

HEATHER WARE

BLOOMFIELD, IA

Majoring in Dietetics at Iowa State University and working under the guidance of Dr. Diane Birt in the department of Food Science and Human Nutrition

The Effect of a Processed High Amylose Starch Diets Effect on Caecum pH and Caecum Weight in Male Fisher 344 Rats.

Resistant starches escape digestion in the small intestine. In the large intestine the resistant starches are fermented by the colonic microflora, leading to the production of short chain fatty acids (SCFA). Increased SCFA's produced by bacterial fermentation lower the caecum (proximal colon) pH, and increase caecum weight. We evaluated the caecum pH and caecum weight on F344 male rats, after feeding them diets containing 55% resistant starch and based on varied cooking method. Highly resistant starch of both cooking methods showed lower caecum pH and higher caecum weight.

The Program for Women in Science and Engineering's 22nd Annual Summer Research Internship Poster Session

Kildee Hall, Ensminger Conference Room & Atrium

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PROGRAM**WELCOME**

Dr. Karen Zunkel
Director, Program for Women in Science and Engineering

KEYNOTE SPEAKER

Dr. Charlotte Bronson
Associate Vice President for Research, Iowa State University

INTRODUCTION OF INTERNS AND PRESENTATION OF CERTIFICATES

Lora Leigh Chrystal
On-campus Coordinator, Program for Women in Science and Engineering

RECEPTION AND POSTER VIEWING

Atrium Kildee Hall

2) cells and their ability to internalize DBP. Our results indicate that PC-3, LNCaP, and Caco-2 cells express Dab2 (mRNA and protein) and megalin (protein) and this expression was markedly enhanced when treated with 10 μ M RA. Furthermore, DBP was readily internalized by PC-3, LNCaP, and Caco-2 cells. Taken together, these are the first studies to our knowledge that have characterized a potential role for Dab2, megalin, and cubilin in the uptake of vitamin D in prostate and colon cells.

THEINT THEINT**BEREA, KY**

Majoring in Chemistry and Physics at Berea College and working under the guidance of Dr. Mei Hong in the department of Chemistry

Study of the Influenza A M2 Transmembrane Peptide and C-terminal Chain by Solid-State NMR.

The M2 protein channel of influenza A plays important role for viral infection and replication. The M2 channel is pH sensitive and opens at acidic pH. Amantadine drugs were widely used to treat influenza A virus. However drug resistance rate in human, birds and pigs has reached more than 90% (1). Knowing the drug binding site in the channel can aid in the understanding of channel mutations and mechanism of drug resistance. Here we use solid-state NMR to examine changes in channel conformation upon drug binding by observing chemical shift of apo and amantadine-bound transmembrane peptides.

1. Deyde, V. M. et al. Surveillance of resistance to adamantanes among influenza A(H3N2) and A(H1N1) viruses isolated worldwide. (2007). J. Infect. Dis.196, 249-257.

TARYN TIGGES**AMES, IA**

Majoring in Engineering at University of Iowa and working under the guidance of Dr. Chris Rehmann in the department of Civil, Construction and Environmental Engineering

Transport of Heat and Bacteria in Lakes

In order to manage water quality in bodies of water, such as lakes, it is imperative to study the transport of heat and contaminants, especially bacteria. This study was conducted to measure mixing in turbulent flows at West Okoboji Lake. The wind speeds, wind directions, Lake numbers, and eddy diffusivities were calculated. In addition, a numerical model was developed to predict the transport of bacteria in lakes by using a transport equation based on the law of conservation of mass. Using the eddy diffusivities obtained at West Okoboji Lake, temperature and *Escherichia coli* over depth and time were modeled. In these models, the measured variable eddy diffusivities are compared to the harmonic mean of the eddy diffusivities.

carbon metabolism pathway and type II diabetes using the diabetic rats. We analyzed transcript levels of renal megalin and Dab2 receptor proteins using real-time PCR, and serum and urinary 25D3, 1,25D3, and DBP levels in 14 wk old ZDF rats. Our data suggested that renal megalin and Dab2 mRNA expression was reduced in the diabetic rats when compared to their lean, non-diabetic controls, indicating a reduced reuptake of the vitamin D complex into the kidney. In addition, urinary excretion of DBP was elevated in diabetic rats. Taken together, these data suggest that a possible mechanism for compromised vitamin D status commonly found in diabetics is due to poor vitamin D reabsorption in the kidney.

LILY TAYLOR

OTTUMWA, IA

Majoring in Dietetics at Iowa State University and working under the guidance of Dr. Wendy White in the department of Food Science and Human Nutrition

Analyzing Vitamins E and K in Spinach Using HPLC with Fluorescence Detection

Increasing intakes of vitamins E and K in the U.S. may lower the risks of prevalent chronic diseases, such as cardiovascular disease and osteoporosis. Analyzing the amounts of these vitamins in commonly consumed vegetables would enhance the accuracy of estimated consumption and may lead to further research investigating their bioavailability. We adapted an abbreviated method of extraction originally developed for extraction of carotenoids from vegetables and found it to be an efficient approach to analyze vitamins E and K in spinach. When combined with HPLC with fluorescence detection, our initial qualitative results suggest this analytical approach is sensitive and specific.

SHANTEL TERNES

AMES, IA

Majoring in Dietetics at Iowa State University and working under the guidance of Dr. Matthew Rowling in the department of Food Science and Human Nutrition

The Vitamin D Transport Protein Disabled-2 is Expressed in Prostate and Colon Epithelial Cells and Modulated by All-Trans-Retinoic Acid

Disabled-2 (Dab2) is an adapter protein, that along with the membrane receptors megalin and cubilin, is essential for uptake of protein-complexed 25-hydroxycholecalciferol (25D3) in the kidney. Previously, we showed that mammary epithelial cells (T47D) also express Dab2, megalin, and cubilin and internalize vitamin D-binding protein by receptor-mediated endocytosis. Moreover, induction of Dab2 and megalin (protein and mRNA) by the differentiating agent all-trans-retinoic acid (RA) correlated with DBP uptake in mammary cells. Various cancer cells do not adequately express Dab2, which led to the suggestion that induction of Dab2 expression may suppress cancer cells by increasing the internalization of vitamin D. In this present study, we examined the expression of Dab2, megalin, and cubilin in prostate cancer (PC-3 and LNCaP) and colon cancer (Caco-

2009 SUMMER INTERNS & ABSTRACTS

CAITLIN ANDERSON

AMES, IA

Majoring in Psychology at Butler University and working under the guidance of Dr. Joan Cunnick in the department of Animal Science

Edible Vaccines Using Maize Expressing *Escherichia coli* Heat-Labile Toxin-B Subunit (LT-B)

The Enterotoxigenic strain of *Escherichia coli* (ETEC) causes 218 million children in third world countries to have life-threatening diarrhea. Of those children, 380 thousand die. This is because the *E. coli* produces a heat labile holotoxin (LT) that induces diarrhea. Previous work used transgenically engineered corn producing LT-B (the nontoxic subunit of LT). As an edible vaccine to protect from LT, the corn was ground, assayed for LT-B and Green Fluorescent Protein (GFP) content, and made into pellets containing LT-B, GFP, or a combination of the two. Pellets were fed to BALB/c mice and blood collected to assay for antigen specific IgG. Positive control groups received injections of LT-B and eGFP. These immunizations should provide proof of concept for LT-B as a carrier in transgenic corn and might even pave the way to edible vaccines of all kinds. LT-B is a potent immunogen because it binds specifically to gangliosides on gut epithelial cells. Due to the specificity of binding, it may be useful as a carrier protein for other immunogens administered orally. To extend the usefulness of edible vaccines to other proteins, transgenic (tg) corn was grown expressing LT-B linked to a second novel protein (eGFP) as well as tg corn expressing eGFP not linked to other proteins.

LINDSEY BATZ

URBAN DALE, IA

Majoring in Genetics, Pre-Pharmacy at Iowa State University and working under the guidance of Dr. Maura McGrail in the department of Genetics/Development & Cell Biology

Characterization of the CD133/Prominin Gene Family in Zebrafish

The CD133/prominin gene has been shown to be a marker for stem cell populations in various tissues and tumors in vertebrates. The CD133 gene encodes a pentamembrane glycoprotein and is represented by one gene in humans and mice. In zebrafish the CD133 gene family consists of three genes: *prominin1-a*, *prominin1-b*, and *prominin2*. We have used whole-mount in situ hybridization to characterize the expression of *prominin1-a* and *prominin1-b* in zebrafish embryos and adult tissues. The results show that zebrafish CD133/*prominin-1* is expressed in proliferating cells during development and will be useful for examining stem cell populations in adult tissues and tumors.

NICOLE BENZONI

SIoux CITY, IA

Majoring in Microbiology at Iowa State University and working under the guidance of Dr. Lisa Nolan in the department of Veterinary Microbiology and Preventative Medicine

Unscrambling the Jigsaw Puzzle : Sequencing *Escherichia coli* Plasmid DNA

While it is known that pathogenic *Escherichia coli* (*E. coli*) are transmissible across species, it is unclear the degree to which infectious human and animal strains are related. Continued study is needed to assess the health implications of closely related *E. coli*. Plasmids are a useful comparative measure in distinguishing physiological and pathogenic differences. To expand the available genomic database and provide data for further comparative studies, we began to sequence the plasmid DNA of avian fecal *Escherichia coli* (AFEC) and porcine enterotoxigenic *Escherichia coli* (ETEC) strains. AFEC 540 and ISAACSON 1474 (the porcine strain) were sequenced using Roche's 454 technology, analyzed, and partially reconstructed.

ALLISON BERQUIST

BURNSVILLE, MN

Majoring in Food Science & Technology at Iowa State University and working under the guidance of Dr. Lisa Nolan in the department of Veterinary Microbiology and Preventative Medicine

Sequencing the *Escherichia coli* Plasmid Puzzle: Neonatal Meningitis *Escherichia coli* 31 and Isaacson 1476

Escherichia coli naturally reside in the intestinal microflora of humans and warm-blooded animals; particular strains are capable of causing diarrhoea, urinary tract infections, neonatal meningitis, and sepsis. Neonatal Meningitis *Escherichia coli* (NMEC) and porcine Enterotoxigenic *Escherichia coli* (porcine ETEC) are responsible for increased morbidity and mortality, resulting in the loss of millions of dollars every year. This work presents the findings of an ongoing project sequencing several *Escherichia coli* plasmids and analyzing the virulence traits. The purpose of this specific investigation was to sequence the plasmids of NMEC 31 and Isaacson 1476 (porcine ETEC) using a combination of computer sequencing software and standard laboratory techniques. Understanding the pathogenesis of *Escherichia coli* causing neonatal meningitis and post-weaning diarrhoea will broaden strategies for the prevention of future *Escherichia coli* infections.

JACQUELINE SOULEYRETTE

NEVADA, IA

Majoring in Biochemistry at Iowa State University and working under the guidance of Dr. Amy Andreotti in the department of Biochemistry, Biophysics and Molecular Biology

Intermolecular Binding of HS1 and Regulation of Immune Responses

Hematopoietic lineage cell-specific protein 1 (HS1) is a non-receptor protein in the pathway for an immune response that is often mutated in patients diagnosed with Systemic Lupus Erythematosus. It has a SH3 (Src-homology 3) domain that has been known to bind to its own proline-rich regions (PRR) in its polypeptide tail. The question was which of these regions is binding to the SH3 domain and how much of these regions would be required to fully bind it. To answer this question, the SH3 domain of HS1 was isolated and titrated with each of the HS1 proline-rich regions using Nuclear Magnetic Resonance (NMR) spectroscopy. It was found that three of the four regions tested did not bind, but PRR3 did. When compared to previous data collected about HS1 by Ruo Xu, it was found that the third PRR binds, but is not stable without the second PRR attached to the molecule. This leads to the wild type protein being 21% bound when it is bound to itself. When the protein is mutated in patients with Systemic Lupus Erythematosus, the binding interaction is decreased and the percentage bound decreases by 5%.

KARA STRAND

CYLINDER, IA

Majoring in Dietetics at Iowa State University and working under the guidance of Dr. Matthew Rowling in the department of Food Science and Human Nutrition

Nutritional Complications in Type II Diabetes

Vitamin D plays a major role in glucose tolerance as it takes part in increasing insulin sensitivity and pancreatic β -cell function, which is responsible for synthesizing and secreting insulin. Alterations of serum levels of the major circulating form of vitamin D (25-hydroxycholecalciferol, 25D3) and its active hormone derivative (1,25-dihydroxycholecalciferol, 1,25D3) have long been associated with type II diabetes in humans. Furthermore, a diabetic condition is characterized by a disruption of the one-carbon metabolism, which can be prevented by insulin treatment. Because vitamin D has been implicated in improving both insulin secretion and insulin sensitivity in type II diabetics, understanding the mechanism by which impaired vitamin D status occurs gains importance when considering the potential beneficial effects of re-establishing optimal vitamin D status as well as determining whether vitamin D supplementation protects against perturbations of hepatic one-carbon metabolism. In the present study, our objective was to characterize the relationship between renal reabsorption of 25D3-vitamin D binding protein (DBP) and vitamin D homeostasis using a type II diabetic rat model. Additionally, our second objective was to determine the correlation between the disrupted one-

prieties such as mobility and electronic states depend on the atomic structure of the dislocation. Atomic scale models are not able to easily predict the structure for temperatures above zero degrees Kelvin. Consequently, the atomic structure of the dislocation was mapped onto a simplified 1D spin model. We used Monte Carlo methods to study the structure of the dislocation as a function of temperature. And, we investigated the temperature of the phase transition for an experimentally reasonable parameter set.

TARYN ROWLEY**MARSHALLTOWN, IA**

Majoring in Biology at Iowa State University and working under the guidance of Dr. Clark Coffman in the department of Genetics/Development & Cell Biology

Assembling Yeast Two-Hybrid Constructs to Test For Possible Interactions Between Tre1 and Proteins in the Hedgehog Signaling Pathway

Understanding mutations and malfunctions in the migration of germ cells in *Drosophila melanogaster* will give a better understanding of cell migration and proliferation in human cells. A G protein-coupled receptor known as trapped in the endoderm-1 (Tre1) functions in *Drosophila* germ cell migration. An allele of *tre1*, *scattershot* (*sctt*), has been shown to disrupt this migratory pathway. There are a cascade of signals in germ cells that may be communicating with Tre1 that are involved in critical cell decisions including cell growth, differentiation, proliferation, migration, survival, and death (Kamps and Coffman 2005). One possible signal communicating with Tre1 is Hedgehog, which has been found to be important in the development of embryos. The proteins Patched (*ptc*), Smoothed (*smo*), and Interference Hedgehog (*iHog*) are all part of the hedgehog signaling network. During this project constructs were made containing *ptc*, *smo*, and *iHog* cDNAs. After all of the constructs are built, we will test for possible interactions with Tre1 using the split-tubiquitin yeast two-hybrid system.

KRISTINE SEIER**PETERSBURG, NE**

Majoring in Biological Systems Engineering at University of Nebraska, Lincoln and working under the guidance of Dr. Brian Hornbuckle in the department of Agronomy, Electrical and Computer Engineering, and Geological and Atmospheric Sciences

Soil Calibration

Soil moisture is the amount of water present in the top layer of the soil and is available to plants. Soil moisture affects plant growth, soil aeration, soil microbial activity, soil erosion, and the movement of nutrients in the soil. The focus of this experiment is to determine how much the calibration of the ThetaProbe, an instrument for measuring soil moisture, changes in different areas of a corn field. The calibration of the ThetaProbe was then used to discover the difference in soil moisture in each of the different plots.

SAVANNA BICE**AKRON, IA**

Majoring in Environmental Science at Western Iowa Tech Community College and working under the guidance of Donna Lutz in the department of Civil, Construction and Environmental Engineering

Cyanobacteria: Initial Survey of Saylorville and Red Rock Recreational Waters for Microcystin Toxins

This paper focuses on cyanobacterial activity in the Saylorville and Red Rock Reservoirs. Cyanobacteria, or blue-green algae, are capable of producing toxins that are irritating to humans, especially those who are immunocompromised. Samples were collected from four popular beach sites; two from each reservoir. Upon analysis of the samples using an indirect ELISA test, it was discovered that both watersheds had detectable amounts of microcystin, a cyanotoxin, but generally at levels too low to be of concern. However, one bloom documented at Saylorville Reservoir had amounts high enough to be worrisome thus illustrating the need for continued and enhanced surveillance at the public beaches.

FAITH BUPE**SANDUSKY, OH**

Majoring in Biology at Allen University and working under the guidance of Dr. Lisa Nolan in the department of Veterinary Microbiology and Preventative Medicine

Sequencing Plasmids from Two Avian Pathogenic *Escherichia coli* (APEC) Strains

Avian pathogenic *Escherichia coli* (APEC) are *E. coli* that cause colibacillosis in birds. Because of its effect on poultry as well as its potential to cause disease in humans, there is an underlying need to understand the virulence genes and mechanisms involved in pathogenicity of APEC. This can be achieved through sequencing of the plasmid DNA found in many APEC strains. In this study, plasmid DNA was purified and submitted for sequencing using Roche's 454 Technology. The obtained contiguous sequences were analyzed and aligned. Gaps between contigs were amplified using PCR and closed by Sanger sequencing. So far, the study suggests that a full sequence of one large plasmid, over 100 kb from strain APEC 68 has been obtained. The full sequences of two very small plasmids, one belonging APEC 50 and the other to APEC 68, have also been completed. Many contigs still remain that are yet to be assigned to their plasmids.

KELLY BYRON**ELLEDALE, MN**

Majoring in Electrical Engineering at University of Southern California and working under the guidance of Drs. Song Zhang and Stephen Gilbert in the department of Human Computer Interaction

Markerless Motion Tracking

Marker-based motion tracking is currently a popular method being used in both films and video games to create realistic movements and special effects. However, this technique requires physical markers to be placed on a human as well as multiple cameras to track the markers, which often cannot be done in real-time. Our work tracks a human hand without using any physical markers. This is done by using a skin detection algorithm to recognize the hand, a curve approximation algorithm to smooth the outline of the fingers, and trigonometric analysis to uniquely identify each finger. The user's hand is able to control a 3D hand model that copies its movements on the computer screen. This system uses a single camera, the ZCam developed by 3DV systems, which is able to keep track of the depth information as well as the 2D information and is done in real-time.

P. J. CAMPBELL**HIGH POINT, NC**

Majoring in Computer Science at St. John's University and working under the guidance of Drs. Richard Stone and Stephen Gilbert in the department of Human Computer Interaction Graduate Program

Augmented Tele-robotic Control

The focus of this research is to test whether a multi-touch interface is more effective than a joystick controller. Customarily, joysticks are used with tele-robotic operations. However, multi-touch interfaces can potentially create a natural experience for the operator, causing an improvement in his/her performance during complicated tasks. Our participants completed search tasks using the two interfaces and we compared the resulting data. Initial results show that the multi-touch interface is helpful in controlling the robot's path.

JUSTINE CARROLL**CARROLL, IA**

Majoring in Biology at Iowa State University and working under the guidance of Dr. Gustavo MacIntosh in the department of Biochemistry, Biophysics and Molecular Biology

Characterization of Ribonucleases RNS4 and RNS5 in *Arabidopsis thaliana*

RNases in the T₂ family have been identified in many forms of life, including plants, animals, amoebas, fungi, bacteria, and viruses, suggesting these RNases are involved in essential life functions. Five RNases from the T₂ family

KATIE PAIGE**CEDAR FALLS, IA**

Majoring in Dietetics at Iowa State University and working under the guidance of Dr. Kevin Schalinske in the department of Food Science and Human Nutrition

Adrenal Function and Glucocorticoids Modulate Methyl Group and Homocysteine Metabolism

Perturbation of methyl-group metabolism is associated with various pathological conditions including cardiovascular disease, neural tube defects, and cancer development. DNA methylation is an epigenetic process that modulates gene expression and thus, must be tightly regulated. Homocysteine (Hcy), a non-protein amino acid, is an intermediate in methyl group metabolism, as S-adenosylmethionine (SAM), the major methyl group donor for most transmethylation reactions, including DNA, is hydrolyzed to S-adenosylhomocysteine and ultimately Hcy. Hcy can be remethylated back to methionine via 5-methyltetrahydrofolate and methionine synthase (MS) or alternatively, degraded to cysteine via cystathionine- β -synthase, a transsulfuration process. Glucocorticoid administration (e.g. dexamethasone, DEX), has been shown to modulate key enzymes of the one-carbon pool in a similar manner to other gluconeogenic conditions (e.g. diabetes), and Hcy is altered by adrenalectomy(ADX). It is not understood at a mechanistic level how adrenal function impacts Hcy balance. Moreover, it is not clear if the hyperhomocysteinemia noted in ADX animals is the result of excessive SAM-dependent methylation, or reflective of a methyl-deficient condition owing to an inability to remethylate Hcy and maintain methyl group supply by either folate-dependent or folate-independent routes. To examine this relation further, our experimental design employed 4 groups of male Sprague Dawley rats: control, ADX, control + DEX, and ADX + DEX. All rats (n=29) were fed a 10% casein control diet ad lib for 2 weeks. On d 7, half of the sham and ADX animals were administered DEX intraperitoneally (1 mg/kg body weight) or vehicle (0.9% saline). The rats were killed on d 14 and plasma fractions of whole blood samples were collected via cardiac puncture and analyzed by HPLC fluorescence to determine homocysteine concentrations. Liver samples were removed, homogenized, and resultant supernatants were utilized for enzyme assay activity and abundance analysis, including MS and GNMT. The cytosine-extension assay was used to determine alterations in hepatic global and CpG island DNA methylation.

ELENA PLESCO**CHISINAU, MOLDOVA**

Majoring in Mathematics at Smith College and working under the guidance of Dr. Scott Beckman in the department of Materials Science and Engineering

Identifying Structural Phase Transitions in Dislocations in Zincblende Crystals

Dislocations in semiconductors are 1D crystal defects that thread through the crystal. A single dislocation will cause deterioration to a device. Pro-

environment affect how people make decisions? It is hard to quantify the underlying processes on how people make decisions in the natural environment; often the recollection processes inaccurately reflect the actual processes that were used when making the decision. The authors would like to determine if there are more effective interfaces to measure the decision process as it occurs. To do this, a typical consumer decision making experience will be evaluated through different interface domains of paper and pencil, desktop application, augmented reality and virtual reality.

ARUNA NAGARAJAN

OAK HILL, VA

Majoring in Chemical Engineering at Virginia Tech and working under the guidance of Dr. Michelle Soupir in the department of Agriculture and Biosystems Engineering

Resuspension of *E. coli* from Direct Fecal Deposits in a Water Column

Cattle grazing and other agricultural activities have the ability to contaminate the water ecosystems, with their wastes, significantly. This polluted water thereby poses a threat to human health by affecting drinking water supplies and recreational surface waters. This experiment studies the resuspension of *E. coli* from direct fecal deposits, in the form of cowpats. To better control the different variables, a flume was used to simulate a stream, and flow and depth that mimic field conditions were selected to identify critical shear stresses for the resuspension to occur. The results from this experiment will give more insight into designing better farming practices and as a result, help to rid streams and other water supplies of *E. coli* and other fecal matter.

THU-THAO NGUYEN

SEATTLE, WA

Majoring in Mathematics & Electrical Engineering at Seattle University and working under the guidance of Dr. Daji Qiao in the department of Electrical and Computer Engineering

Smoothing Algorithm Development for Object Tracking in Wireless Sensor Networks

In theory, received signal strength decreases logarithmically with distance. However, in practice, this received signal strength tends to fluctuate or drop randomly over time. Thus, it is hard to accurately locate and track the position of an object based on its raw received signal strength indication (RSSI). Using MATLAB to develop smoothing algorithms can help smooth out a raw RSSI trace, thus object localization can become more accurate. Nonetheless, the smoothed RSSI trace needs to have minimum false alarms and a high level of responsiveness. Hence, comparing different smoothing methods can yield to the one satisfying these conditions.

have been identified in *Arabidopsis thaliana*. The first three RNases are well-characterized, and their putative functions are mainly defense and phosphate recycling. The present work determined the tissue-specificity of RNS4 (flowers and roots) and RNS5 (only roots). We also isolated mutants lacking RNS4 and RNS5 that may help determine the functions of RNS4 and RNS5.

MINA CHOI

CENTERVILLE, VA

Majoring in Biomedical Engineering at George Washington University and working under the guidance of Drs. Rob West, Brian Mennecke, and Stephen Gilbert in the department of Human Computer Interaction Graduate Program

Psychophysiological Data Acquisition in Digital Games

EEG measurements may provide an improvement over previous methods of measuring an individual's experience during game play (i.e., the questionnaire method). One limitation of the questionnaire method is that players may not accurately report their experience. GameScience Lab refers to this phenomenon as "subconscious distortion." An additional disadvantage of the questionnaire method is "perceptive discrepancy" that results from the player forgetting important events within the game. Real-time "logging" (the process of monitoring and recording the player's activities during play) may address both these problems. Existing video game software does not accommodate real-time integration with EEG recording. Therefore, one purpose of this project was to develop a first-person shooter (FPS) digital game using the Torque Advanced game engine where game events were integrated with EEG data acquisition in real-time. This application provides a method for the rapid development of digital games for psychological experiments using EEG. This increases one's ability to conduct quantitative studies using digital games. The use of digital games may provide a more realistic environment for psychological experiments. In this experiment we were able to confirm the reinforcement learning ERN potential in test subjects through the FPS digital game. New data logging functionality in digital games through an EEG was also achieved by obtaining time precise communication between the game and EEG triggers.

XIMENA CIBILS-STEWART

AMES, IA

Majoring in Biology and Entomology at Iowa State University and working under the guidance of Dr. Mark Gleason in the department of Plant Pathology

Impact of Row Covers on Bacterial Wilt Prevention and Pollination Efficacy in Muskmelons (*Cucumis melo*)

Yield losses of >80% can occur on muskmelon due to bacterial wilt, a disease caused by *Erwinia tracheiphila*. The bacterium is transmitted by two species of cucumber beetles (*Acalymma vitatum* and *Diabrotica undecimpunctata howardi*). Disease management requires suppression of the beetles. Row covers placed over

plants until 10 days after the start of bloom can control bacterial wilt (Gleason et al, 2005), but could potentially impede pollination if the row covers block access by pollinating insects. To test this possibility, I compared muskmelon yield in two row-covered treatments (row cover ends opened at the start of bloom, and bumble bees inserted under the cover) with adjacent control plots (no row cover, and row cover without bees or opened ends). Results will be evaluated by comparing yield in each 10-ft-long segment of the 100-ft-long plots. These results will help to define pollination risks associated with use of row covers.

KRISTEN COPE**WILLOW PARK, TX**

Majoring in Biological Systems Engineering at University of Nebraska-Lincoln and working under the guidance of Dr. Michelle Rehmann/Soupir in the department of Agriculture and Biosystems Engineering

Resuspension of *E. Coli* from Manure in Streams

Bacteria from animal waste are a major form of pollution in streams, which can lead to major health risks for people drinking or swimming in the water. This study focuses on how the bacteria *E. coli* is resuspended in the water column after being directly deposited in the form of cow manure. A flume was used to represent a stream, and the manure was dropped into the tank in the shape of a cow pie. Velocity profiles were measured to see at what speed and location in the tank resuspension was best. Water sampling was also done in two locations in the tank to see how much bacteria was resuspended from the manure.

JENNA DIXON**MASON CITY, IA**

Majoring in Animal Science/Pre-Vet at Iowa State University and working under the guidance of Dr. Joshua Selsby in the department of Animal Science

Proteomic analysis of Muscle from Dystrophin Deficient Mice

Duchenne muscular dystrophy (DMD) is the most common, fatal, X-linked disease leading to wheelchair confinement and death by the third decade. While the deficiency in dystrophin protein is the causative factor of this disease, associated changes in the expression of alternative proteins may contribute to disease pathology. The objectives of this investigation are to determine the extent to which the protein profile of dystrophic muscle differs from healthy muscle and to identify proteins that exhibit differential expression patterns. We hypothesized that the protein profile of dystrophic muscle will differ from healthy muscle. To test this hypothesis, a 2D DIGE analysis of normal gastrocnemius (n=4) versus dystrophic gastrocnemius (n=4) from mice was performed. Forty spots (representing a combination of differing proteins, unique isoforms, and modified proteins) were found to be significantly different with 16 increasing, and 24 decreasing expression in the mdx mice compared to healthy muscle. Identification of

Apple growers in the Midwest must manage a wide range of pests such as codling moth, sooty blotch and flyspeck, apple scab, and weeds. Four pest management systems were investigated on three apple scab-resistant cultivars (Redfree, Liberty, and Gold Rush) in an Iowa orchard. My project carries out the third year of this 3-year study. A conventional system of calendar-based pesticide sprays was compared to a current integrated pest management (IPM) system and two new IPM systems using weather based disease-warning systems and alternative pesticides. The study also evaluated the ability of composted bark mulch to reduce the need for herbicide sprays in controlling weeds.

BLANKA LEDERER**SAN DIEGO, CA**

Majoring in Molecular/Environmental Biology at University of California-Berkeley and working under the guidance of Dr. Fred Janzen in the department of Ecology, Evolutionary and Organismal Biology

Size Distribution and Sex Ratio of the Painted Turtle (*Chrysemys Picta bellii*) Determined by Trapping Data

To understand the basic biology and dynamics of populations, we must quantify general demographic parameters, such as the age/size structure of individuals in the population, the relative abundance of juveniles, and the overall adult sex ratio. For over 20 years, our lab has been studying a population of painted turtles (*Chrysemys picta bellii*) in northwestern Illinois. During May and June of each year, most of our sampling has been conducted on female turtles when they emerge from the slough to lay eggs.

Because of this sampling method, virtually nothing is known about the male population. Thus, our goal was to conduct a survey of male turtles by means of aquatic trapping. Over 10 years of trapping, we captured a total of 630 males and 359 females. Trapping was extremely male biased, and our results demonstrate that nearly all males captured were adults; virtually all of the juveniles captured were female. The sex ratio of turtles captured varied substantially among years, as well as during the trapping season within years. However, trapping success tended to be greatest during late May and early June. These results provide important preliminary information about critical demographic parameters of this painted turtle population.

BELLA MANOIM**MILLBURN, NJ**

Majoring in Computer Science at Bard College and working under the guidance of Drs. Nir Keren and Ross Bohner in the department of Human Computer Interaction Graduate Program

The Effect of Interface Domain on Decision Making Experience

Is there a better way to evaluate how people make decisions? Does the

ALYSSA HOFFMEISTER**MARSHALLTOWN, IA**

Majoring in Biology at Iowa State University and working under the guidance of Dr. Fred Janzen in the department of Ecology, Evolutionary and Organismal Biology

Effects of Disturbance on Western Hognose snakes and Ornate Box Turtles

More than 99% of sand prairie habitat in Illinois has been destroyed. Though many are working to protect the remaining habitats, and restore new ones, most are in a small area that is regularly disturbed. This could affect the animals living in the sand prairies in many ways, such as; population size, body condition, and recruitment. Three different sand prairie sites, two disturbed and one undisturbed, were surveyed every morning on rotation. A significant difference in population size (as estimated by capture success of individuals) was found in the hognose snake (*Heterodon nasicus*) and the box turtle (*Terrepen ornata*) populations. There were some trends, but no real significance was found in any of the other factors that were analyzed. This data could be beneficial if considered when locating new areas to build restored sand prairies.

ELIZABETH KENKEL**COUNCIL BLUFFS, IA**

Majoring in Genetics at Iowa State University and working under the guidance of Dr. Christopher Tuggle in the department of Animal Science

Confirming NF- κ B Target Motifs in Genes with Early Response to *Salmonella* Infection in Swine and Mouse

NF- κ B is a transcription factor important to the inflammatory response, in particular the response to *Salmonella*. This study attempts to identify potential mouse targets of NF- κ B and to conduct a comparative analysis of NF- κ B targets in mouse and pig. Using a bioinformatic analysis of transcriptomic data, a set of genes were identified that were induced in porcine mesenteric lymph nodes during early *Salmonella* infection. Electrophoretic Mobility Shift Assays (EMSAs) were used to test predicted NF- κ B motifs in the mouse equivalent of these genes. Results identify five novel mouse motifs of genes that could be NF- κ B targets. Thus we propose that this integrated bioinformatic and experimental approach can be useful in identifying novel NF- κ B target genes during inflammatory processes.

RACHEL KREIS**WATERLOO, IA**

Majoring in Horticulture at Iowa State University and working under the guidance of Dr. Mark Gleason in the department of Plant Pathology

Year 3: Assessing New Integrated Pest Management Strategies for Apple Orchards in the Midwest

these differentially expressed proteins may provide researchers and clinicians with novel strategies to minimize the progression of this debilitating disease.

ALYSSA ECKHOLT**AMES, IA**

Majoring in Biology at Iowa State University and working under the guidance of Dr. Basil Nikolau in the department of Biochemistry, Biophysics and Molecular Biology

Investigation of Maize Fatty Acid Elongase System by *in vitro* Expression and Membrane Reconstitution

Fatty acids are synthesized by two enzyme systems, fatty acid synthase (FAS) and fatty acid elongase. Much is known about de novo FAS, however, the nature of the elongase system has proven difficult to characterize via traditional biochemical approaches. The goal of this project is to further study the elongase system by *in vitro* expression and membrane reconstitution, as well as produce antibodies for all four integral membrane proteins of maize elongase. Significant work has been done optimizing the expression and solubility of these proteins. Through the utilization of solubility tags and various cells lines we are beginning to see expression of these integral membrane proteins. Further work needs to be done to find an expression system that is capable of fully expressing the maize elongase system.

MICHELLE FORMANEK**KNOXVILLE, IA**

Majoring in Genetics at Iowa State University and working under the guidance of Dr. Krysta Deitz in the department of Veterinary Clinical Sciences

Secreted Frizzled-related Protein 2 Expression in Canine Thyroid Tumors

Recent studies have shown increased expression of secreted frizzled-related protein 2 (SFRP2) in canine mammary gland tumors, with little to no immunoreactivity in normal canine mammary tissue. Due to the epithelial nature of both mammary and thyroid glands, it is suspected that SFRP2 may also play a role in the formation of canine thyroid tumors. The purpose of this study was to determine if SFRP2 is over-expressed via immunohistochemistry in canine thyroid carcinoma tissues. Twenty-one thyroid samples consisting of twenty thyroid carcinomas and one normal thyroid were analyzed via immunohistochemical staining for the expression of SFRP2. Immunohistochemical staining confirmed the presence of SFRP2 in all twenty carcinoma specimens. Staining had varying degrees of intensity and distribution throughout the samples. No staining was observed in normal thyroid tissue. The presence of immunoreactivity in all thyroid carcinoma specimens may indicate up-regulation of SFRP2 in the formation of canine thyroid carcinomas.

CLAIRE FUNKE**DUBUQUE, IA**

Majoring in Mechanical Engineering at Iowa State University and working under the guidance of Dr. Ted Heindel in the department of Mechanical Engineering

Aeration Jet Identification in a Fluidized Bed

Fluidized beds are used in a variety of industrial processes including drying, combustion, and catalysis due to their high heat and mass transfer rates, uniform temperature distributions, and low pressure drops. The aeration region directly above the gas distributor of a fluidized bed is important because of the presence of jets issuing from individual inlet holes. These jets lead to high and irregular reaction rates in this region and may damage any nearby internal parts through a sandblasting effect. Therefore, accurate prediction of the jets within the aeration region is integral to the proper design of a fluidized bed. Using images obtained through X-ray computed tomography (CT), the aeration jets can be easily seen with the human eye. However, it is difficult to quantify the jet characteristics in these images due to the lack of a definite interface between the jets and the surrounding bed. This study developed a method to automatically determine the exact location of each aeration jet within a fluidized bed. This method will then be used to ascertain jet length and expansion angle in a future study.

AMY GREEN**CEDAR FALLS, IA**

Majoring in Graphic Design at Northwestern College and working under the guidance of Drs. Richard Stone and Stephen Gilbert in the department of Human Computer Interaction Graduate Program

Augmented Tele-robotic Control

The focus of this research is to test whether a multi-touch interface is more effective than a joystick controller. Customarily, joysticks are used with tele-robotic operations. However, multi-touch interfaces can potentially create a natural experience for the operator, causing an improvement in his/her performance during complicated tasks. Our participants completed search tasks using the two interfaces and we compared the resulting data. Initial results show that the multi-touch interface is helpful in controlling the robot's path.

AMANDA HARRIS**SPENCER, IA**

Majoring in Animal Science at Western Iowa Tech Community College and working under the guidance of Dr. Nicole Valenzuela in the department of Ecology, Evolutionary and Organismal Biology

Understanding TSD in *C. picta* Through the Evolution of Gene Networks

TSD is temperature-dependent sex determination. While sex is deter-

mined at conception by sex chromosomes in most animals (GSD), others, mostly reptiles, are determined by their incubation temperature (TSD). The same genes are involved in the sex determination in both GSD and TSD; however, different connections in the gene networks determine whether the sex will be temperature-dependent or genotypic. In order to locate which gene(s) are the "master switch" between TSD and GSD, multiple genes involved in the developmental stages prior to and during the thermosensitive period of *C. picta* were examined. Previous research conducted by Dr. Valenzuela and her lab gave potential results that the gene *Wt1* activates the gene *Sf1* which together creates TSD in *C. picta*. Further research is being conducted to come to a more definite conclusion.

CHI-SING HO**AMES, IA**

Majoring in Physics at University of California Berkeley and working under the guidance of Dr. Paul Canfield in the department of Physics & Astronomy and Ames Laboratory

Solution Growth and Physical Properties of Intermetallic Compounds

Single crystals grown from solutions of two or more metals are ideal for exploring the physical properties of novel intermetallic compounds. This ongoing study is focused on binary compounds that melt incongruently (that are very hard to grow single crystals of via conventional techniques). The goal of the study is to explore the basic properties of these poorly studied intermetallic compounds, in hopes of discovering states or transitions that will be of academic and industrial interest.

EMILY HOFFMAN**COPLEY, OH**

Majoring in Biomedical Engineering at Case Western Reserve University and working under the guidance of Dr. Michael Kessler in the department of Materials Science and Engineering

On the Kinetics of Reversible Diels-Alder Based Thermosetting Polymers

In this study the kinetics of a reversible, crosslinked Diels-Alder polymer for self-healing applications was evaluated. Two different polymer systems were synthesized and studied using differential scanning calorimetry (DSC). The first system, having a high glass transition temperature, inhibited the occurrence of the forward Diels-Alder reaction on a measurable time scale. The second system, with a lower glass transition temperature, demonstrated that the degree of reversibility increased with increasing time in the retro-Diels-Alder temperature range. The second system's solid state reaction kinetics while cooling was studied after an initial reversing step and the forward reaction varied based on an accumulation of reversed polymer bonds. Furthermore, while the forward reaction occurred on cooling, the forward reaction was absent during heating under similar conditions.