movement to *Orobanche* cells via xylem/apoplastic connections. These gene constructs have been subcloned into the pBIB binary vector and introduced into arabidopsis (*Arabidopsis thaliana* L.) and tobacco (*Nicotiana tabacum* L.) using *Agrobacetrium*-mediated transformation. The incorporation of these genes into the plant genomes has been confirmed by PCR. GFP expression in arabidopsis has been confirmed by fluorescence microscopy and shows appropriate GFP accumulation at wound sites and branch points of secondary roots, consistent with known expression of *HMG2*. Likewise, appropriate GFP protein production has been confirmed in tobacco by western blot analysis.

5. Reduced Mammary Development in Ovariectomized Heifers is Associated with Decreased Epithelial Proliferation and Increased Expression of Estrogen Receptor
S. Berry

The objectives were to determine the effects of ovariectomy on mammary growth, mammary epithelial proliferation, and estrogen receptor *f*Ñ (ER) expression within the bovine mammary gland. Fourteen Holstein heifers were utilized. Before three months of age, eight of the calves were ovariectomized and remaining calves served as controls. At six months of age, calves were treated with Bromodeoxyuridine (BrdU) to label proliferating cells and sacrificed two hours later. Total mammary mass was dramatically reduced in ovariectomized animals (130 ¡Ó 21g vs. 304 ¡Ó 25g, $p < 0.001$), and in some ovariectomized animals, parenchymal tissue was essentially absent. Coinciding with reduced mammary development, proliferation of epithelial cells was lower in ovariectomized calves compared with intact controls (0.25% vs. 2.24%, $p < 0.001$). ER expression was restricted to epithelial cells, and was not observed within intra-lobular stroma of parenchymal tissue. The majority of ER positive cells were in the embedded layers of epithelial cells, but a small portion of lumenal and basal cells were ER positive. Expression of ER was higher in ovariectomized animals than intact controls (46.7% ¡Ó 2.4 vs. 36.1% ¡Ó 2.2; $p < 0.05$). This may be related to the observation that proliferating cells are ER negative (Capuco et al. 2002). Alternatively, circulating estrogen may be lower in ovariectomized calves resulting in reduced negative feedback and consequently higher ER expression. In conclusion, reduced mammary development following ovariectomy is associated with decreased epithelial proliferation and increased ER expression. Continuing studies will investigate the mechanisms of ER stimulated mammary epithelial proliferation.

6. Establishment and Potential Productivity of Forages in Partially Reclaimed Soils
R. Lemus

Reclamation of surface mined soils is ecologically and environmentally important. A field study was established in summer, 1990 to assess revegetation potential on a partially reclaimed surface mine in southwest Virginia. The soil was comprised of sandstone and siltstone overburdened materials. Prior to planting, a 2:1 mixture of composted wood chips and sewage sludge (112 Mg dry sewage sludge ha^{-1}) was incorporated with a chisel plow to provide a source of N, P, and organic matter. Sixteen treatments were established using 12 forage species in pure stand and mixtures. Plant samples were collected in the fall of 1996-2000 to determine botanical composition and biomass produced in each treatment. Samples were separated by target species (the species originally planted), and non-target grasses, forbs, and legumes. Tall fescue (*Festuca arundinacea*), sericea lespedeza (*Lespedeza cuneata*), switchgrass (*Panicum virgatum*), and switchgrass/AULotan (*Lespedeza* sp.) mix most successfully established. The treatments containing alfalfa (*Medicago sativa*), ladino clover (*Trifolium repens*), and birdsfoot trefoil (*Lotus corniculatus*), all of which are legumes, consistently had poor biomass accumulation. The species chosen for revegetation of these soils will depend on intended post-mine use and characteristics of mined soils.

7. Effect of Clomipramine on the Canine Hypothalamic-pituitary-thyroid Axis
K. Gulikers

To evaluate the effect of long-term clomipramine administration on the hypothalamic-pituitary-thyroid axis in normal dogs, fourteen adult, normal dogs (10 males and 4 neutered females), all >15 kg, were enrolled in a prospective study. Clomipramine (3 mg/kg PO q12h) was administered to all dogs beginning day 0, and continued for 112 days. Serum total thyroxine (T4), free thyroxine (fT4), 3,5,3' triiodothyronine (T3), 3,3',5' triiodothyronine (reverse T3; rT3) and thyroid-stimulating hormone (TSH) were measured on days 0, 7, 28, 42, 56, and 112. A thyrotropin-releasing hormone (TRH) response test was performed at the same times. Significant decreases (mean ± SE) were noted in the basal serum T4 (26 ± 1.2 to 17 ± 0.5 nmol/L at day 112), fT4, (29 ± 2.4 to 18 ± 1.7 pmol/L on day 56), and rT3 (1.21 ± 0.13 to 0.83 ± 0.08 nmol/L on day 112) concentrations during clomipramine treatment. The effect of treatment over time on serum T3 concentration was significant as well, but the deviation in T3 from baseline was variable. No significant effect was noted on either pre- or post-TRH TSH concentrations. The 35% and 38% decreases in serum T4 and fT4 concentrations, respectively, during clomipramine administration may lead to a misdiagnosis of hypothyroidism. Although no evidence of hypothyroidism was noted in this study population, subclinical hypothyroidism may have occurred. A longer duration of treatment might further suppress thyroid function, and concurrent illness or other drug administration might exacerbate clomipramine's effects.

8. Construction, and In Vitro & In Vivo Characterization of an Infectious Molecular DNA Clone of Type II Porcine Circovirus
M. Fenaux

We report here the construction and use of an infectious molecular DNA clone of PCV2 to characterize the disease and pathological lesions associated with PCV2 infection by direct in vivo transfection of pigs. Forty SPF pigs of 4 weeks of age were randomly assigned to four groups. Group 1 pigs served as uninoculated controls. Pigs in group 2 were each inoculated intranasally with $1.2 \times 10^{5.5} TCID_{50}$ of a homogeneous PCV2 virus stock. Pigs in group 3 were each injected intrahepatically with 200 μg of the PCV2 plasmid DNA, and pigs in group 4 were each injected into the lymph nodes with 200 μg of the PCV2 plasmid DNA. Animals injected with the PCV2 plasmid DNA developed infection resembling that induced by inoculation with PCV2 live virus. Seroconversion to PCV2-specific antibody was detected in the majority of pigs from the three inoculated groups at 35 DPI. Viremia, beginning at 14 DPI and lasting 2 to 4 weeks, was detected in the majority of the pigs from all three inoculated groups. There were no remarkable clinical signs of PMWS in any pigs. Gross lesions in pigs of the 3 inoculated groups were similar and characterized by systematically enlarged tan-colored lymph nodes and lungs that failed to collapse. Histopathological lesions and PCV2-specific antigen were detected in numerous tissues and organs of infected pigs. This study more definitively characterizes the clinical course and pathological lesions exclusively attributable to PCV2 infection. The data also suggest that PCV2 may require other agents to induce clinical PMWS.

9. Characterization of a new, putative signal-terminating gene from Arabidopsis: At5PTase11
M. Ercetin

The ability to respond to a variety of biotic and abiotic signals is crucial to many organisms. Signals outside the cell can be perceived and amplified at the cell membrane by a variety of signaling pathways, including the inositol 1,4,5-trisphosphate (IP3) pathway. To determine whether the signal terminating enzymes that hydrolyze IP3 are regulatory in plants, we have identified 15 Arabidopsis putative inositol 5'-phosphatases(At5PTases).We have previously characterized the substrate specificity and regulation of At5PTase1, a 64.5 kD protein (Plant Physiol.,2001,126:801-810). At5PTase11 is a smaller (37 kD) protein predicted to also catalyze the hydrolysis of IP3 and IP4. To investigate regulation of At5PTase11 expression, a rabbit anti-At5PTase11 antibody was generated against purified his-tagged At5PTase11 fusion protein. In wild type seedlings, At5PTase11 protein levels are upregulated within 1 hour in response to ABA and light in a manner similar to that of At5PTase1. Preliminary data have shown that At5PTase11 mRNA levels are also up regulated by ABA. We conclude that At5PTase11 is regulated by some of the same signals that regulate At5PTase1. To determine the substrate specificity of At5PTase11, activity assays using his-tagged At5PTase11 fusion protein were performed. Our results suggest that the bacterially-expressed fusion protein is inactive. To obtain a catalytically active protein, transgenic plants overexpressing At5PTase11 have been generated. These plants will be used to determine the substrate specificity of At5PTase11. Thefunction of At5PTase11 is also being investigated using a recently isolated T -DNA At5PTase11 knock-out mutant.

10. Effects of Transplant Season and Size on Landscape Establishment of Mountain Laurel
A.M. Hanson

Mountain laurel (Kalmia latifolia) is locally common within the Appalachian Mountains; however, it is hard to establish in landscapes. Two experiments were conducted to test the effects of transplant season and container size on landscape establishment of Kalmia latifolia 'Olympic Wedding'. Experiment one consisted of 24 each of 9- and 17- L plants. Half were transplanted into a simulated landscape in Blacksburg, VA (USDA plant hardiness zone 6A) in Fall 2000 and and half in Spring 2001. Leaf xylem potential (Y), stem and leaf dry mass, canopy volume growth, leaf area, visual rating, and rootball moisture were measured. The 17-L plants had the lowest Y (more stressed). Leaf and stem dry mass were similar between seasons. Canopy volume increase was similar between seasons and sizes. Leaf area was significantly greater for the Spring transplants. The 17-L plants had a higher (better) visual rating. Experiment two was a Rhizotron study with 8, 17-L plants, half transplanted in Fall 2000 and half in Spring 2001. Spring transplants had more canopy volume growth during the 2001-growing season. Fall transplants had significantly longer roots, although no differences were observed in the field-grown plants. Overall, our data suggest that best results will be obtained by transplanting 17-L mountain laurel in the spring.

11. Using strain RB51 tp provide protection against anthrax and brucellosis in a single vaccine
S. Poff

Bacillus anthracis is a facultative intracellular bacterial pathogen causing cutaneous, gastrointestinal or respiratory disease in many vertebrates. Commercially available anthrax vaccines for immunization of humans are of limited duration and may not protect against the respiratory form of the disease, in addition the live spore vaccine used to immunize animals has been shown to cause disease in some species. *Brucella abortus* is a facultative intracellular bacterium that causes chronic infection in animals and humans. Cell mediated immune responses (CMI) are crucial in affording protection against brucellosis. *B. abortus* strain RB51 is useful in eliciting protective cell mediated immunity and humoral responses against *Brucella* in cattle and other animal species. Since the protective antigen (PA) of *B. anthracis* is known to induce protective antibodies, we tested whether the gene encoding PA could be expressed in strain RB51 producing a dual vaccine to protect against both brucellosis and anthrax. The PA gene was transcriptionally fused to the promoter of gene encoding heat shock protein GroE, subcloned into a broad host range plasmid (pBBR1MCS) and shown by immunoblotting to express in *E. coli*. The pBB/PA plasmid was used to transform *B. abortus* RB51 and CmR clones screened for the expression of PA by immunoblotting. Three clones were shown to express a 63-83kDa protein as detected by antiserum specific for PA. Using the A/J mouse, an immunocompromised vertebrate model, immunization and protection studies with strain RB51/PA were performed. Preliminary results demonstrate that the vaccine is capable of producing protection against a live challenge with *B. abortus* 2308 and some partial protection against a challenge using the spores of *B. anthracis* Sterne strain.

12. Generation of a recombinant RB51strain expressing antigens from M. avium ssp. paratuberculosis
A. Contreras

B. abortus vaccine strain RB51 is the official vaccine in the US for the control of brucellosis in cattle. The vaccine elicits specific cell mediated responses that are able to control infection by *B. abortus* (1). Our lab has previously reported that overexpression of the homologous antigen Cu/ZnSOD in RB51 can increase protection to Brucella challenge and also, that RB51 can express and generate immune responses to foreign antigens making it a suitable candidate in the protection against other intracellular parasites (2,3). Johne's disease or paratuberculosis is a chronic disease caused by *Mycobacterium avium ssp. paratuberculosis (M. paratuberculosis).* It affects cattle, sheep, and goats worldwide and causes large economic losses (4). With the aim of generating an RB51 strain able to simultaneously protect against brucellosis and paratuberculosis, we cloned the mycobacterial antigens 85A and 35 kDa protein into the plasmid pBBR1MCS with and without concomitant overexpresion of SOD, and transformed into RB51. We show that strain RB51 is able to express these proteins.

13. Efficacy of Synthetic Gonadotropin Releasing Hormone Analogs for Control of Ovulation during Estrus Synchronization Protocols
M. Cline

Two experiments were conducted to determine efficacy of GnRH analogs, Cystorelin (CYS, gonadorelin diacetate tetrahydrate) and Factrel (FAC, gonadorelin hydrochloride), for use in beef timed artificial insemination synchronization. In Experiment one 342 beef cows from 7 herds were assigned CYS or FAC treatment as part of the Ovsynch protocol (GnRH d 0 and 9, Lutalyse d 7). Cattle treated with FAC had greater tendency (P = .09) to be pregnant at d 45. One individual herd demonstrated FAC-treated cows had more pregnancies at day 45. In Experiment two, 18 beef cows received either CYS or FAC as part of the Ovsynch protocol, and intensive blood samples were collected from time –30 to 525 min post GnRH injection, at each GnRH injection. Ultrasounds were conducted daily over the course of the protocol. A treatment by phase interaction (P = .03) was demonstrated for the time to maximum LH concentration, where CYS-treated follicular cows had a shorter interval than did FAC treated follicular or luteal cows. The duration of detectable LH response showed a treatment by phase interaction (P = .02) where follicular and luteal CYS-treated cows had a shorter interval than follicular or luteal FAC-treated cows. The variables maximum LH concentration, and area under LH curve did not differ. Cows treated with CYS had more (P=.02) non-dominant follicles. We conclude that either product may be used in beef cows without compromising fertility.

14. Effect of Reserpine on Body Weight, Feed Intake, Catecholamine and Indoleamine Levels in High- and Low-Body Weight Selected Chickens
A. Kuo

The effect of reserpine on body weight, feed intake, and brain neurotransmitter levels in high- (HWS) and low- (LWS)-weight selected chickens was investigated. Three treatment groups from each line were injected intraperitoneally with saline, 1.25 mg/kg, or 2.50 mg/kg of reserpine at hatch, and again at 5 weeks-of-age. At 7 weeks of age, twelve males and twelve females from each group were sacrificed. The levels of catecholamines and serotonin in the whole brain were determined. Body weight of the HWS chickens was decreased dose-dependently though 7 weeks-of-age whereas body weight was decreased only through the first two weeks-of-age in the LWS. Reserpine also decreased weekly body weight gain, feed consummation, and feed efficiency in a linear manner in the HWS, but not the LWS chickens. After determining the sex of each bird at 5 weeks-of-age, it was noted that reserpine caused a dose-dependent decrease in body weight in both HWS male and female chickens, but not in LWS chickens from 5-7 weeks-of-age. Norpinephrine concentration in the whole brain of HWS birds was higher than in LWS birds, while epinephrine, dopamine, 3,4-dihydorxyphenylacetic acid, and 5-hydroxyindoleacetic acid were higher in the LWS birds. In the LWS birds norepinephrine decreased in a quadratic manner in response to the various doses of reserpine but not in the HWS birds. Dopamine was decreased in a linear manner in response to dopamine in both lines. The levels of serotonin were not affected by reserpine.

15. Effect of two pharmacological agents, reserpine and glibenclamide, and the pesticide rotenone on dopamine release in the ICR mouse
K. Jinghong

Many epidemiological studies suggest pesticides and other environmental toxins contribute to the etiology of Parkinson's Disease (PD). Post mortem and biochemical studies strongly indicate that the pathogenesis of PD associated with mitochondrial impairment and oxidative damage. Rotenone, a lipophilic pesticide, is used as the animal model for environmentally induced PD. Rotenone causes selective degeneration of dopaminergic nerve terminals in the nigrostriatum by inducing inhibition of mitochondrial respiration at complex I. Reserpine, a typical inhibitor of vesicle transporter, can play an important role in altering dopamine metabolism and irreversibly damage dopamine uptake-storage mechanism. It has also been found that reserpine causes a decrease in respiratory control ration (RCR) and ADP/O ration as an uncoupler of oxidative phosphorylation. In our studies, we tested the dopamine-depleting effects of rotenone and reserpine by performing the dopamine release assay in ICR mouse striata. Additionally, in order to understand the underlying mechanism, GBR12909 (a dopamine transporter antagonist, which blocks dopamine reuptake.) and glibenclamine (an ATP-Sensitive potassium channel blocker) were investigated either given alone or in conjuction with reserpine or rotenone. The results of our experiments in vitro confirmed the dopamine-depleting effects of rotenone and reserpine as shown in the dose-response curve. Glibenclamide synergizes in vitro dopamine release by rotenone at higher concentration, while the addition of GBR decreases in vitro dopamine release by reserpine at higher concentration. This suggests different mechanisms may contribute to the dopamine-depleting effects of rotenone and reserpine at higher and lower concentration.

16. The Expression and Characterization of Human Cystic Fibrosis Transmembrane Conductance Regulator (CFTR) in Tobacco
W. William

Cystic Fibrosis is a severe human disease resulting from mutations in the gene encoding CFTR. CFTR is a putative chloride ion channel in the ABC class of transporter proteins. CFTR is a large glycoprotein encoded by a 4451bp cDNA and contains 12 transmembrane domains. Due to the natural low abundance of the CFTR protein and its low expression in mammalian cell culture, the exact function and structure of the protein are not known. Expression of CFTR in E. coli is lethal and mammalian culture systems are expensive and low yielding. However, successful bioproduction of many complex human proteins has been shown in transgenic plants. The initial strategy for expression in plants involved fusion of the CFTR coding region to a constitutive CaMV double-enhanced 35S promoter. Introduction of this vector into E. coli resulted in lethality. Two strategies were designed to overcome this problem: introduction of an intron and the use of an inducible promoter. A plant intron was introduced between exon 3 and exon 4 of the CFTR cDNA, thus eliminating production of the full length CFTR in E. coli. Also a plant wound-inducible promoter MeGA was fused to both wild type and intron containing CFTR. Plant tissues were transformed with all constructs. CFTR presence was determined by PCR and expression and intron splicing was analyzed by RT-PCR. Protein expression was determined by western analysis. Our goal is to exploit the plant systems to produce sufficient CFTR to delineate the exact function and the structure of this important protein

ENGINEERING

17. Vibration Control of an Inflated Torus Using Smart Materials
J. Akhilesh

Inflatable structures have several applications such as communication antennas, solar thermal propulsion, and space solar power. The major advantages of using inflatable structures in space are their extremely low weight, on-orbit deployability, and subsequent space saving in launching. For a successful mission, vibrations of these structures must be reduced. Piezoelectric materials are found to be strong candidates for actuator/sensor applications in the active vibration control of such structures due to their lightweight and conformability to the host structure. This study is directed toward controlling the vibration of an inflated torus using these materials. In order to understand the vibrational characteristics of the inflated torus, a detail analysis of natural frequencies and mode shapes has been done considering nonlinear effects due to internal pressure. The results are verified using finite element analysis. Thereafter, actuator and sensor models of the piezoelectric material have been developed. In order to reduce the required actuator force and to enhance the quality of sensor voltage, optimal locations and sizes of the piezoelectric patches have been determined using genetic algorithm. This optimality is based upon the criteria of maximum energy transfer between the piezoelectric patches and the inflated torus. Using the optimum actuators and sensors, a controller is designed to attenuate the vibration of inflated torus. The vibration reduction has been also verified using experiments. This study provides a comprehensive methodology for vibration analysis, actuator and sensor modeling and their optimal selection, and the vibration suppression of an inflated torus.

18. Mechanistic Life-Prediction Methodology
T. Bandorawalla

Service reliability of composite materials has been a topic of research over the past several years. An understanding of the durability of composite materials under their service conditions will enable engineers to certify structures and components, develop more efficient designs, warranty products, and reduce the need for experimental testing, while at the same time leading to more widespread use of these materials. The Materials Response Group at Virginia Tech has pioneered a technique for lifetime prediction of composite materials that is based on remaining strength as a damage metric. The method is able to account for all the synergistic effects that influence material lifetime. In this work we apply the remaining strength methodology to life prediction of composite pipelines. The analysis includes the effect of mechanical loads applied to the pipe in conjunction with moisture diffusion and its effect on material properties. Experimental procedures to study the integrity of these pipelines are also shown. Favorable comparison between predictions and experimental lifetimes are made.

19. Creating a Methodology for the Design of Timber Frame Structures
D. Carradine

Contemporary timber frame structures typically utilize structural-insulated panels (SIPs) attached to a timber frame skeleton to create functional, enclosed structures. SIPs consist of a layer of rigid insulation covered on one side by oriented strand board and on the other side by oriented strand board, drywall, or some other interior finish. Current design methodologies for timber frame structures do not include potential structural benefits of SIPs considered as diaphragm elements. Lateral forces resulting from wind and earthquakes induce considerable stress into building components. While timber frame structures are typically well within safety limits with regard to gravity loads, lateral loads potentially exceed stress limits of timbers and joints. Timber frame structures have an excellent performance record and it is therefore assumed that even though the frame alone does not have the strength to resist lateral loads, the SIPs contribute to the ability of these structures to effectively resist lateral loading. The objective of this research is to quantify necessary design and test parameters that will enable timber frame designers to capitalize on diaphragm action of SIPs when designing timber frame structures to resist lateral loads. An analysis of research leading to current diaphragm design procedures has provided guidelines and strategies that will enable this objective to be met without starting from scratch. The needs of the design community in the form of laboratory test data from roof diaphragm assemblies, and analyses required in order to establish safe and cost effective design procedures for timber frame structures will be developed.

20. Electro-Optic Properties of Self-Assembled Optically Non-Linear Polymer Thin-Films
R. Duncan

Electro-optic (EO) modulators are widely used in broadband fiber optic communication systems due to their well-defined transfer functions, large output optical power, wide modulation bandwidth, high extinction ratio, and low wavelength dependence. Current commercial EO modulators take advantage of solid-state crystals such as LiNbO3 and have half-wave voltages typically in the range of 3-5 V so that broadband amplifiers are required to drive the modulators, limiting bandwidth considerably. As the need for bandwidth grows, it is desired to have broadband modulators with low driving voltages (<1V) and low thermal dependence. It has been recognized that EO polymers are well suited to serve as the next generation modulators because of their low dielectric constants, excellent velocity match between optical-wave and modulation microwave, and potentially higher EO coefficients. This research investigates the EO properties of electrostatic self-assembled (ESA) polymers with an emphasis on optimization of electro-optic activity, minimization of optical loss, and other fine-tuning of device parameters. Traveling-wave EO modulators, based on ESA chromophoric superlattices possessing intrinsically polar microstructures have been designed. The intrinsic order of ESA EO polymers has yielded EO coefficients >100 pico-meters per volt, the highest ever published and fully an order of magnitude higher than present commercially viable materials. It is expected that these ultra-high EO coefficients will yield a half-wave voltage <0.5 V upon device fabrication.

21. Digital Library Network for Engineering and Technology
S. Mahadevan

Digital Library Network for Engineering and Technology (DLNET) will assist in the lifelong learning of engineering faculty and students, practicing engineers and technical professionals. It is a platform for collecting, archiving and distributing reusable learning entities. As a part of the broader National Science Foundation (NSF) Science, Technology, Engineering and Mathematics (STEM) Digital Library initiative, DLNET provides technologies for developing, discovering and delivering learning programs. Towards developing learning programs, a homegrown authoring tool that assists in metadata extraction, validation and content packaging has been built. Such packages termed learning objects (LO) are defined as structured electronic resources encapsulating high quality information facilitating learning and pedagogy. Metadata for these resources is represented in a popular XML content packaging standard. The resources can then be uploaded to DLNET where they are peer-reviewed and rated for quality control. Upon meeting benchmark standards, these resources are archived thus making them publicly available for discovery. Search and retrieval capabilities include basic keyword search, advanced Boolean search and a three level taxonomical search of various engineering fields. DLNET hopes to share metadata between other federating libraries under the NSDL umbrella using the Open Archives Initiative (OAI) protocol thus allowing education of a broader audience. Repositories at DLNET are stored in high-end servers with a capacity to serve hundreds of users simultaneously. Core server-side functionality for DLNET is provided using java components such as java Beans, Servlets and JSP technologies hosted by a java servlet engine provided by apache (Tomcat). Use of XML requires extensive usage of java based XML parsers and language transformers

22. Visualization of Multidimensional Functions
S. Jayaraman

Multidimensional functions are an important component in many engineering disciplines. Such functions are characterized by a large number of parameters on which the functional value depends. An example is the variety of production functions in economics. Such complex functions are very difficult to understand and study in order to derive valuable insights regarding their behavior. A unique solution to this problem is to visualize the functional space and allow the user to manipulate the visual interface to obtain useful and interesting information. We have developed a tool that displays an overview of the functional space around a point of interest (called the focal point) to the user. The visualization is based on the "focus+context" approach as it displays greater amount of detail to the user near the focal point. Lesser amount of detail is shown on moving away from the focal point providing for the contextual information. The visualization depicts the nature of the space along each of the dimensions of the function around the focal point. This approach enables the user to obtain an overview of the space and grasp its nature with respect to a point of interest. Additional utilities such as the ability to change the focal point, aid the user in exploring the functional space. The main advantages of the tool are that its simple to use, provides enough freedom to the user to navigate through the functional space in their own perspective and is scalable.

23. Strength and Life Predictions for Advanced Structural Composites
M. Hayes

Fiber-reinforced polymeric (FRP) composites show great promise for civil infrastructure due to their excellent durability and light weight. However, the failure modes and long-term performance of structural composites in these applications have not been adequately addressed. The present study considers a particular FRP section, a 3-ft deep double-web beam, developed for bridge spans up to 60 feet long. This structure is a hybrid composite comprised of both fiberglass and carbon fiber, manufactured using the pultrusion process.Testing of the beam under transverse loading suggests that failure occurs by delamination within the compressive flange near a load point. The delamination initiates at a free edge and is attributed to large normal, out-of-plane stresses. A finite element model is being developed to identify the exact location of the failure and to establish the free edge stress state. However, a simple stress analysis suitable for design and optimization is preferred, so higher-order plate and sandwich theories are considered to calculate in-plane, ply-level stresses. A local free edge model is also required, and approximate methods developed for laminates in the literature are considered. The long-term objective of this work is to integrate this stress analysis into a life prediction code. This model would permit degradation in ply-level properties due to fatigue, creep, and hygro-thermal changes; and the remaining strength of the critical elements would be tracked versus time. In this case, the critical elements are the zones of high interlaminar stresses where delamination occurs.

24. Characterizing Lane Changes with a Slow Lead Vehicle Present
E. Olsen

The objective of this effort was to characterize normal lane changes in which a slow lead vehicle was present. Of 8,668 lane changes recorded, the most common maneuver included 3,228 (37 percent) lane changes in which a slow vehicle was present in front. Analyses revealed that the mean duration for single slow lead vehicle lane changes was 6.26 seconds (SD = 2.2 seconds). However, no significant effects for duration were observed in terms of route, driver type, gender, or vehicle type. For frequency, significantly more lane changes were completed by interstate drivers, perhaps due to traffic density. Sedan drivers made significantly more lane changes than SUV drivers, suggesting differences in average velocity and lane choice. Significant interactions resulted for all single slow lead lane changes, perhaps due to driving style, lane preference, commute length, or route velocity. A sample of 220 lane changes rated high in severity or urgency was analyzed in-depth. Turn signals were used in less than half of the lane changes observed. The majority of lane changes were to the left. The safety zone that drivers maintain is smaller for right lane changes. This phenomenon may be the result of a willingness to cut closer to other vehicles or an increased level of confidence in judging the velocity and distances to vehicles in the right lane ahead. Glance pattern analysis revealed support for previous findings suggesting that locating visual alerts in the left or rear view mirror may be justified for crash avoidance systems of the future.

25. Incised-valley-fill architecture of the Lower Pennsylvanian New River Formation, West Virginia

J. Korrus

The New River Formation (NRF) consists of siliciclastic, coal-bearing rocks that developed within a fluvio-estuarine paleovalley system of the Appalachian foreland basin. Despite the economic importance of these deposits, their origin is poorly understood. A depositional framework for the NRF, based on a combination of outcrop mapping and subsurface well-log analysis, reveals channel-form and sheet-like rock bodies that contain predictable internal architectures. An idealized rock body consists of deeply incised, fluvial channel sandstone separated from overlying tidally-modified estuarine sandstone and mudrock by a quartz pebble conglomerate, and is capped by coarsening-upward bayhead delta facies and coal. This upward change in facies is interpreted as the result of rising relative sea level during the development of an incised-valley-fill (IVF). Each IVF represents the basal part of a 4th-order stratigraphic sequence. Multiple 4th-order sequences are vertically stacked into 3rd-order stratigraphic sequences such that within each sequence, fluvial-dominated IVF's occur below estuarine-dominated IVF's. Low accommodation and asymmetric subsidence within the foreland basin resulted in westward amalgamation of multiple, 4th-order, fluvial IVF's. The Early Pennsylvanian time period was characterized by global icehouse conditions and the tectonic assembly of Pangea. These events affected the geometry of the overall stratigraphic package, which can be attributed to high-magnitude, high-frequency, glacioeustatic sea-level fluctuations superimposed on relatively slow, asymmetric tectonic subsidence.

26. Type 2 Diabetes in EFNEP and FSNEP Clients in Virginia

J.P. Carpenter

Quantum wires have interesting physical properties that make them good candidates for the next generation of electronic devices. We will discuss the possibility that, under certain conditions, for arrays of quantum dots (0-D case) and arrays of one-dimensional quantum wires (1-D case) electronic transport can be chaotic. Chaos is due to the formation of electric domains and domain walls in the array when sequential resonant tunneling occurs between adjacent units. A similar phenomenon has been predicted and demonstrated for solid-state superlattices. [1] However, unlike in superlattices (2-D case), the electric domains in the 0-D and 1-D cases are distributed across several units. The difference between the 2-D case and the other two is due to the different spatial distribution of the electric field. Work supported in part by Carilion Biomedical Institute and ACS-Petroleum Research Fund No. 37130-G5.

27. Isopiestic Determination of the Osmotic Coefficient of Concentrated-acidic Ferric Sulfate Aqueous Solutions at 298.15 and 323.15 k

M. Velazquez

The oxidation of sulfide minerals can produce acid brines rich in iron(III) and sulfate, with total concentrations reaching 1 and 4 mol/L, respectively. The relationships between the activities and concentrations of dissolved species in these concentrated-acidic solutions are unknown. The activity coefficients of iron(III), sulfate and hydrogen ions can be retrieved from the analysis of the osmotic coefficients of concentrated {yH2SO4+(1-y)Fe2(SO4)3}(aq) solutions, where y is the solute mole fraction of H2SO4. These data can then be used to model aqueous solutions in equilibrium with highly soluble iron(III) sulfate minerals. We have measured the osmotic coefficient of concentrated {yH2SO4+(1-y)Fe2(SO4)3}(aq) solutions using the isopiestic method. The osmotic coefficients of the reference standards were calculated using the models of Archer (J. Phys. Chem. Ref. Data 21: 793-829) for NaCl and Clegg et al. (J. Chem. Soc. Faraday Trans. 90: 1875-1894) for H2SO4. Measurements have been made for 34 different values of y ranging from 0.74948 to 0.94682 at 298.15 K and for 18 different values of y, over the same range, at 323.15 K. At 298.15 K, the total molal concentration (mT or [H2SO4]+[Fe2(SO4)3]) increased from 0.42221 to 6.71642 mo/kg and the stoichiometric ionic strength (IS) from 1.94671 to 25.88862 mol/kg. At 323.15 K, the mT ranged from 0.8124305 to 7.236699 mol/kg and the IS from 3.99018 to 28.40216 mol/kg. The stoichiometric osmotic coefficient (fS) of the test solutions ranged from 0.47342 to 0.75499 at 298.15 K and from 0.48413 to 0.69933 at 323.15 K. The values of fS converged as mT increased and the solutions became increasingly saturated with respect to iron(III) sulfate phases. This behavior is to be expected: the solute-solvent interactions of the test solutions become similar as the concentration increase. The data provided by this study can be modeled using Pitzer's equations to obtain a general expression of the {yH2SO4+(1-y)Fe2(SO4)3}(aq) solution osmotic coefficient as a function of iron(III), sulfate, and hydrogen ion concentrations. An equation for the activity coefficient for each one of the ionic species in the system can be developed during the fitting and modeling process.

28. Chaotic transport in arrays of quantum wires

M. Zwolak

Quantum wires have interesting physical properties that make them good candidates for the next generation of electronic devices. We will discuss the possibility that, under certain conditions, for arrays of quantum dots (0-D case) and arrays of one-dimensional quantum wires (1-D case) electronic transport can be chaotic. Chaos is due to the formation of electric domains and domain walls in the array when sequential resonant tunneling occurs between adjacent units. A similar phenomenon has been predicted and demonstrated for solid-state superlattices. [1] However, unlike in superlattices (2-D case), the electric domains in the 0-D and 1-D cases are distributed across several units. The difference between the 2-D case and the other two is due to the different spatial distribution of the electric field. Work supported in part by Carilion Biomedical Institute and ACS-Petroleum Research Fund No. 37130-G5.

29. Control of sFlt-1 Expression Through the Flt-1 Intron 13 Polypyrimidine Tract
R.Roche

Vascular Endothelial Growth Factor (VEGF) is important in angiogenesis as a mediator for endothelial cell proliferation and migration. A truncated, secreted form of a VEGF receptor, sFlt-1, has been found to inhibit actions of VEGF *in vivo,* including tumor vascularization. Consequently, sFlt-1 is a prospective anti-tumor agent. sFlt-1 is translated from an alternatively spliced mRNA that retains part of intron 13 from the Flt-1 gene. This project focuses on characterizing the intronic elements that regulate mRNA splicing (to produce full-length Flt-1) or polyadenylation (to produce sFlt-1). A "wild-type" construct (pFIN13) containing the first 13 exons, intron 13 and then exons 14-30 of mouse Flt-1 was shown to produce both forms of Flt-1 mRNA after transfection into HEK293 cells. To gauge the strength of the native splicing signals in intron 13 of Flt-1, a series of point mutations were made in the polypyrimidine tract using pFIN13. After transient transfection, the levels of Flt-1 and sFlt-1 protein and mRNA were compared through quantitative PCR, western and northern blotting. Substitutions of purines for pyrimidines caused a 200 to 600 fold decrease in Flt-1:sFlt-1 mRNA ratios, reflecting less efficient splicing. Increasing the uridine complement in the polypyrimidine tract yielded a 1.5 to 2.5 fold increase in Flt-1:sFlt-1 mRNA ratios, reflecting improved splicing. These results suggest that the wild-type polypyrimidine tract is of intermediate strength and may be a regulatory locus for sFlt-1 expression.

30. Analysis of interspecific and intraspecific interactions between Ailanthus altissima and Robinia pseudoacacia
L. Call

Invasive exotic plants can persist and successfully spread within ecosystems and negatively affect the recruitment of native species. The exotic invasive Ailanthus altissima and the native Robinia pseudoacacia are frequently found in disturbed sites and exhibit similar growth and reproductive characteristics, yet each has distinct functional roles such as allelopathy and nitrogen fixation, respectively. 1) A four-month fully additive series in the greenhouse and 2) spatial point pattern analysis in treated field sites were used to analyze the intraspecific and interspecific interference between these two species. In the greenhouse experiment, total biomass responses per plant for both species were significantly affected by interspecific rather than intraspecific interference. Competition indices such as the Relative Yield Total and the Relative Crowding Coefficient suggested that A. altissima was the better competitor in the mixtures. Ailanthus altissima consistently produced a larger belowground relative yield while R. pseudoacacia generated a larger aboveground relative yield at high mixture densities. Robinia pseudoacacia also exhibited overall more variation for multiple biomass traits. Analysis of spatial point patterns with Ripley's K indicated that the two species were positively associated with each other in the majority of the field sites, suggesting no negative interspecific interactions. However, the greenhouse results revealed that interspecific interference occurred between these two species. Both species exhibited competitive traits that could potentially aid in excluding the other depending on the conditions.

31. Using Transposon Display to identify polymorphic markers and active transposons in the African Malaria Mosquito, Anopheles gambiae
J. Biedler

Transposon Display (TD), a modified form of Amplified Fragment Length Polymorphism (AFLP), has been successfully used to identify transposable element insertion polymorphisms (TEIPs) in Anopheles gambiae individual mosquitoes. TD differs from AFLP in that one of the primers is designed according to a transposable element. This technique was shown to be both specific and reproducible using several transposons in Anopheles gambiae. Re-amplification and sequencing of bands from a TD gel verified the presence of both transposon and genomic sequence, which allowed mapping of the transposon insertions onto the Anopheles gambiae genome. We also showed a relatively high level of insertion polymorphism of some of these transposons. With the completion of the An. gambiae genome sequence in the near future, the establishment of a robust TD assay for mosquitoes is invaluable. It will be a powerful new tool for the study of transposon activity and for population analysis of this medically important mosquito species.

32. Nitric oxide synthesis in Anopheles: Plasmodium contribution and defense
J. Lim

Nitric oxide (NO) synthesis is induced in the *Anopheles* midgut epithelium within hours of ingestion of *Plasmodium*. This suggests that parasite-derived factor(s) signal the mosquito midgut epithelium to induce *A. stephensi* nitric oxide synthase (AsNOS). Crude lysates prepared from *P. berghei*-infected and uninfected mouse erythrocytes were added to *A. stephensi (ASE)* cells for 48hrs. AsNOS expression, as measured by quantitative RT-PCR, was ~1.7-fold higher in cells exposed to *P. berghei* lysates than in cells exposed to uninfected lysates. To further characterize the AsNOS-inducing factor(s), crude lysates were extracted with methanol/chloroform/water (10:10:3). The resulting glycolipid-enriched extract of *P. berghei*-infected erythrocytes induced AsNOS expression in *ASE* cells ~5-fold as compared to the extract of uninfected erythrocytes. Purified *P. falciparum* glycosylphosphatidylinositol, presumed to be present in the glycolipid-enriched extract, also induced AsNOS expression. In mammals, NOS expression is regulated in part through the Toll signaling pathway. We have determined that two Toll genes (AsTRR1 and AsTRR2) are expressed in *A. stephensi* midgut in response to *Plasmodium* infection. Further, the expression of AsTRR1 was induced in ASE cells by crude lysate that could induce AsNOS expression. Despite the NO-rich environment of the midgut, *Plasmodium* development is not completely inhibited in *A. stephensi*. *Plasmodium* likely defends itself against nitrosative stress, a process that may be alleviated by well-characterized antioxidants such as 1-cys-peroxiredoxin, 2-cys-peroxiredoxin, heat shock protein 70, thioredoxin and glutathione reductase. These antioxidants are expressed during parasite development in the mosquito; quantitative analysis of expression patterns may suggest a role in defense against *Anopheles* NO.

35. Activity of American Eels in Selected Tributaries of the James River
P. Strickland

The diel activity of 24 different eels was monitored from October of 1999 to June of 2001. Eels were captured using backpack electroshockers in Shoe Creek, S.F. Tye River, and S.F. Piney River, Virginia. Each fish was implanted with a model 10-28 radio transmitter provided by Advanced Telemetry Systems (ATS). Each fish was monitored for one, 24-hour period for each season (fall, winter, and spring). The number of changes in the amplitude of the transmitter pulse was recorded for each fish for a three-minute interval every hour, which is indicative of the amount of activity. After performing a Two-way ANOVA with crossed structure, there was a significant difference in average diel activity among seasons ($p<0.0001$). We then used Tukey's Studentized Range test to determine that diel activity in the spring was significantly higher than fall and winter. In addition, the test also informed us that there was a significant difference in diel activity among streams ($p<0.0001$), as well as among streams within seasons ($p=0.0035$). We again used Tukey's Studentized Range test and determined that diel activity in Shoe Creek was significantly higher than in S.F. Tye and S.F. Piney. Upon examining the Least Square Means it was apparent that Shoe Creek had a significantly higher level of diel activity in the winter and spring than the other two streams. This was surprising considering that eels tracked in all three streams were similar in size (500-700 mm). Possible explanations for the activity differences are under current investigation.

36. Speciation in water lilies: Evidence from morphology and the internal transcribed spacer region (ITS)
K. Niehaus

This study has combined morphology and molecular techniques to investigate speciation in the North American water lily Nymphaea odorata. Nymphaea odorata has a wide geographic distribution across the United States. Nymphaea odorata has been separated into two subspecies based on morphological characteristics. Samples from across both subspecies geographic range were collected for the analysis. A literature search was done to determine the morphological characteristics that have been used by previous authors. A total of 40 characters were measured, 28 quantitative and 12 qualitative. For each subspecies, the mean of each character was calculated and then analyzed by ANOVA and NTSYS. Morphologic evidence showed no significant subspecies or geographic grouping of characters. Molecular techniques were used to characterize the genetic difference between the two subspecies. The ITS region was chosen based on a previous studies that have shown variation at the subspecies level (Borsch 1999). DNA was extracted from each sample and sequenced using PCR based methods. The sequence data was then analyzed in the computer program PAUP*. Using N. mexicana as an outgroup, a strict consensus tree of the parsimony analysis showed no specific grouping of the subspecies but a clear distinction at the species level. Other analysis, such as bootstrap and neighbor joining, showed a significant difference between the subspecies. The sequences however, revealed possible hybridization among populations.

37. Friend or Foe: Nitrosative Stress in the Malaria Parasite-Infected Mosquito Midgut

T.M.L. Peterson

Nitric oxide (NO) is a double-edged sword: it can protect or damage host tissue depending on its concentration and interactions. Both vertebrates and anopheline mosquitoes inhibit *Plasmodium* (malaria parasite) development via induction of nitric oxide synthase (NOS). Expression of *Anopheles stephensi* NOS is induced in the midgut epithelial tissue of mosquitoes _following a *Plasmodium berghei*-infected bloodmeal. In addition to decreasing parasite levels, the formation of nitric oxide (NO) modifies host proteins; enhanced immunohistochemical detection of nitrotyrosine, a well documented marker for NO and/or peroxynitrite exposure, was seen in paraffin embedded tissue sections of *Plasmodium*-infected blood fed *A. stephensi* at 24h post-bloodmeal. Blood meal digestion takes around 48 hours. NO reacts/interact with other compounds forming a variety of reactive nitrogen intermediates (RNIs) that may impose a nitrosative stress. Photolysis-chemiluminescence was used to release and detect bound NO from compounds in blood_ filled midguts dissected at various time points (0-33h) following post-bloodmeal_ and Results showed significantly increased NO levels in *Plasmodium*-infected samples at 12.5-13.5h and 24-25.5h post-bloodmeal (Student's t-test, p=0.02 and p=0.03)ous. Nitrite and nitrate are stable end products of NO; infected Infected midguts at 12hous after post-bloodmeal showed significantly elevated levels of nitrite/nitrate, stable end products of NO (Student's t-test, p=0.015). These times suggest an increase in nitrosative stress as a result of parasite motility and invasion of the midgut epithelium. Peroxynitrite is the main RNI that causes biological nitrotyrosine formation. Peroxiredoxins have been discovered in many organisms and have been shown to act on peroxynitrite. Presently we have isolated a 2-Cys peroxiredoxin from *A. stephensi* (AsPRX). Quantitative RT-PCR has detected induction of that AsPRX is induced in the midgut epithelium by *Plasmodium*-infected blood filled midgut RNA samples taken at 12-33hous post bloodmeal, suggesting a role in protecting *Anopheles stephensi* from NO produced for defense purposes.

38. Effects Of Constitutively Active Calcineurin On SERCA Expression And Activity In Mouse Skeletal Muscle

S. Lees

In skeletal muscle, the calcineurin signaling system has been implicated in the activation of several slow phenotypic genes. Expression of a constitutively active form of calcineurin has been demonstrated to induce slow muscle fiber gene expression in vitro and in vivo. Therefore, a transgenic mouse model expressing constitutively active calcineurin in skeletal muscle (MCK-CN*) was used to assess the influence of calcineurin activation on calcium handling by the sarcoplasmic reticulum (SR). Tibialis anterior (TA) muscles were removed, pooled, and homogenized in 5 volumes of homogenization buffer. Samples were centrifuged at 1600g at 4°C for 10 minutes and the resulting supernatant was stored at -80°C. TA calcium uptake and release rates were measured from MCK-CN* and wild type (WT) animals. Student's t-tests were used for statistical comparisons. Peak calcium uptake rates were 4.52±0.95 and 5.38±0.79 nmol/mg per min for MCK-CN* and WT animals, respectively (p=0.28). At 2 M free calcium, uptakes rates were 1.43±0.17 and 1.46±0.11 nmol/mg per min for MCK-CN* and WT animals, respectively (p=0.46). SR calcium release rates, induced using AgNO3, were 6.67±2.11 and 6.91±1.06 nmol/mg per min for MCK-CN* and WT animals, respectively (p=0.46). Western analyses of both major skeletal muscle sarco(endo)plasmic reticulum calcium ATPase (SERCA) isoforms revealed no differences in SERCA 1a (fast) expression between groups and no detectable expression of SERCA 2a (slow) in either MCK-CN* or WT animals. Coomassie stained SDS-PAGE indicated that total SERCA expression and yield were not different between groups. These data indicate that chronic calcineurin activation does not alter calcium handling by the SR. Also, it seems that this model does not induce a phenotypic change in the expression of SERCA in the TA. Further investigation into the expression of other calcium handling proteins, as well as, other measures of calcium handling in MCK-CN* mice are necessary in the future.

39. Information Visualization in Virtual Environments: Interaction Techniques and Data Representation

A. Datey

Information visualization (info vis) deals with how to increase the bandwidth of effective communication between computer and human, enabling us to see more, understand more, and accomplish more. Traditionally, it deals with interaction and display techniques of visualizing often abstract data on the two-dimensional desktop. Immersive virtual environments (VEs) offer new, exciting possibilities for information visualization. Immersion gives an enhanced realistic effect, and improves spatial understanding and orientation. Head tracking allows natural viewing. However, it is yet unclear how interaction techniques used for visualizing information on the desktop can be adapted for VE systems. By identifying or developing useful interaction techniques, we could develop VE systems for better information visualization. Our focus is on exploring interaction techniques in VEs for information visualization. We need to explore and evaluate ways for adapting info vis techniques for their potential use in VEs. The first problem we are going to focus on is on adapting overview+detail techniques in VEs. We want to develop and evaluate ITs to support overview +detail, and identify potential types of applications that would benefit from such a technique. It appears that data representation might have a large influence on the kind of visualization as well as the kind of interaction needed. Are there characteristics of data that make it more suitable to be visualized in VE systems? Thus, this knowledge would help us choose ITs based on the data representation while developing a VE system. We seek to verify the techniques through user experiments.

41. Tobacco-based bioexpression of the putative anti-cancer therapeutic mda-7
N. Warholic

Human melanoma differentiated gene 7 (mda-7), a novel tumor growth suppressor with apoptotic activity, holds promise as a cancer targeted therapeutic. Its activity has been shown to specifically target tumor cells of various origin including small lung, melanoma, and breast. Efforts to develop an mda-7 protein-based therapeutic have been unsuccessful due to limitations associated with large-scale protein expression and insufficient protein processing in mammalian and bacterial expression systems respectively. We have targeted transgenic plant bioexpression as a system that offers advantages in safety, rapid scalability and bioproduction costs for expressing recombinant human proteins. Additionally, as plants are capable of performing complex protein processing, we initiated studies to express a human mda-7 in transgenic tobacco. A full-length mda-7 gene and a mda-7/myc tagged gene construct provided by Introgenã Inc. were amplified by PCR. These mda-7 fragments were cloned behind either a high expressing constitutive plant promoter (35S dual enhanced) or an inducible promoter (MeGAä; Crop Tech) and transformed into E. coli. Clones encoding a plant-derived signal sequence upstream of mda-7 were also generated to potentially facilitate targeting and secretion of this plant-expressed human protein. All constructs were verified by restriction digests and sequencing. The promoter:mda-7 gene cassettes were subcloned into a plant expressed binary vector pBIBKan and transformed into Agrobacteria tumefacien. The ability of tobacco to produce the mda-7 gene product was assessed using an Agrobacterium-mediated transient expression assay protein from the various constructs were expressed in a tobacco leaf strip transient assay and Western analysis.

PHYSICAL SCIENCES

42. Measurement of Pion Production Cross Section and Beam Asymmetry With Polarized Gamma Rays on Protons and Neutrons (Nucleons)
H. Meyer

Gamma rays are useful to probe the structure of nucleons that make up the nucleus of an atom. Polarized gamma rays are of special interest because information about the spin structure of the nucleon becomes accessible. The LEGS facility (located at Brookhaven National Lab) provides an intense beam of highly polarized gamma rays, energetic enough to produce charged
pions, through backscattering of laser light from electrons in a storage ring. Pion (a particle with a lifetime of a few billionths of a second) production is a particularly sensitive reaction. A detector array allows detection of produced particles with highefficiency. The target is made from HD (hydrogen-deuteride) so protons and neutrons can be simultaneously studied. In the current experiment the cross section and beam asymmetry were measured, giving new input to theoretical models of the nucleon. The target can be polarized to a high degree and has further advantages over competing target designs. Data on polarized HD has been taken, providing the first measurement ever for some of the double polarization observables and greatly increasing the accuracy of others. Virginia Tech is a member of the LEGS collaboration.

43. The CS1 Sandbox Project: Applying Subsets to a Novice Programmer's Language
P. Depasquale

Computer Science education is lacking programming environments in which students can learn to experiment with programming statements following a similar pedagogy in which they are experiencing program development in the classroom. Today's general model of a CS1 course introduces portions of a programming language in an iterative methodology, in which students are told to ignore portions of the language that will be discussed at a later time. However, it is quite common to then see institutions require their students to use a professional quality, structured development environment for completion of their assignments and programming work, forcing the students to deal with issues and constructs of the language which they have been instructed to disregard for the interim.This research work (named the CS1 Sandbox) focuses on tailoring and modifying the development environments which students can use to learn computer languages and programming. My efforts improve upon a programming environment by permitting course instructors to instantiate a subset of a programming language, which in turn can be propagated to a student's programming environment. The environment would lead to a pedagogical sandbox in which students can concentrate on only those aspects of the language that are currently applicable (as related to their class) and obtain relevant feedback (error messages, warnings) based upon the syntactic and semantic capabilities available to them.

SOCIAL SCIENCES AND HUMANITIES

45. A Descriptive Analysis of the Perceived Effectiveness of Virginia Tech's Faculty Development Institute
C.Banks

Virginia Tech's Faculty Development Institute (FDI) was developed to address issues related to the computer technology revolution; training and education of faculty; faculty professional development; and the university adjusting to change. The purpose of this study is to identify and compare the goals, expectations, and perceived outcomes that the university, FDI developers, and the initial participants had for Virginia Tech's FDI initiative as originally implemented. A mixed methodological approach using both qualitative and quantitative research and motivation theory, specifically met expectation hypothesis, is used in this study to identify the perceived outcomes for the developers and initial participants. The fundamental concepts of evaluation, personal recall and self-perception theory are used help to describe the process that occurred for the university, the developer's, and initial participants. Interview results from the five developers and historical document analysis was used to develop surveys for the 50 initial participants and the developers in order to provide validity for the results. Interviews, historical documents and the survey results show that initial participants, developers and the university had very similar expectations for the outcomes during and/or immediately following the initial FDI workshop. There were wider differences in expectations of long-term outcomes as a result of the FDI initiative.The results also differ in terms of the extent to which expectations were met for both participants and developers both short and long term.

46. Leader Emergence and Gender Roles: A Contextual Examination
A. Gershenoff

Research suggests that gender role, rather than sex, is associated with the perception of individuals as leaders. This study tests the effect of gender role and intelligence on leadership emergence by using a pattern approach and manipulating task-type. Two hundred female undergraduate subjects, categorized by their pattern of masculinity, femininity, and intelligence, were placed in groups of four members. Groups were randomly assigned to an initiating structure or consensus-building task condition. In the initiating structure task condition, both masculine-intelligent and androgynous-intelligent individuals emerged more than feminine-intelligent or mixed pattern individuals. In the consensus-building task condition, feminine-intelligent individuals did not emerge as leaders more than masculine-intelligent or mixed pattern individuals. However, partial support was found for the emergence of androgynous-intelligent individuals. The implications of these findings and directions for future research will be presented.

47. Green Entrepreneurship: Adding Value to Local Livelihoods (A case of the Bhanjada community in India
A. Bhardwaj

The survival/revival of a natural resource base is predicated upon the survival/revival of local communities that utilise that base. A local group or community will sustain a natural resource if it makes that group or community existentially viable. Joint Forest Management experiences or JFM (under the 1988 forest policy) in India have revealed the crucial role that economic incentives play in eliciting participation of the forest dependent communities for regenerating degraded forestlands. Current JFM practice promises the dependent communities benefits in terms of share in non-timber forests products (NTFP's) such as grasses and fuelwood or timber in return for forest conservation and protection. While JFM incentives have increased the access of the communities to forest resources, the financial returns are poor. Presence of middlemen and lack of NTFP processing leave little to the local communities. Green entrepreneurship promises to return a larger share of the product value to the rightful protector community. It transforms them from mere collectors of NTFP's to entrepreneurs thus ensuring sustainability of both local economies and resources. Taking the case of the bamboo dependent Bhanjada community in Haryana, India this paper establishes the need of such an entrepreneurship and recommends strategies to initiate it. Product diversification and building marketing institutions will add value to livelihoods of the Bhanjadas and bring about forest regeneration as well.

48. Psychosocial correlates of self-reported anxiety in adolescents: results from a four-year school-based prospective study of adolescent functioning
H. Blier

The developmental progression of anxiety in children and adolescents is the source of ongoing investigation. As a result, differences in the expression of anxiety, based on individual and familial factors, have been elucidated. However, during adolescence the context of development shifts away from parental factors and parent-child rearing factors and involves greater influence by school and peer figures. A more complete picture of anxiety in adolescents would need to include assessment of these influences. Further research is needed to understand the many contextual factors involved in the development of anxiety in youth (Gullone, King, & Ollendick, 2001). This poster will present findings from a school-based longitudinal study examining the continuity and correlates of self-reported anxiety in adolescents. The sample consists of 434 adolescents (214 males, 220 females) evaluated at three time points (i.e., spring of 6th, 8th and 10th grade school years). Analyses will include both self- and peer-report measures of functioning, as well as objective behavior reports provided by the school. Both correlational and hierarchical regression analyses will be performed in order to examine possible predictors of anxiety symptoms. Finally, analyses will be conducted to identify potential mediating and/or moderating variables, including gender. Results will be discussed in terms of school-based assessment and interventions for anxiety symptomology.

49. Family environment and children's self-reported anxiety and depression: The independent contribution of parent and child characteristics
H. Blier

The expression of childhood internalizing disorders is influenced by the family context in which much early learning and development occurs. Recent studies identify family environment as a predictor of self-reported internalizing disorders in children, beyond the risk of associated psychiatric symptoms (Hollis, 1996; Lau & Kwok, 2000). However, varied experiences and roles among family members suggest a need to explore these differences in the clinical assessment of children. For instance, it is important to consider whether the report of fathers as well as mothers contributes to understanding the clinical picture, including the context in which such problems occur. The purpose of the present poster is to examine the association between parental report of family functioning and internalizing problems reported by the child. Specifically, the independent contribution of mothers and fathers in the report of family environment will be considered. Findings from a clinical sample of 82 children (64.6% males; M age=9.93, SD=2.48) will be presented. Hierarchical regression analyses incorporating dimensions derived from the Family Environment Scale and child self-report measures of anxiety and depression will be conducted to identify predictors of internalizing problems. Age and gender differences will be evaluated as potential moderators in this relation. Results will be discussed in terms of assessment and treatment implications.

50. Rationality and Choice: Towards an Alternative Theory of Choice
S. Mousavi

Every one of us deals, daily, with problematic situations, which are discomforting, and thus call for an action to resolve them. My subject of investigation is the general form of describing, explaining, and formalizing the procedure of inquiry. It is an effort to describe in abstract terms and to evaluate the capacity of alternative frameworks to characterize inquiry. When a thinker studies a question, she looks for an answer that fits her personal beliefs. Suppose that her philosophy includes these rules (R1): "There exists a real world," and (R2): "A truth-seeker converges to *the real answer* as long as the investigation is on right track." Both these rules are almost trivial. The problem I want to point to lies exactly in this *triviality*. I assert that these rules characterize the underlying philosophy of economists, who model human activity as utility maximization. Alternatively, I want to analyze inquiry by reinvestigating its procedure from another mindset. This mindset *does not* postulate a unique reality that can be reached by following a truthful path. Rather, the mind of the seeker is part of the seeking procedure. Inquiry starts when a state of equilibrium is disrupted and the inquirer seeks to restore equilibrium. "Reality" is what that is realized by the inquirer at each level of inquiry, which could remain true or be rejected in later steps of the inquiry. Note that I *don't need* to postulate a "reality" to describe the procedure of inquiry nor do I impose a constraint of some "truth" on the inquirer. My alternative approach can be conceived only in an alternative mindset: a mindset that rejects (R1) and (R2).

51. Specialized clothing product development focused on business clothing for women with physical disabilities
K. Carroll

The U.S. clothing industry needs to become more flexible to adapt to consumers' changing needs in the current business climate (Kincade, 1995). Consumers with special needs (i.e., working women with physical disabilities), comprise one group who might benefit from specialized products targeted to their needs (Reich & Otten, 1991). Paradoxically, research shows that consumers with physical disabilities do not wish to be treated as a specialized group (Freeman, Kaiser & Wingate, 1986). The concept of Universal Design, typically applied to spatial and product design, provides a framework within which clothing could be produced to satisfy a variety of consumers, regardless their physical ability. This study employed qualitative research techniques using multiple data collection and analysis strategies in two Phases. In Phase A, detailed information was obtained from a group of nine working women to develop one prototype suitable for work situations. The prototype was wear-tested with the original group of women and a control group (N=6) to assess the success of the universal design strategy. In Phase B, interviews with industry personnel (N=6) explored constraining issues within the existing ready-to-wear system.Results indicated that (a) Universal Design can be a successful strategy for clothing product development, (b) a universally-designed clothing product can be easily manufactured within the existing clothing system, and (c) clothing companies currently are not marketing a product to consumers with physical disabilities because of what they perceive as the small and specialized target market. More work needs to be done with clothing manufacturers and distributors to gain acceptance for focused target markets.

52. The Effects of Emotional Labor on Employee Work Outcomes
K.H.L. Chu

Emotional labor is a distinct characteristic that differentiates hospitality employees from other types of workers. While other industry requires physical or intellectual labor, the service industry in general, the hospitality industry in particular, requires emotional input from employees. This study investigates emotional labor and its associated antecedents and consequences from the perspective of individual dispositions. It is expected that the results of this study could help the industry identify that what types of employee can perform emotional labor better and thus can help the hospitality industry refine its current employee selection process.

53. Effects of Gender on Risky Driving
H. Sewell

This field study analyzed safe vs. at-risk driving over 1,500 drivers across three busy intersections. Researchers observed the risky behaviors of red-light running, not using a safety-belt, and using a cellular phone while driving. Data were collected on weekdays for one hour in the evening for 12 consecutive weeks. Results showed a substantial red-light running problem. Gender differences and implications for a behavior-based intervention will be discussed.

54. Gains and Losses from Household Formation
R. Kheirandish

The main purpose of this paper is to investigate the effect of considering the individual, rather than the household, as the smallest unit of the economy. In this paper, I am going to use a general equilibrium model of a free exchange economy and investigate what happens to individuals if they form a household, compared to remaining single. I am interested in the incentives for household formation for both spouses, in identifying the mechanisms and situations that make it possible for individuals to gain from household formation. To what extent it is true that set of opportunities for a household is `bigger' than a single person. It has been shown that if there is no externality, then there is no gain from household formation. But what about the case that there is some externality? In this paper, a general equilibrium model is introduced where a household may consist of more than one member, each with their own preferences and endowments. I introduce a simple model with two types of individuals and pure group externalities. I define the extended core for such an economy and show that any allocation in the extended core can be supported as a competitive equilibrium allocation. Stability of equilibrium is also investigated. I also examine a special case of consumption externality and show that if certain conditions hold, similar results are obtained.

55. Pattern Classification of a Stimulus-Response Specificity and Individual Response Stereotypy: Implications for Reactivity Research
I. Christie

The principles of stimulus-response specificity (SRS) and individual response stereotypy (IRS) are fundamental in psychophysiological research and bear particular import for reactivity models of cardiovascular disease development. A central theme of reactivity models is a consistently large magnitude response to an array of stressors either within tasks and across subjects (SRS) or within subjects and across tasks (IRS). Pattern classification techniques were used to determine whether the laboratory stressors or individual differences in reactivity play a greater role in overall patterns of reactivity. Five college-aged females participated in five standard laboratory tasks (facial cooling, cold pressor, hand grip, supine rest, and orthostatic stress) on three separate occasions while electrocardiogram, impedance cardiogram, and blood pressure were recorded. Mean values were calculated across the three-minute tasks yielding a range of cardiovascular variables (mean inter-beat interval, mean successive difference of successive inter-beat intervals, respiratory sinus arrhythmia, systolic and diastolic blood pressure, left ventricular ejection time, and pre-ejection period) yielding a total of 75 observations. These data were then subjected to two pattern classification analyses, first using subjects and second using tasks as classification variable. Results of both analyses resulted in classification accuracies at statistically greater than chance levels (subjects: $z=13.9$, $p<.001$; tasks: $z=9.8$, $p<.001$). Classification hit rates for subjects was 77% overall (range: 60-93%) and 61% overall for tasks (range: 33-80%). Results suggest patterns within the individual may be more robust than patterns at task level. Task hit rates also provide a means of exploring the efficacy of commonly used laboratory stressor tasks.

56. An Investigation of Companion Animals in Animal Shelters: Behavioral Determinants of Relinquishment
A. K. Fournier

Millions of companion animals are relinquished to shelters and euthanized each year because of pet owner deficits in spay/neuter education and animal behavior modification. The present study explored spay/neuter rates and behavioral determinants of pet relinquishment at two animal shelters. Results and implications for educational and behavioral intervention will be discussed.

57. Negative Outcomes and Front-Loading
M. Stuart

This study investigated bar setting drinking behavior and it's relation to blood alcohol concentration (BAC) levels, as well as negative outcomes. Participants were randomly approached in a downtown bar setting and asked questions regarding drinking behaviors, specifically how many drinks they had consumed before arriving downtown that evening (front-loading), their experience with negative outcomes (i.e. vomiting, hangover, etc.), and preliminary designated driver use. They were then administered a breathalyzer test to assess their actual BAC level. There were 333 participants (90 women, 243 men) that completed both the downtown drinking questionnaire and the BAC assessment. 170 participants identified themselves as non-front-loaders, while 159 participants said they had front-loaded that evening.The mean BAC for everyone downtown was .070 (SD=.055) with a range of .000 to .247. The mean BAC level of those individuals that front-loaded was .090 (SD=.050), with a range from .000 to .247. The mean BAC of those individuals that did not front-load was .050 (SD=.060), with a range of .000 to .212. It was found that non-front-loaders experienced an average of 2.54 (SD=4.39) total negative outcomes. Front-loaders, on the other hand, reported experiencing 3.89 (SD=4.30) total negative outcomes.The differences in front-loading behavior and negative outcomes based on gender and Greek status will be discussed in greater depth. Also, further information regarding preliminary designated driver usage and the implication of these findings for preventing driving under the influence of alcohol (DUI) will be discussed.

58. Assessing the Effect of Relationship Status on Alcohol Consumption
S. Rayne

The purpose of this study was to observe the effect of an intimate partner or date's presence at a party on the participant's blood alcohol concentration (BAC). Results will be discussed with an emphasis on preventing negative outcomes from drinking among students.

59. Reliability of the Factor Structure, Internal Consistency, and Divergent Validity of the Multidimensional Anxiety Scale for Children (MASC) in a New Community Samples of Children
A. Grills

Epidemiological studies continue to reveal high prevalence rates of anxiety disorders, placing them among the most commonly diagnosed disorders in childhood and adolescence. These rates illustrate the need for appropriate and accurate assessment measures specifically designed for youths. Based on these assumptions, the MASC was designed to examine anxiety symptoms in line with DSM-IV. This 39-item self-report questionnaire measures four major domains of anxiety (i.e., physical symptoms, harm avoidance, social anxiety, and separation/panic) as well as provides a total anxiety score, anxiety disorders index, and inconsistency index. Normative and psychometric properties for this scale are available for children aged 8-19 years.The primary purpose of the present study was to examine and replicate findings regarding the MASC in a new community cohort of children. Participants include 279 sixth grade students ($\underline{M}$ = 11.75; SD = .53). In addition to the MASC, children completed the Reynolds Adolescent Depression Scale. Thus, the present study allowed for the factor structure, internal consistency, and divergent validity of the MASC and its indexes to be examined in a community sample of youth different from that reported in the original manual. Results will be discussed in terms of implications for the reliability and validity of the MASC.

60. The Prediction of Internalizing Symptoms and Victimization Experiences in Adolescents: A Longitudinal Study
A. Grills

Several recent investigations have found significant associations among peer victimization experiences and internalizing symptoms in children and adolescents. However, the nature of these relations has remained unclear. For instance, internalizing symptoms may lead to later peer victimization experiences, or peer victimization experiences might contribute to the development of internalizing symptoms. The primary purpose of this longitudinal study is to examine relations among anxiety, depression, and bully/victim status in a sample of adolescents. One major advantage of this longitudinal investigation is the opportunity to determine the precipitants and consequences of internalizing symptoms in school-age adolescents. Participants include 441 adolescents (218 males, 223 females) who were evaluated in the spring of their 8th and 10th grade school years. In the eighth grade, participants completed self-reports of anxiety, depression, and self-competence as well as peer status ratings. In the tenth grade, self-report measures of depression, aggression, and bully/victim experiences were completed. Descriptive and correlational analyses will be conducted for all measures of interest. In addition, hierarchical regression analyses will be performed in order to examine possible predictors of internalizing symptoms and bully/victim behaviors. Finally, analyses will be conducted to determine potential mediating and/or moderating variables (e.g., global self-worth). Results will be discussed in terms of preventions and interventions for internalizing symptoms and peer victimization.

61. Development of a brief body dysmorphic questionnaire
H. Littleton

Body dysmorphic symptomology, which includes such behaviors as excessive mirror checking, camouflaging, and reassurance seeking regarding a perceived defect (Phillips, 1991), has received little research attention, despite its potential importance. One possible reason for the dearth of research into body dysmorphic symptoms may be the lack of a quick, reliable way to assess these symptoms. The goal of the present research is to develop a quick, psychometrically sound self-report measure of body dysmorphic symptomology (BDQ). To establish the BDQ's reliability and to provide some preliminary validity evidence, it was administered to a group of 184 undergraduates along with the existing self-report measure of body dysmorphic symptomology, the BDDE-SR. To provide further validity evidence for the BDQ, it was administered to a second group of 25 undergraduates who were also administered the BDD-YBOCS, an interview measure of body dysmorphic symptomology. Finally, to test the BDQ's utility as a clinical screening measure, it was administered to a group of 72 women seeking treatment at a university counseling center. The validity of the BDQ was supported. It correlated highly with the longer self-report measure, the BDDE-SR. The BDQ also correlated significantly with the interview measure, the BDD-YBOCS. The results also support the utility of the BDQ in treatment seeking samples. Women who reported body image or eating concerns as an area of much or great concern to them on a screening measure, scored significantly higher on the BDQ than those women who did not report such concerns.

62. The Working Conditions of Domestic Helpers in the Philippines
J. Amado

This paper examines the working and living conditions of live-in domestic helpers in a third world setting. Conducted in a medium-sized city in the Philippines, several ethnographic methods were utilized, including in-depth interviews with 10 helpers and 10 female employers, 4 focus groups with a total of 21 helpers, and participant observation. Recorded interviews/focus groups were transcribed and processed using QSR-NUD*IST. Domestic helpers, who were initiated into paid domestic work as child laborers, live in their mistresses' households where they perform household chores and carework. Aside from their job description, they carry out additional tasks within and outside the household, depending on their employers' demands. Earning an average monthly wage of $US 27, these domestic helpers follow all orders from their agalon (masters), and they never caution their agalon that the tasks assigned to them are already outside their role as domestic workers. Living in their employers' homes put them under a twenty-four hour work cycle. Occasionally they are roused from their sleep to attend to their employers' nocturnal requests, and yet, they always begin their work at dawn to have everything prepared when their employers wake up. The helpers' living arrangements are indications of apparent class divisions in the household, as indicated in 1) restricted use of certain household appliances, 2) inferior sleeping arrangement, and 3) disparities in food quality and eating pattern.

63. Economic valuation of Bhoj Wetland, India, for sustainable use
N. Bakshi

Water management measures along with sustainable use need to be promoted in order to meet the growing drinking water needs, which is true especially for developing countries. The Bhoj Wetland, located in the heart of one of the fastest growing cities of India: Bhopal, is one of 16 wetlands of "national importance" in India. It is unique since it is a thousand years old man-made reservoir providing drinking water and other direct and indirect benefits to the city's population of 1.5 million. Wetland Management and restoration activities initiated by the State Government are on to improve the water quantity and quality but maintenance plans are yet to be developed. People's participation has been neglected and it is unclear how these restoration plans will succeed without the involvement of people and without considering their perceptions and views about conservation of the wetland.Economic valuation of the wetland services provides a strong base for bringing environmental considerations into future planning for maintenance of the wetland so that it could be used on a sustainable basis. Various valuation techniques like direct valuation, cost of illness and defensive costs, contingent valuation method and hedonic pricing have been used to capture the economic value and the results are discussed here. Recommendations towards formation of a lake management society comprising major stakeholders have been made as an integrated management scheme for sustainable use of the Bhoj Wetland.

64. Now I'm Really Angry, Just Look at My Brain!
P. Foster

Considerable knowledge has been amassed concerning the cerebral localization of positive and negative emotions. However, relatively little is known about the cerebral representation of subjective emotional intensity. Indeed, to date, few studies seem to have been conducted concerning the cerebral effects of increased emotional intensity. The purpose of the present investigation was to study the relationship between the intensity of cerebral activation and emotional arousal using quantitative electroencephalography (QEEG). A total of 5 men and 16 women were asked to recollect an angry memory while QEEG as recorded from 19 electrode sites arranged according to the International 10/20 System. Data for men and women were analyzed separately due to sex differences in cerebral functioning. Significant positive correlations were found between ratings of subjective intensity of angry memories and changes in low beta (13 to 21 Hz) and high beta (22 to 32 Hz) magnitude at numerous sites across the cerebrum. More specifically, among men, significant correlations were found at the F8, T6, and O1 electrode sites for both bandwidths analyzed. However, among women, only a single electrode site (T6) was found to have a signficant correlation between intensity of angry memories and changes in cerebral activation. These findings carry potentially serious clinical implications. Specifically, given that research has found that high levels of hostility are associated with increased right temporal activation, the present findings suggest that as the level of right temporal lobe activation increases the level of hostility would also increase.

65. Cardiovascular and Affective Responses to Laboratory Tasks
A. Santucci

The cardiovascular (CV) effects of autonomic challenges such as hand cold pressor (HC), video games (VG), quiet rest (QR), and paced breathing (PB) are fairly familiar, but emotional responses to these tasks are less known. Affective and CV patterns in six college-aged subjects were examined in response to these laboratory tasks, in three sessions spaced one-week apart. Electrocardiogram, impedance cardiogram, and blood pressure were recorded. Dependent physiological measures were heart rate (HR), respiratory sinus arrhythmia (RSA), left ventricular ejection time (LVET), Heather index of contractility (HI), and mean arterial pressure (MAP). Following each task, subjects completed an emotion adjective checklist designed to sample affective dimensions of valence and activation. Data were standardized within-subjects and averaged across subjects and sessions. Contrast analyses showed that HC elicited higher HR, HI, and MAP than all other conditions ($p<.01$), and more anger, uneasiness, and arousal than QR and PB ($p<.05$). VG showed higher HR, MAP, and HI than QR and PB ($p<.01$), and greater interest, excitement, happiness, enjoyment, and arousal than all tasks ($p<.05$). PB displayed longer LVET, greater RSA, and more peacefulness, relaxation, and tiredness than HC and VG ($p<.05$), and longer LVET ($p<.01$) and less excitement than QR ($p<.05$). HC and VG were marked by alpha and beta-adrenergic activation and emotional arousal, but only VG elicited positive affect. Findings suggest that tasks similar in hedonic value (VG and PB) may be discriminated on the basis of affective arousal.

66. Why are some people intolerant to pain?
S. Daugherty

Pain is a multidimensional phenomenon that includes psychological, social, behavioral and sensory components. It is not yet understood why some individuals are tolerant to pain and others are not. To investigate this, 60 university students (men = 29) submerged their left hand twice in ice cold water (0° C) for up to 3 minutes. Participants reported their sensory pain and distress levels every 20 sec on a scale from 1 to 10. Those who left their hand in the water for the entire 3 minutes comprised the pain tolerant group (N = 38), while those who removed their hand before 3 minutes comprised the pain intolerant group (N = 22). Subsequently, questionnaires were administered to assess pain catastrophizing, pain and noise sensitivity, attentional styles, and personality styles. In comparison to tolerants, pain intolerants (1) rated both their sensory and distress pain significantly higher, (2) reported greater sensitivity to noise in the environment, (3) perceived themselves as being more helpless when faced with previously encountered painful situations, and (4) perceived their overall emotional state to be less positive. Tolerants reported that they could focus and sustain their attention significantly better in noisy and distracting environments. Thus, pain sensitivity may be related to overall increased general physiological sensitivity, decreased perception of coping ability, decreased attentional focusing, and increased affective expressiveness. Future research will include the use of event related potentials to investigate brain activity differences between those who are pain tolerant and intolerant.

67. Effects of Music on Brain Activity: Music vs. Verbal Script Induction of Self-Generated Emotion

S. Daugherty

EEG hemispheric differences for happy vs. sad emotions is commonly reported, albeit inconsistently. We examined the effects of verbal script vs. music induction of self-generated happy and sad emotions on EEG activity. 24 participants (12 female) were exposed to 4 counterbalanced conditions, with 60 sec of EEG recorded subsequently. Using mean spectral magnitude, 4 frequency bands [low theta (3.5-5.5 Hz), high theta (5.5-7.5 Hz), low alpha (7.5-10 Hz), and high alpha (10-13.5 Hz)] were evaluated for anterior frontal (Fp1, Fp2), midfrontal (F3, F4) lateral frontal (F7, F8), central (C3, C4), and parietal (P3, P4) regions. Low alpha was significantly greater in right than left anterior frontal hemispheres, across both emotions, with no other significant effects. For high alpha, a 3-way interaction occurred at the anterior region: during script, right was significantly higher than left for sad but not happy emotions; no differences were observed for music. At the central region, following the verbal script, more high alpha activation was observed in the right hemisphere, while following the music condition no asymmetries were observed. For low theta, at the midfronto-central region, left hemispheric activity was higher than right for musically induced emotions, but no asymmetry was observed for verbal script induction. At all fronto-central regions, following verbal script, there was more high theta activation for sad than happy emotion, whereas following music, there was more activation for happy than sad emotion. Thus, emotion induction type differentially impacts EEG.

68. An Ordering of Secondary Display Attributes

C. Chewar

This poster describes an empirical human-computer interaction experiment conducted to further understanding of guidelines for information design. We are specifically concerned with computer applications that are situated outside of the focus and do not require a user's constant attention to maintain information awareness. We refer to these applications as secondary displays. The empirical study we conducted investigated whether W. S. Cleveland's ordering of visual primitives (such as position, length, shape, and angle), which is quite influential for focal information design, can be directly extended or modified to meet design objectives for secondary information. We found these established focal guidelines cannot be extended to images displayed as a secondary task, and we illustrate an analytical technique suitable for dual-task evaluation. This method reveals significant differences in attribute effectiveness, based on simultaneous secondary display objectives of conveying information without introducing primary task distraction

69. A Theoretical Information System Designing for the Tourism Destination Management

Y. J. Chang

This research aims to study the information flow in the nature characteristic of tourism business. Tourism is an industry based on imagery; its overriding concern is to construct, through multiple representations of paradise, and imagery (of the destination) that entices the outsider to place himself or herself into the symbol-defined space (Buck, 1993). The more complete measurement of a destination image provides useful information for positing and promotional strategies (Mayo and Jarvis, 1981). Information cannot be remained in a motionless status but needs to flow to convey its underlying message. In engineering, when things flow, energy is generated. Flow refers to things travel, it also alludes to the intangible, such as information, which is the essence of Information Technology (IT). Froschl and Werthner (1997) have proposed three observations that reflect the nature of tourism as well as the ongoing changes within the tourism market: (1) tourism is an information business (2) tourism undergoes a structural change (3) tourism business goes electronic. Thus, as IT has caught up with the dynamics of tourism business, who controls information flow; who wins the competition. In this paper, a theoretical model is proposed to process the complex and dynamics of information. The issues of information systems and tourism destination management are viewed from the angle of strategic management. That is, the information systems has the excellency in information management and the results are reflecting onto useful information that will be implemented as resources for management, decision making, and policy making in tourism industry.

UNDERGRADUATE STUDENTS

70. Growth Performance and Bone Characteristics of Female Broilers as Influenced by dietary Nickel
E. Wilson

The effects of dietary nickel (0, 25, 50, 75, 100, and 150) on performance parameters and bone strength characteristics of female broiler chicks were investigated. Broilers were housed in either cages or floor pens. At 7 weeks of age, the shear force, stress, and fracture energy of the tibia for both the floor and caged birds all increased but not statistically when the basal diet contained 25 mg of dietary nickel per kilogram of feed. Dietary nickel had no effect on bird body weight, but the caged broilers (2420g) were heavier than the floor birds (2128g). Percent tibia bone ash, a measurement of density, was not influenced by dietary nickel, but the tibia ash of the floor birds (40.1%) was greater than that of the caged birds (36.4%). Overall, the data suggests that there is an optimum amount of dietary nickel near 25 mg/kg of dietary nickel that will have a positive influence on bone strength characteristics and performance of the female broilers.

71. Localization of the At5PTase1 Protein and Analysis of At5PTase1 Expression
J. Butler

Arabidopsis inositol 5`phosphatase-1 (At5PTase1) has been shown to degrade the second messenger inositol 1,4,5- trisphosphate (IP3). IP3 is an important second messenger whose production is stimulated by external signals such as drought and which acts to effect release of Ca^{++} from intracellular stores. This Ca^{++} release has been shown to ultimately regulate physiological responses, such as stomatal closure, which helps the plant conserve water. To better understand the role of this enzyme in the plant cell, the localization of At5PTase1 will be determined and its promoter will be analyzed for regulatory elements. Since IP3 initiated Ca^{++} release is a cytosolic pathway, it is hypothesized that if At5PTase1 regulates this pathway then this enzyme will be located in the cytosol. To test this hypothesis, the CaMV35S promoter has been used to drive expression of an At5PTase1: GFP fusion protein. Initially, the subcellular location of At5PTase1 will be determined by observing transient expression of this construct in onion epidermal cells. Later, subcellular location will be assessed in stable Arabidopsis transformants. A computer analysis of the At5PTase1 promoter region has suggested the cold, light, and ABA regulatory elements are present. To test whether these putative elements function, the CaMV35S promoter of the aforementioned At5PT1:GFP construct will be replaced with the native At5PTase1 promoter. Transient expression in onion and stable Arabidopsis transformants will be used to assess At5PTase1 expression in response to these stimuli.

72. Supporting the Construction of Real World Interfaces
D. Bussert

In recent years, real world objects have been used to reflect information previously shown on the computer screen. Displays have been developed that use lighting, airflow, and physical objects external to the computer screen, but typically lacking are simple and straightforward steps for presenting this information. While most earlier efforts have required significant developer knowledge and skills to construct and program the displays, our work is investigating methods to enable programmers to use real world objects in much the same way that they would typical user interface widgets. This presentation describes several programming interfaces developed on top of the X10 protocol, a process for controlling power flow to electrical devices, used in conjunction with common household appliances and outlines our framework for creating real world interfaces quickly, easily, and inexpensively.

73. Probing the Function of the At5PTase1 Signal Terminating Gene in Arabidopsis thaliana
M. Pauls

Inositol 1,4,5-trisphosphate (IP3) is one of several second messengers found in plants that is produced in response to external signals. It has been previously shown that At5PTase1, one of the fifteen inositol 5' phosphatases found in Arabidopsis thaliana (At), can break down IP3, and thus terminate the signaling process. To determine the role of At5PTase1 in plant growth and development, we have sought to reduce expression of this gene via construction of transgenic plants expressing an antisense At5PTase1 gene. We found that the gross morphology of At5PTase1 antisense plants was altered and was similar to a known mutant, rotundifolia. A significant increase in leaf size and alterations in leaf shape characterizes this phenotype. Protein blot analysis has been used to show a correlation between the antisense phenotype and At5PTase1 protein levels. Our hypothesis to explain the antisense phenotype is that an increase in signaling-insued IP3 has occurred because At5PTase1 is not available to break down IP3. To test this hypothesis, we are currently examining IP3 levels in antisense At5PTase1 plants and comparing them to wildtype levels. These experiments will shed light on how plants use IP3 to regulate growth and development.

74. Luteinizing hormone response after administration of three synthetic gonadotropin releasing analogs in the ewe

S. Umbarger

Data regarding the efficacy of gonadotropin releasing hormone (GnRH) analogs for use in sheep estrus synchronization protocols is lacking in the current literature. Thus, an experiment was conducted to determine luteinizing hormone (LH) response after 100 μg injections of three GnRH analogs, Cystorelin (CYS, gonadorelin diacetate tetrahydrate, n=5), Factrel (FAC, gonadorelin hydrochloride, n=5) and Fertagyl (FER; gonadorelin diacetate tetrahydrate, n=6) in crossbred ewes. Ewes of various ages were fitted with jugular catheters and blood samples were collected every 15 min from time –15 to 585 min post GnRH analog i.m. injection on day 11 of synchronized estrus. A double antibody radioimmunoassay was validated in our laboratory to quantify LH concentration in each sample. Our results demonstrated FAC-(17.01 ± 5.55ng/mL) treated ewes experienced a reduced maximal LH concentration ($P<.05$) compared to FER-(37.53 ± 5.07ng/mL) and did not differ for CYS-(32.55 ± 5.55ng/mL) treated ewes. Area beneath the resulting LH curve was less ($P<.05$) for FAC-(617 ± 213[ng/mL]/min) than for FER-(1309 ± 194[ng/mL]/min) and did not differ for CYS-(1117 ± 213[ng/mL]/min) treated ewes. The variables time to maximal LH concentration and duration of detectable response did not differ ($P>.05$) among treatments. We conclude CYS and FER produce greater LH release than FAC in ewes. CYS and FER may be more effective in sheep estrus synchronization protocols utilizing GnRH analogs.

75. Synthesis and Characterization of Polystyrene Homopolymers Via Dinitroxide Mediated Radical Polymerizations

S. Anderson

The use of nitroxide-mediated or stable free radical polymerization (SFRP) techniques has generated polymers with complex yet controlled architectures. Previous work with SFRP methodologies has employed monofunctional nitroxides. The use of a difunctional stable free radical nitroxide will be discussed. The dinitroxide was prepared by reacting hexamethylene diisocyanate and hydroxy 2,2,6,6-Tetramethyl-1-piperidinooxy (TEMPO) and was characterized by mass spectrometry. Using styrene, benzoyl peroxide (BPO), and the prepared dinitroxide, various SFRP reaction conditions were be examined. Specifically, the effects of temperature, molar ratio of dinitroxide to initiator (BPO), and chlorobenzene concentration were examined. Different molecular weight polymers were produced to examine rheological characteristics, such as the dissociation of the C-O bond between BPO and dinitroxide at elevated temperatures and the effect on melt viscosity.

76. What Effect Do Silphinenes Have On Drosophila CNS
C. Hild

Antifeedants act in many ways to stop a pest from destroying entire crops. Silphinenes are compounds found in plants and are proposed to stop unwanted feeding on plants by blocking neuronal inhibition by the gamma-aminobutyric acid (GABA) receptor/chloride channel complex (Mullins, 1991). The general structure of the silphinenes are similar to that of picrotoxinin, a compound that blocks GABA-gated chloride channels (Mullins, 1991). This structural similarity is why they are both thought to block the GABA-gated chloride channel, but few specific measurements have tested this theory in insect nerves. We now plan to compare the responses of silphinenes in a picrotoxinin-resistant strain of Drosophila known to contain an altered GABA receptor and do structure-activity studies on several different silphinenes. I will compare the mean firing rates before and after GABA or the silphinene to determine whether they have a significant effect on nerve discharge, and on the response of parent silphinene on wild-type and resistant strains. Average effect will be compared by the use of T-tests.

77. Test-Retest Reliability of a Dangerouse Driving Measure
D. Ramsey

Every day millions of people take the risk of becoming victim of aggressive driving. Whether it is going to work or just a quick trip to the store, a driver is taking the risk of encountering an aggressive driver or acting aggressively as a driver his or herself. Aggressive driving is a serious problem that plagues our country and is becoming more prevalent with the increase of the use of motor vehicles. We are attempting to provide a measure that would asses personality traits as being a factor in aggressive driving. In this study we will be determining the test-retest reliability of the aggressive driving measure to demonstrate that aggressive driving is a personality trait and not a transient state of mind. The study will consist of undergraduate students at Virginia Polytechnic and State University enrolled in a psychology course. The students will participate in two separate testing sessions, spaced four weeks apart. The students will be tracked from time one to time two by using the last four digits of their social security number and the first two letters of their mother's name. Upon the completion of the first testing session students will receive one point and after completion of the second testing session they will receive two additional points. The answers from time one and time two will be scored and compared to establish the test-retest reliability.

78. "Multi-tech Tennis" Technology of Tennis for Teaching & Learning in 21st Century

F. Konukman

Using Technology in physical education and sports is gaining popularity recently. Technology can assist to provide more individualized instruction in the gymnasium or out of the gymnasium. Using Computer-Assisted Instruction (CAI) with multimedia technologies students may learn motor skills and cognitive concepts. Multi-Tech Tennis is a CD-ROM application package that provides a comprehensive approach to teach tennis.

Tennis Task Analysis (TTA) is a problem-solving program that promotes the development of observatory skills of physical education students and teachers. It is designed to help learn the basic of tennis by using concept mapping, restructuring tasks, and video to identify either correct performance or common faults of each tennis skill.

Interactive Tennis (IT) multimedia CD-ROM is a tutorial program that promotes student learning used in undergraduate physical education teacher education tennis course. This CD-Rom tutorial assists outside of the course and as a study tool students practice about equipment, rules, strokes, etiquette and strategy in tennis using pictures, videos, and text.

One of the advantages of these CD-ROM applications is that students may progress in their pace to learn main concepts. By using computer-assisted instruction, we hope to facilitate and improve instruction. We believe that innovations in technology will contribute a better status of physical education in our schools in the millennium.

79. A Measure of Design Readiness: Using Patterns to Teach Object-Oriented Design

T. Lewis

Introductory Computer Science courses often focus language specifics as opposed to general concepts applicable in multiple languages. Oftentimes, design is discussed during the last week of a semester long course, or emphasized in tidbits interwoven with discussions of implementation issued. This teaching model produces students with fuzzy, text book knowledge of design concepts. Since design documents are usually a required portion of a programming assignment submission, students will often reverse-engineer their design activity, making it such that the code and the design document perfectly correlate. We propose a measure of assessing "design readiness"- an assessment of the cognitive state where one is able to understand design abstractly. We will then use patterns to assist in teaching critical design concepts. This research in an attempt to answer the questions (1) is there something is a student's background that makes them ready to learn design and (2) is there an order or to which we teach pattern that will make them more or less assessable.

80. Learning and Reuse in Visual Programming Environments: Simulation Builder for Teachers
C. Seals

End User Programming has become a popular technique to support novices in their day-to-day activities. I am investigating how to support teachers in the Creation and Reuse of Educational simulations. There is literature on kids learning to program, but no work in the area of supporting teachers as a novice programming community. I have identified strategies for reuse in this culture as copy and past; we will build upon this and hope to enhance their productivity. We will also provide the user with the choice of building from scratch or reusing and adapting existing functionality. If an educational technology is to have impact in the real world of education, it must be learned and internalized by classroom teachers. These are the individuals who will create curricula to expose students to the technology. As a result, the current research focuses on public school teachers as a target user population. Because teachers have little time or motivation to learn new technology, the usability emphasis will be on learning and reuse. Thus the goal of this research is to create a new framework for simulation creation environments, which will help teachers create their own customized educational materials in collaboration with their students. We will accomplish this by 1.Analyzing opportunities and limitations of existing tools for educational simulations.2.Developing, evaluating and refining a new set of tools that emphasize minimalism, active learning, and component reuse.