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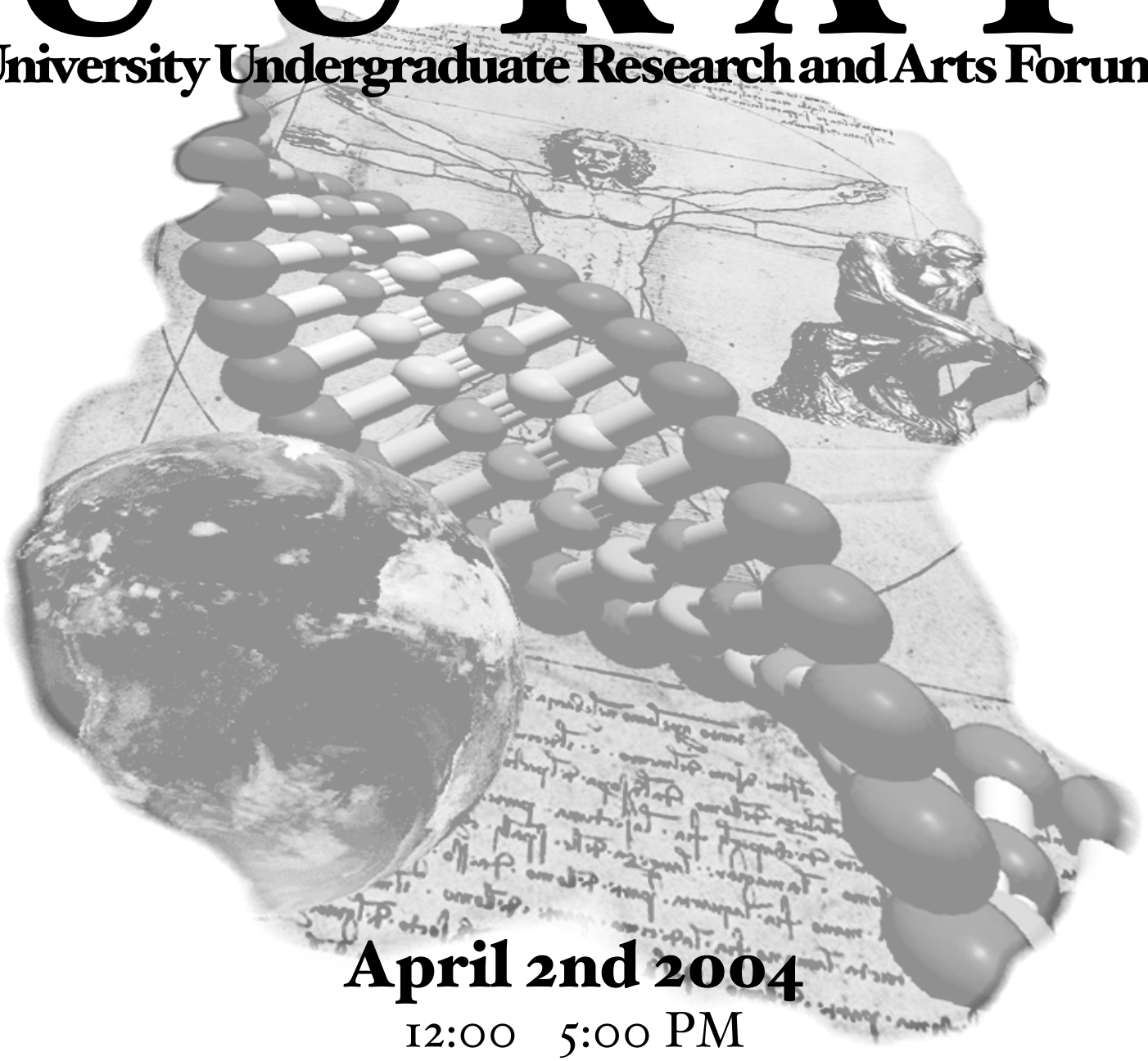
University Undergraduate Research and Arts Forum



April 2nd 2004

12:00 5:00 PM

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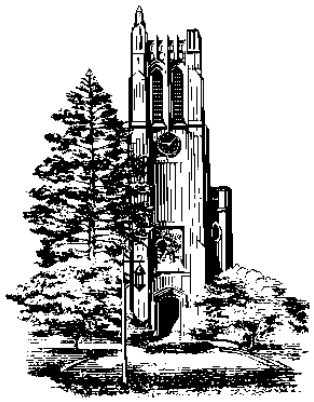

University Undergraduate Research and Arts Forum

Welcome to the Michigan State University Undergraduate Research and Arts Forum, sponsored by the General Electric Company. Today, undergraduates from diverse academic disciplines present their outstanding research and creative endeavors. Thank you for joining us as we observe the exciting work of these students and acknowledge their impressive accomplishments.

We would like to acknowledge President Peter McPherson for his continuing efforts on behalf of undergraduate education and research at Michigan State University. The Undergraduate Research and Arts Forum received support, guidance, and planning from Provost Lou Anna K. Simon, Assistant Provost June Youatt, Dr. Ronald Fisher, undergraduate associate and assistant deans, Dr. Kelly Funk, Judd Hark, and the HCSAC-UURAF Student Planning Committee. We also wish to thank the many dedicated faculty mentors who guided the research projects and creative activities presented today, as well as those faculty members serving as judges.

April 2, 2004

MSU Union Building
Michigan State University

MSU is an affirmative-action, equal-opportunity institution.

Cover artwork by Alex Fine '05

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Schedule of Events

Time	Event	Location
12:00 p.m. - 12:10 p.m.	Welcome Message from Dr. June Youatt, Assistant Provost for Undergraduate Education	Parlor Rooms B and C
12:15 p.m. - 1:45 p.m.	Presentation Session One	Please See Itemized Schedules on pages 3-11
1:45 p.m. - 2:15 p.m.	Refreshments	Second Floor Concourse
2:15 p.m. - 3:45 p.m.	Presentation Session Two	Please See Itemized Schedules on pages 3-11
4:15 p.m. - 4:45 p.m.	Awards Ceremony Dr. Ronald Fisher, Director of the Honors College, Presiding	Parlor Rooms B and C

Acknowledgements

We would like to offer special thanks to Aimee Barrette, Jeff Domeyer, Alex Fine, Amy Hark, Lindsey Oehmen, and Robin Pline for their support of the 2004 University Undergraduate Research and Arts Forum.

Oral Presentations

Parlor Room A		
Session One: Biochemistry		
Time	**Presenter**	**Title**
12:15-12:25	Alicia A. DeMarco	Guanosine Triphosphate Cyclohydrolase I is an Important Regulator of Blood Pressure in Salt-sensitive Hypertension
12:30-12:40	Andrew M. McCoy	Effect of Decreased Levels of hRev7 on UV-induced Mutagenesis in Human Fibroblasts
12:45-12:55	Erin E. Allaire	Examining the Cross-resistance of Pig Mutants to Amino Acids
1:00 - 1:10	Erica L. Scheller	Design of Novel Ansamycin Antibiotic Derivatives as Inhibitors for Parasitic Hsp90
1:15 - 1:25	David J. Taggart	Protein Expression and Deletion Mutagenesis of Hepatitis Delta Antigen
1:30 - 1:40	Katie L. Zobeck	Regulation of Translocation by Transcription Factor IIF
1:45 - 1:55	Ankoor B. Soni	The Role of hRev7 Over-expression on Mutagenesis in Human Fibroblasts
Session Two: Food Science, Agriculture, and Environmental Science		
Time	**Presenter**	**Title**
2:15 - 2:25	Marti A. Mayack	Equine Urine Handling Procedures Affects Calcium and Nitrogen Concentrations
2:30 - 2:40	Kim Klein	The Effect of Income on Male Grocery Shoppers' Habits
2:45 - 2:55	Mason R. Bradbury	Long-Term Changes in Average Household Size across the Globe
3:00 - 3:10	Kevin J. Vogel	Pheromone Pre-exposure Modulates Subsequent Behavioral Responses to Pheromone in Two Species of Tortricid Moths
3:15 - 3:25	Katie L. Barott	The Impact of the East Lansing Sewage Treatment Plant on the Invertebrate Community of the Red Cedar
3:30 - 3:45	Sara L. Auer and Kent A. Dankenbring	Stratigraphic Evaluation of the Alluvial Deposits at Lawrence Livermore National Laboratory, Livermore, California, USA
3:50 - 4:00	Kathryn C. Ambrose	Emergence of an Iridovirus of Potential Threat to Sportfisheries in Michigan
4:15 - 4:45	Awards Ceremony	Parlor Rooms B and C

Gold Room A		
Session One: Molecular Biology		
Time	**Presenter**	**Title**
12:15-12:25	Anjali Rohatgi	Dismutase Gene for Experimental Gene Therapy
12:30-12:40	Meghan C. Drummond	Analysis of G746A Variation in Connexin 31
12:45-12:55	Phillip C. Delekta	A Use of Retroviral Vectors in Chickens
1:00 - 1:10	Tiffany L. Newton	Physical and Behavioral Assessment of Rai1 BAC Transgenic Mice
1:15 - 1:25	Kathryn H. Diller	Characterization of Arabidopsis thaliana CBF Overexpression Mutants
1:30 - 1:40	Kirsten S. Brendtro	Spatial Genetic Relationships and Estimates of Relatedness in the American Common Eider (Somateria mollissima dresseri)
1:45 – 1:55	Sowkya Rangarajan	Genetic Investigation of Molecular Chaperones Involved in Protein Import into Chloroplasts
Session Two: Microbiology and Cell Biology		
Time	**Presenter**	**Title**
2:30 - 2:40	Tony I. McHerron	Regulation of MLK3 by Binding to Pin1
2:45 - 2:55	Brittany N. Dugger	Effects of a Base-Pair Substitution in the Androgen Receptor Gene on a Sexually Dimorphic Neural Structure in Rats
3:00-3:10	Vishal B. Malhotra	Intracellular Trafficking Regulation Involved With Cystic Fibrosis Using Microphysiometry
3:15 - 3:25	Judith A. Turnbull	Optimized Detection of Bacteriuria
3:30 - 3:40	Brooke B. Ancrile	Combined Effects of Vitamin D3 and Retinoids in Prostate Cancer Prevention
3:45 - 3:55	Catherine N. Barth	RAI1 Mutation Analysis in Putative Smith-Magenis Syndrome Patients
4:15 - 4:45	Awards Ceremony	Parlor Rooms B and C

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Time	**Presenter**	**Title**
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12:30-12:40	Justin M. Carroll	Nativism and the Ku Klux Klan of Michigan
12:45-12:55	Amber L. Luttig	Cultural and Historical Perspectives on Joan of Arc
1:00 - 1:10	Aimee B. Sutherland	Life or Death: How John Campbell's *Astounding* Survived the Great 1950's Die-off
1:15 - 1:25	Amanda G. Tigner	Why Duchamp? Marcel Duchamp's Influence on Contemporary Architecture
1:30 - 1:40	Joanna C. Hecker	Antoniazzo Romano and the Forgotten Renaissance in Rome
1:45 - 1:55	Andrew L. Hickner	Reinaldo Arenas: Dissidence and Silence in Cuba
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Time	**Presenter**	**Title**
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2:45 - 2:55	Darya E. Howell	Inversion and Hydrogen Exchange in 1,2-Cyclopentanediols: A Geometrically Constrained Model for Aqueous-Phase "Green" Catalytic Carbohydrate Hydrogenolysis
3:00-3:10	Alfredo Estrade Vaz	MOCADI Simulation for the Transport of Ion Beams through the NSCL Beamline
3:15 - 3:25	James F. Humpula	Sequencing Osteocalcin Obtained from Fossils and Its Use in Determining Phylogeny
3:30 - 3:40	Vinayak K. Prasad	Synthesis of a Novel Alphahydroxyester for use in Biodegradable and Biorenewable Lactide Polymers
4:15 - 4:45	Awards Ceremony	Parlor Rooms B and C

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Time	**Presenter**	**Title**
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12:30-12:40	Sally J. Behrenwald	Researching My Roots: A Discussion of Women's Roles and Perceptions of Women's Ministry in the Wesleyan Church
12:45-12:55	Geneva S. Thomas	Black Womanhood on the Cover: The Historical Evolution of *Essence* Magazine, 1970-2004
1:00 - 1:10	Christine M. DiClaudio	Commerce and Crime: Assessing the Impact of United States v. Lopez on Federal Criminal Jurisdiction
1:15 - 1:25	Monica R. Costello	Alternatives to "Spare the Rod and Spoil the Child": Schoolwide Behavior Management Systems in the Greater Lansing Area
1:30 - 1:40	Amanda M. Woods	Relationships Between Dietary Restraint, Stress, and Binge Eating Behaviors in a Female College Sample
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Time	**Presenter**	**Title**
2:30 - 2:40	LaToya S. Morgan	Looking Through a Clearer Frame: The Reparations Debate
2:45 - 2:55	Rehab M. Abdel-Kariem	Quality of Life in Colorectal Cancer Patients
3:00-3:10	Sharon M. Barnes	The Correlation Between Peoples' Perception and Preparedness on Terrorism
3:15 - 3:25	Deanna M. DeHaven	Children's Public Health Insurance Promotion and Increased Enrollment
3:30 - 3:40	Erica M. Begun	Preliminary Typology and Comparative Analysis of West Mexican Figurines
3:45 – 3:55	Khalifah K. Shabazz	Educational Video Games
4:15 - 4:45	Awards Ceremony	Parlor Rooms B and C

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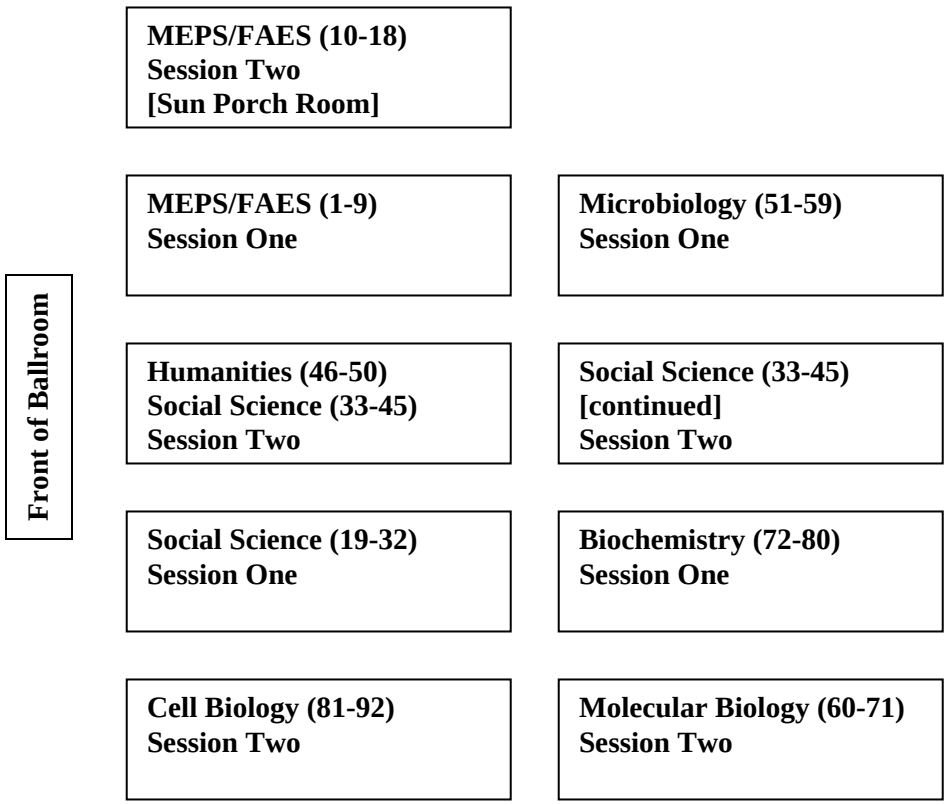
Microbiology, Poster Numbers 51-59	Humanities, Poster Numbers 46-50
Biochemistry, Poster Numbers 72-80	Molecular Biology, Poster Numbers 60-71
	Cell Biology, Poster Numbers 81-92

Ballroom Diagram



1	Avi Friedman, Namir A. Khandker, Danielle M. Larese, and Neeaz M. Mahmud	Chaos Theory Applied to Quantum Mechanics
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4	Maxwell D. Walter	A Computer Interface for Playing Checkers
5	Ali Saeed	Development of Augmented Reality System for AFM Based Nanomanipulation
6	Derek C. Baars and Aaron D. Stewart	Effect of Poloxamer 188 in Long-term Survival of Damaged Bovine Articular Cartilage Cells
7	Tolam T. Nguyen	Quantifying Heat-Induced Muscle Tissue Shrinkage
8	Casey L. Meekhof, Mihai L. Peteu, And Saini Shailesh	BluJag: A Raytraced Rendering System
9	April J. Sanders	Climate Change Effects on the Structure of Southern Beach (Nothafagus spp.) Forests in Southern Tierra del Fuego, Argentina
10	Charles A. Otto	Image Assembly for the i-EDA System
11	Shannon K. McGraw	Rapid Detection Biosensor Versus Standard Plating for Bacteria Detection
12	Hannah S. Remtema	Communicating Changes in Horizontal Alignment: Current Results
13	Andrew W. Stoeckle	Modeling Bean Texture as a Function of Time and Temperature
14	Marita L. Sheldon	Characterization of Polyaniline for Improving an Antibody-based Biosensor
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16	Erin M. Henderson	Nutrient-Isolation Efficiency of a Swine Manure-partitioning System
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18b	Michael A. Grillo	Genetic Analysis of Emerald Ash Borer Populations
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21	Shakthi Kumar	Understanding Cognitive Mechanisms of Modular Arithmetic
22	Kara M. DeVlieger	Cognitive Factors in Reconstructing the Temporal Order of Events
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24	Clare E. Jagenow	Bridge Over the Rio Gaudiana: Two Countries United by The Water That Separates Them
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53	Catherine R. Beauduy	Characterization of the NQR (Sodium-translocating Ubiquinone-reductase) Locus of Neisseria gonorrhoeae
54	Daniel C. Peltier and Kathryn G. Williams	Western Blot Analysis of the Pathway to Tumor Formation in Human Fibroblasts
55	Isaiah A. Scott	Prediction of Host Disease Phenotype Based on Genetic Anaylsis of the Capsid Protein Gene of Feline Calicivirus
56	Elizabeth A. Bartlett	Characterization of the Gene Responsible for Bovine Hereditary Zinc Deficiency
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65	Jennifer V. DenHouter	Development of SINE and SNP Markers for Estimation of Linkage Disequilibrium in Purebred Dog Populations
66	Melissa S. Bosma	Molecular Identification of the Interaction between the General Transcription Factors SNAP190 and TBP
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68	Chad M. Coe	The Role Of Arachidonic Acid Release From Cell Membranes In Response Tumor Promoting-Type Polycyclic Aromatic Hydrocarbons
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70	Cora A. MacAlister	Signal Transduction in Induction of Alternative Oxidase in Arabidopsis thaliana
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72	Kartik Viswanathan	Regulation of a Developmental Myxococcus xanthus Gene that Depends Absolutely on C-signaling for Expression
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74	Charles T. Smark	Role of Caveolae in endothelin-1 (ET-1)-induced Contraction in Arteries and Veins
75	William J. Horton and Heather A. Wolf	Altered Lifespan and Behavioral Aging in Drosophila Beta-Integrin Mutants
76	David W. Hamman	Effects of Chronic Estrogen Exposure on Neurotransmitters in the Paraventricular Nucleus: Comparison with Aging
77	Daniel J. Wood	Effects of DNA in the GTP Hydrolysis Activity of the Neisseria gonorrhoeae Signal Recognition Particle Protein PilA
78	Nathan D. Lord	Cloning the GCN5-Encoding cDNA from Tomato
79	James R. Doroghazi	Measuring Viral Gene Expression in Herpes Simplex Virus Infected Cells
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84	Bryan D. Mets	Fluorescent Red Gene Expression in Human Tumor-derived Cells
85	Michael J. Van Andel	Expression of Genes in the Adrenal Gland of Cattle Under Stress
86	Daniel C. Gutteridge, Katherine E. Kruse, and Andrew M. McCoy	Airway Surface Fluid Antibacterial Properties in Calu-3 Cells Demonstrate Characteristics of CFTR Presence When Compared With 2WT2 Cells
87	Kelly M. Burnett	Identification of Putative Chloroplast Division Proteins by the Yeast Two-Hybrid System
88	Kevin K. Ogden	Role of Crk-Associated Substrate (CAS) in Arterial Contraction to 5-HT
89	Julie M. Ziobro	Olfactory and Vomeronasal Responses in a Salamander
90	Miriam D. Kleinman	Spectinomycin Resistance in Chlamydomonas reinhardtii
91	Andrew R. Reinink	Modulation of Osteoblast AP-1 Levels by Hypoxic Conditions
92	Angela K. Wright	Is CFTR an Exchanger or a Channel: Determination via Amino Acid Sequence Analysis and Microphysiometry

Presentation Abstracts

Quality of Life in Colorectal Cancer Patients
Rehab M. Abdel-Kariem, under the direction of Dr. Daniel Williams,

About 1 out of every 17 Americans will develop colorectal cancer (CRC). It is the second leading cause of cancer death in the United States of both men and women combined. Despite the fact that ninety percent of CRC cases and deaths are considered preventable through screening techniques, less than 50% of individuals over 50 have been screened in the last five years. This apathy has been puzzling for most clinicians. What does the average patient know about CRC? Are prevention techniques being practiced? How does CRC affect patients' quality of life? The project set out to answer some of these questions in a two-pronged approach. First, a patient brochure was developed summarizing available CRC information, prevention, screening techniques, and treatment options in an effort to encourage patient education and awareness. Second, seventeen volunteer patients from Owosso and Lansing, Michigan, were interviewed from October 2003 to February 2004 regarding diagnostic information, staging, family history, physical symptoms, meaning of life, and quality of life. The results have the potential to aid in empathetic and comfortable treatment of CRC as well as increase patient CRC awareness and conscientious decision-making.

Photodynamic Therapy in the Treatment of Cancer
Keith P. Aldrich, under the direction of Dr. David Wenkert, Physiology

Photodynamic therapy is a method for clinical treatment of various cancers. Despite having been introduced clinically only a little over a decade ago, it is becoming increasingly used in cancer treatments. In this treatment method, selected tissue areas containing a photosensitizer are exposed to visible light of a certain wavelength. The resulting activated photosensitizer can then transfer energy to ground state triplet oxygen resulting in the generation of highly reactive singlet oxygen. The latter can cause toxic damage to blood vessels and direct cellular toxicity. As a consequence, tumors can be killed and/or reduced by selective light treatment. I have been conducting research into the synthesis of new photosensitizers via novel synthetic routes. The synthetic routes will be discussed. It is hoped that such drugs will ultimately lead to new photodynamic therapy treatment modalities.

Examining the Cross-resistance of Pig Mutants to Amino Acids
Erin E. Allaire, under the direction of Dr. Andreas Weber, Plant Biology

The biosynthesis of aromatic, glutamate- and aspartate-derived amino acids are examples of branched pathways. Most of the branching points in these pathways are feedback controlled by the end products. External supply of certain free amino acids leads to feedback inhibition of their respective biosynthetic pathways, and thus has a toxic effect on Arabidopsis thaliana seedlings. We utilized this mechanism to screen for phenylalanine-insensitive (pig) mutants of Arabidopsis. The pig (phenylalanine insensitive growth)- mutants were isolated from an EMS mutagenized population and are insensitive to at least 10mM Phe, whereas 6 mM Phe is completely toxic to the wild type. Surveying the amino acid contents of pig mutants fed with phenylalanine indicated a cross-resistant effect. Pig mutants were grown on each of the minor amino acids at varying concentrations, and a cross-resistance was evident for some of the amino acids tested, such as most aspartate-derived amino acids, and cysteine. The cross-resistance observed in the pig mutants implies the presence of a 'general control' in Arabidopsis. The existence of a 'general' and 'basal control' of amino acid metabolism in yeast are well documented. 'General' and 'basal control' supersede feedback regulation of amino acid biosynthesis in yeast. In response to a

shortage in one particular amino acid, the 'general control' up regulates the biosynthesis of all amino acids. Our data indicate a 'general control' mechanism governing amino acid biosynthesis in plants. Identification of the pig gene is currently in progress.

Stereotype Threat and Working Memory
Sandra N. Amble, under the direction of Dr. Tom Carr, Psychology

The purpose of this research is to examine how the presentation of a task-relevant negative stereotype about a group to which one belongs affects performance on that task. Individuals who participate in this research will be administered arithmetic tasks, measures of working memory capacity as well as questionnaires pertaining to their performance. Additionally, individuals will be exposed to different performance environments, such as the presentation of varying gender stereotypes. The purpose of these manipulations is to examine how varying presentation of task-relevant stereotypes affects performance. The ultimate goal of this study is to better understand the effects of stereotype threat and the mechanisms through which these effects take place.

Emergence of an Iridovirus of Potential Threat to Sportfisheries in Michigan
Kathryn C. Ambrose, under the direction of Dr. Mohamed Faisal, Pathobiology and Diagnostic Investigation

In the summer of 2000, massive fish kills of trophy-size largemouth bass (Micropterus salmoides) were reported in Lake George, a major lake that borders Michigan and Indiana. A ranavirus (Family Iridoviridae) was isolated from diseased fish and is believed to have caused these mortalities. For three consecutive years, samples were collected to follow the spread of this deadly virus in inland lakes of Michigan's Lower Peninsula and to evaluate its impact on largemouth bass populations. Tissue culture analyses were performed on pooled and individual fish samples. Positive results were confirmed by PCR using primers designed to amplify a conserved region in the major capsid protein gene of ranaviruses. Results indicated a progressive northward, westward and eastward expansion of the largemouth bass virus (LMBV) range in southern Michigan since its initial outbreak in Lake George. Gene sequencing demonstrated that LMBV strains present in Michigan share homology among themselves and with strains isolated from southern United States. LMBV caused hemorrhages in the swim bladder of infected fish associated with swelling and inflammation of tissues surrounding the kidneys. Additionally, fish from infected lakes have statistically significant lower condition factors (indicative of health and growth status). This study is the first to demonstrate the detrimental impact of an emerging infection spreading to an unprecedented degree in Michigan's most popular sportfish species.

Combined Effects of Vitamin D3 and Retinoids in Prostate Cancer Prevention
Brooke B. Ancrile, under the direction of Dr. Mukta M. Webber, Zoology and Medicine

Prostate cancer, the most common cancer and the second leading cause of death, accounts for 33% of all cancers in American men. It may take 20 to 30 years for the cancer to develop. This provides an important opportunity to develop new strategies for cancer prevention during this long latent period. Vitamins A and D have shown potential for cancer prevention. Agents readily available to large segments of the population and at little cost are especially useful. Deficiency of vitamins A and D can contribute to cancer development. Exposure to sunlight is required for vitamin D synthesis in our skin. Evidence suggests that the incidence of prostate cancer is higher in the Northern tier of States, such as Michigan, with low sunlight exposure, as compared to Southern States, such as Arizona and Texas. Preliminary results show that vitamins A or D alone can inhibit cancer cell growth. My specific aims are to examine

the combined effects of vitamins A and D on human prostate pre-cancer and cancer cell growth to determine if their combined effects are synergistic or antagonistic and to ultimately determine their mechanism of action. The significance of these studies is that agents found to be effective may eventually be used for prevention and treatment of prostate cancer.

Stratigraphic Evaluation of the Alluvial Deposits at Lawrence Livermore National Laboratory, Livermore, California, USA
Sara L. Auer, under the direction of Dr. Gary Weissmann, Geology

The stratigraphy of the alluvial deposits in the west/northwest portion of the Lawrence Livermore National Laboratory (LLNL), California, indicates an unexpected complex depositional history for the site. We conducted this stratigraphic evaluation to aid in hydrologic characterization of the area. Visual core descriptions included lithology, sedimentologic features, and color that came from a total of 43 wells. Four general facies were identified: gravel, sand, silty sand, and paleosols. These facies typically showed distinctive signatures on geophysical well logs. We further categorized the paleosol facies into four types based on the amount of carbonate, amount of manganese oxide, clay content, morphology, and structure. Correlations attempted between wells focused on these paleosols since we expected them to be the most laterally continuous facies in the section. The other facies were not utilized as extensively in the correlations due to their more sporadic depositional nature. However, even the paleosols did not appear to correlate between wells, leaving the general stratigraphic structure of the area unclear. Future research is necessary to determine reasons for this stratigraphic complexity. Possible explanations for these findings may include autocyclic fan lobe switching, multiple sediment sources with distinct histories (e.g., stream piracy or capture), contemporaneous faulting and folding of the area, and other undetermined factors.

Effect of Poloxamer 188 in Long-term Survival of Damaged Bovine Articular Cartilage Cells
Derek C. Baars, under the direction of Dr. Roger Haut, Osteopathic Manipulative Medicine

Cell necrosis in articular cartilage after blunt trauma is thought to lead to osteoarthritis—a major issue in terms of both medical cost and personal health for those afflicted. Cell necrosis results from a ruptured cellular membrane, in this case caused by the shearing forces induced by blunt trauma. Our lab has been investigating Poloxamer 188, a polymer that can insert itself into a damaged cell's membrane, thereby sealing the membrane and preventing cell necrosis. We have been investigating if treating bovine articular cartilage explants with P188 post-impact will result in saving cells. This lab has already shown that at 24 hours post-impact, P188 treated explants did have a higher percentage of live cells than those explants not treated with P188. Whether the cells saved by treatment with P188 continue to survive past the first 24 hours post-impact had not been pursued, until now. We are currently running experiments in which explants are impacted, after which some explants are treated with P188 for 18 hours and some explants are not. We then evaluate cell necrosis at 24 hours and 4 days post-impact and compare the percentage of live cells in P188 treated and non-treated groups of explants. We will present our findings in this regard. If safe and effective, it is hoped that P188 may be used for human patients after blunt trauma to joints, such as knee-dashboard impacts in car crashes, to mitigate possible effects of osteoarthritis by reducing cell necrosis.

The Correlation Between Peoples' Perception and Preparedness on Terrorism
Sharon M. Barnes, under the direction of Dr. Bruce Benson, Criminal Justice

Terrorism on American Soil has recently been a large issue because of September 11th and the threat of war. Federal, local, and state governments have many resources and programs available for American

citizens to protect and prepare themselves against terrorism. The purpose of this study is to determine if there is a correlation between people's perception of terrorist threat and their emergency preparedness. Questionnaires were completed by a sample of the adult population focusing on their perception of terrorist threat and preparedness on terrorism. The results were analyzed using the Statistical Package for the Social Sciences. It is expected that the data from this research will contribute toward assisting policymakers in targeting the programs to those least prepared. Using the demographic data, it is possible the findings will identify specific groups that are not aware or taking action. Findings of the research may suggest the need for the government or relevant private agencies to take a more serious and immediate look at the problem on a larger scale.

The Impact of the East Lansing Sewage Treatment Plant on the Invertebrate Community of the Red Cedar

Katie L. Barott, under the direction of Dr. Thomas Burton, Zoology and Fisheries and Wildlife

Invertebrate communities are common indicators used to identify the health of an aquatic ecosystem. The objective of this study was to look at the recovering macro-invertebrate communities at three sites along a pollution gradient of the Red Cedar River. Sampling took place in September, approximately one month after the major blackout of 2003, which caused the release of a large amount of untreated sewage into the river. The site downstream of the sewage plant was expected to have very low biodiversity, and to be dominated by taxa commonly found to thrive in low oxygen, high nutrient areas. The two sites upstream of the sewage plant were expected to have higher diversities, with the site farthest upstream being the least polluted and therefore having the highest diversity and the most taxa normally absent in polluted areas such as the downstream sites. The results were mostly as expected. Pollution-sensitive taxa and biodiversity decreased drastically moving downstream from the first site. The site farthest downstream showed some signs of recovery from the pollution event in August, but it was still missing all taxa sensitive to organic effluent.

RAI1 Mutation Analysis in Putative Smith-Magenis Syndrome Patients

Catherine N. Barth, under the direction of Dr. Sarah Elsea, Zoology

Smith-Magenis syndrome is a multiple congenital anomalies/mental retardation disorder associated with an interstitial deletion of chromosome 17p11.2. RAI1 is an important gene within the critical region for SMS, and mutations in this gene are associated with the SMS phenotype. Previously, we reported de novo mutations in three patients with the SMS phenotype. These, along with nine other patients, have been analyzed using polymerase chain reaction (PCR) and subsequent sequencing to look for other mutations. Recently, we identified a deletion of a single C in exon three in SMS188, who displays typical SMS features. The mutation results in a frameshift, inclusion of several incorrect amino acids, and a truncated protein. Along with this mutation, several known single nucleotide polymorphisms (SNPs) were also noted in the twelve patients. In the control samples, one individual was found to carry a unusual sequencing feature. In exon three of RAI1, one allele was encode two adjacent glutamic acids while the other allele encoded only one. Currently, another possible mutation in a polymorphic region is being analyzed by sequencing and the use of parental and control DNA for comparison. We will present mutation analysis of RAI1 exons and splice/EST variants of current SMS patients in the hopes of further understanding the role and function of RAI1 in SMS.

Characterization of the Gene Responsible for Bovine Hereditary Zinc Deficiency
Elizabeth A. Bartlett, under the direction of Dr. Vilma Yuzbasiyan-Gurkan, Microbiology and Molecular Genetics

Bovine Hereditary Zinc Deficiency (BHZD) is an autosomal recessive disorder that results in many clinical symptoms due to inefficient absorption of zinc in the intestines, such as skin lesions, diarrhea, and eventually death if untreated with large doses of zinc. Acrodermatitis enteropathica (AE) is a similar disease in humans. Our laboratory had previously mapped BHZD to a region in the bovine genome that is homologous to that of AE. Recently, we identified that the gene mutated in AE shows aberrant mRNA transcripts in affected cows. The mRNA transcripts in affected animals are shortened and lead to a frameshift and a premature stop codon. To understand why this alternative splicing of the RNA transcript occurs it has been necessary to characterize the genomic sequence at the boundaries between introns and exons. Using banked tissue from affected and normal animals, RNA and DNA samples were isolated, and amplified by PCR using primers directed at the regions bordering the splice junctions. Sequence analysis of the resulting fragments is ongoing. Our findings should provide insight into both BHZD and the process of RNA splicing.

Characterization of the NQR (Sodium-translocating Ubiquinone-reductase) Locus of Neisseria gonorrhoeae
Catherine R. Beauduy, under the direction of Dr. Cindy Arvidson, Microbiology and Microbial Genetics

Neisseria gonorrhoeae is the causative agent of the sexually transmitted disease (STD) gonorrhea, the second most common bacterial STD in the United States. N. gonorrhoeae has a very narrow host range with humans being its only host and reservoir yet has been around hundreds of years. In the annotated genome sequence of N. gonorrhoeae, an operon, nqr, has been identified which encodes a putative sodium-translocating NADH-ubiquinone reductase (NQR). NQR is a key part of the respiratory chain in several halophilic and marine bacteria (Hayashi, et al., 2001, Biochim Biophys Acta 1505: 37). Nqr is not ubiquitous in prokaryotes, but appears to be present in several bacterial pathogens; however, the significance of this is unknown. The goal of my research is to determine the role of nqr in N. gonorrhoeae. Nqr null mutants of N. gonorrhoeae strain MS11A were constructed by transposon mutagenesis and allelic exchange and were also characterized for growth and survival under conditions of varied sodium chloride (NaCl) concentrations. Our data indicates that the mutants are more sensitive to increasing NaCl concentrations than the wild type. This implies the NQR may be important to survival of N. gonorrhoeae and may have implications in the pathogenesis of the organism.

Preliminary Typology and Comparative Analysis of West Mexican Figurines
Erica M. Begun, under the direction of Dr. Helen Pollard, Anthropology

Ceramic figurines are an important source of information which are often overlooked in the archaeological record. The purpose of this paper is two-fold. First, I have constructed a preliminary classification of figurines found in the Tarascan region of Western Mexico. Second, I show that despite the absence of tight chronological controls the figurines can be used as cultural markers of ethnic groups living within the region based on the typological information from my own sample and from the literature about surrounding areas.

Researching My Roots: A Discussion of Women's Roles and Perceptions of Women's Ministry in the Wesleyan Church
Sally J. Behrenwald, under the direction of Fred Roberts, Anthropology

The Methodist/Holiness tradition of Christianity has throughout its history been more favorable towards women in ministry roles than many other religious groups. However, a shift away from this position has been posited by church leaders. Is it really happening, and if so, why? These were the questions I asked myself upon embarking on a research project in which I returned to the church where I had grown up and interviewed various women who are active members of the church, looking both at their answers and at the reasons they gave for thinking as they did. The answers I received were fascinating and surprising, leading me to realize that the role of women within the Wesleyan Church is much richer and complex than I had originally realized.

Molecular Identification of the Interaction between the General Transcription Factors SNAP190 and TBP
Melissa S. Bosma, under the direction of Dr. Bill Henry, Biochemistry and Molecular Biology

In eukaryotes transcription is carried out by three different polymerases – RNA Polymerase I, II, and III. However, none of these polymerases can recognize its target promoters directly. Instead, promoter elements are first recognized by specific transcription factors that then recruit the correct RNA polymerase. In human U6 small nuclear RNA (snRNA) gene transcription, two general transcription factors called the snRNA-activating protein complex (SNAPc) and the TATA-box binding protein (TBP) must cooperatively bind the promoter in order for transcription by RNA Polymerase III to occur. SNAPc is a multiprotein complex composed of five subunits: SNAP19, SNAP43, SNAP45, SNAP50, and SNAP190. The Myb DNA binding domain of SNAP190 plays a pivotal role in the recruitment of TBP to the U6 promoter. The goal of my project is to crystallize the binding of the Myb DNA binding domain of SNAP190 to the DNA binding domain of TBP, as well as to the DNA of the U6 promoter to which they are both bound, in order to better understand the molecular mechanism of the formation of the RNA Polymerase III preinitiation complex.

Long-Term Changes in Average Household Size across the Globe
Mason R. Bradbury, under the direction of Dr. Jianguo Liu, Fisheries and Wildlife

In their 2003 study, which was published in Nature, Liu et al. showed that household size (i.e., persons per household) across the world has decreased, resulting in millions more households and greater pressure on global ecosystems. However, due to the study's limited time span (1985-2000), it is impossible to gauge any long-term trends from it. I have, therefore, studied changes in average household size over the past two centuries, and in some cases as far back as the 1500's. Primarily using census data from 36 countries, I found that, with only a few exceptions, household size across the globe has been steadily decreasing for the past century, although less developed countries generally began to reduce household size more recently than did more developed countries.

Spatial Genetic Relationships and Estimates of Relatedness in the American Common Eider (Somateria mollissima dresseri)
Kirsten S. Brendtro, under the direction of Dr. Kim Scribner, Fisheries and Wildlife

The common eider is a particularly interesting species of migratory waterfowl, which has become increasingly rare. As part of ongoing effort towards their conservation, studies are being conducted on

spatial genetic relationships and behavioral trends among populations. American common eider females have been observed to be highly philopatric and participate in creching behavior where multiple adult females protect the offspring of other individuals against predation. Observations of four distinct breeding populations along the eastern coast of the United States and Canada have documented varying levels of both philopatry and creching. It is hypothesized that a population with high levels of philopatry as well as high creching behavior would be more closely related than a population that is more open and does not have creching. Spatial genetic relationships and estimates of relatedness were investigated through mitochondrial DNA sequencing and genotyping with eight microsatellite loci.

Identification of Putative Chloroplast Division Proteins by the Yeast Two-Hybrid System
Kelly M. Burnett, under the direction of Dr. Katherine Osteryoung, Plant Biology

Chloroplast and bacterial division require the formation of a constricting ring composed of the evolutionarily related FtsZ protein. During bacterial division, the highly conserved C-terminal end of FtsZ mediates interactions with the division proteins ZipA and FtsA. In spite of the complete genome sequence data available for Arabidopsis thaliana, protein homologs to these bacterial FtsZ-interacting proteins have yet to be identified. Moreover, recent discoveries by the Osteryoung laboratory indicate that plastid division proteins, such as Arc5, lack a prokaryotic origin. In an effort to identify functional homologs to bacterial division proteins and chloroplast-specific division proteins, we have employed a yeast two-hybrid screen by using the FtsZ2 C-terminal core domain as bait. Eleven different genes were identified as putative FtsZ2 interacting proteins. Since disrupting the endogenous level of plastid division proteins results in reduced number of enlarged chloroplasts per cell, phenotype and genotype analysis was performed with transgenic, knockout, or antisense plants for some of the putative genes. Ongoing analysis of several of the FtsZ2-partner candidates includes determining if these proteins localize to chloroplasts by GFP-tagging. Progress to date and future work to determine if the candidate genes are involved in chloroplast division will be presented.

Sequence-based Method for Characterizing the Genetic Diversity of Environmental *Escherichia coli*
Lisa M. Calhoun, under the direction of Dr. Thomas S. Whittam, Microbiology and Molecular Genetics

Escherichia coli is a widely used indicator of polluted waters, and infection by pathogenic strains causes a variety of human diseases. Many environmental habitats are not conducive for *E. coli* reproduction, but recent evidence shows these bacteria can reach high numbers in aquatic systems. One hypothesis to explain these data is that there exists an environmentally adapted subset of the *E. coli* population with a fitness advantage outside the host. Here, we used multilocus enzyme electrophoresis (MLEE) to resolve protein polymorphisms and identify distinct genotypes in E. coli strains isolated from Lake Erie. In addition, the same isolates were subtyped by DNA sequencing of two conserved housekeeping genes for comparison to the MLEE profiles. We found 13 distinct electrophoretic types (ETs) in 17 strains based on the enzyme mobility of 18 housekeeping loci. Sequence analysis of two housekeeping genes (uidA and mdh) revealed only 12 sequence types (STs). The two methods showed no simple correlation based on pairwise distance between strains. However, dendrograms based on the two methods do produce similar topologies. Our data suggest that di-locus sequencing may not sufficiently characterize the genetic diversity of a population of this size. Future efforts should concentrate on either sequencing more loci or establishing a database of allele frequencies.

Nativism and the Ku Klux Klan of Michigan
Justin M. Carroll, under the direction of Dr. Melanie Shell-Weiss, History, Johns Hopkins University

By focusing of the founding of the national Ku Klux Klan in the 1920s, and its ideological background, my initial research compelled me into an area of Klan activity little studied or examined by historians in North America – the Klan of Michigan. Changes in Michigan's agricultural and industrial base contributed to an environment where the Klan could flourish, even though such groups had no prior history in the state. Examining this group's rallies, political initiatives, and their use of violence, one can clearly see a difference between Klan activity in the North compared to that of the South. The research garnered shows a Klan quite different from other such groups found in the country, and moreover, tended to show a rural/urban dichotomy that was opposite of what was expected – the Klan operated better in the cities than it did in the country areas.

The Role Of Arachidonic Acid Release From Cell Membranes In Response Tumor Promoting-Type Polycyclic Aromatic Hydrocarbons
Chad M. Coe, under the direction of Dr. James Trosko and Dr. Brad Upham, Pediatrics and Human Development

Polycyclic aromatic hydrocarbons (PAHs), combustion byproducts of organic compounds, have been assessed primarily as complete carcinogens and tumor initiators, and not as tumor promoters. The most abundant PAHs in cigarette smoke, however, are the low molecular weight PAHs that tend to have stronger promoting activity, and not the high molecular weight initiating-type PAHs. Tumor promoters require at least two critical mitogenic events; one is the removal of an initiated cell from growth suppression by inhibiting gap junction intercellular communication (GJIC) and the second is the activation of mitogen activated protein kinase pathways (MAPKs). Upham et al. previously demonstrated that the activation of MAPK and inhibition of GJIC by low molecular weight PAHs required a bay or bay-like structure, e.g. 1-methylanthracene (1-MeA), while linear structured PAHs are inactive, e.g. 2-methylanthracene (2-MeA). In response to 1-MeA, the recruitment of phosphatidylcholine specific phospholipase C (PLC) and the release of arachidonic acid (AA) from the plasma membrane were also determined to be critical upstream regulators of GJIC and MAPK. This study determined that exposure to exogenous AA will reversibly inhibit GJIC in a dose and time dependent fashion. Future goals will be to determine if exogenous AA will also activate MAPK in a time and dose dependent manner, and determine if other PLC-products interact with AA in controlling GJIC and MAPK.

Alternatives to "Spare the Rod and Spoil the Child": Schoolwide Behavior Management Systems in the Greater Lansing Area
Monica R. Costello, under the direction of Dr. Julia Grant, James Madison College

"Go to the office!" "You're in so much trouble!" Too frequently, "bad" elementary students hear these statements. How can students learn positive social norms in this negative and reactionary environment? Socialization is largely influenced by the behavior management practices the school utilizes. The favored behavior management approach has changed over the years, in part due to shifting views of the child. Current educational research highlights certain practices as particularly effective, including problem prevention and alternatives to punishment. However, barriers exist to the complete implementation of such practices, thereby limiting their effectiveness. Behavior management practices at Red Cedar and Maple Grove, two elementary schools in the greater Lansing area, are compared to the MSU College of Education's curriculum to highlight the gap between research and implementation. Using current educational research, these practices are also examined to discover how different contexts may affect the degree of conformity to research-validated practices.

Impulsivity as an Underlying Factor in the Relationship between Bulimic and Sexual Behavior
Kristen M. Culbert, under the direction of Dr. Kelly Klump, Psychology

Previous research has reported associations between bulimia nervosa (BN), increased sexual activity, and general impulsivity. However, most studies have looked at each of these topics separately and have not investigated the extent to which impulsivity might underlie relationships between BN and sexual behaviors. In addition, studies have not examined these relationships with specific BN behaviors. Consequently, the purpose of this study was to examine relationships between specific BN behaviors, sexual behaviors, and impulsivity. Participants included 500 female undergraduate students from a large Midwestern University. BN behavior was measured with the Binge Eating (BE) and Compensatory Behavior (CB) subscales from the Minnesota Eating Disorders Inventory (M-EDI). The Human Sexuality Questionnaire (HSQ) was used to assess sexual activity. The Barratt Impulsiveness Scale, Version 11 (BIS-11) was used to measure impulsivity. Relationships between BN behaviors and sexual behaviors, impulsivity and BN behaviors, and impulsivity and sexual behaviors were examined using Pearson product moment correlations. Partial correlations and multiple regression analyses were then used to examine relationships between specific BN and sexual behaviors, after controlling for levels of impulsivity. Impulsivity showed significant relationships with BN behaviors and sexual experiences, however the only BN behavior that significantly correlated with sexual experiences was CB. Partial correlations and regression analyses indicated that impulsivity may underlie this relationship since associations between CB and sexual experiences decreased and were no longer statistically significant when impulsivity was accounted for. Results suggest that impulsivity might be an underlying factor in increased sexual behavior and all types of BN behavior, and impulsivity may account for relationships between increased sexual behaviors and CB. This last finding suggests that both CB and increased sexual activity might represent risky behaviors that are influenced by impulsivity levels.

Real Magic: A look into the Conceptions, Perceptions, and Roles of Magic in the English Renaissance
Alex Cybulski, under the direction of Dr. Tess Tavormina, English

In our modern era, where science is almost a religion unto itself, we often forget that in times past it was not always the only explanation for strange or unexplained phenomena, and indeed was not always considered the best mode of approach to such phenomena. This presentation explores the role of magic in Renaissance society, as perceived by various social groups. Not all of these groups agreed on what magic was, or if it had any acceptable uses. It was the conflict between the belief in magic as an inherently wicked and demonic force and the opposing belief in magic as an evolving natural "science," which ended up shaping the conceptions and roles of magic in English Renaissance society. This conflict surrounding the roles of Renaissance magic would end up drawing upon some of the greatest thinkers and philosophers of the time, as well as bringing some of the founding fathers of modern scientific thought into the ongoing debate.

Stratigraphic Evaluation of the Alluvial Deposits at Lawrence Livermore National Laboratory, Livermore, California, USA
Kent A. Dankenbring, under the direction of Dr. Gary Weissmann, Geology

The stratigraphy of the alluvial deposits in the west/northwest portion of the Lawrence Livermore National Laboratory (LLNL), California, indicates an unexpected complex depositional history for the site. We conducted this stratigraphic evaluation to aid in hydrologic characterization of the area. Visual core descriptions included lithology, sedimentologic features, and color that came from a total of 43 wells. Four general facies were identified: gravel, sand, silty sand, and paleosols. These facies typically

showed distinctive signatures on geophysical well logs. We further categorized the paleosol facies into four types based on the amount of carbonate, amount of manganese oxide, clay content, morphology, and structure. Correlations attempted between wells focused on these paleosols since we expected them to be the most laterally continuous facies in the section. The other facies were not utilized as extensively in the correlations due to their more sporadic depositional nature. However, even the paleosols did not appear to correlate between wells, leaving the general stratigraphic structure of the area unclear. Future research is necessary to determine reasons for this stratigraphic complexity. Possible explanations for these findings may include autocyclic fan lobe switching, multiple sediment sources with distinct histories (e.g., stream piracy or capture), contemporaneous faulting and folding of the area, and other undetermined factors.

Children's Public Health Insurance Promotion and Increased Enrollment
Deanna M. DeHaven, under the direction of Dr. Nancy Nystrom, Social Work

The number of uninsured children in Mid-Michigan is alarming. A child who is without health insurance is less likely to have access to proper preventative and curative medical attention as well as adequate medications. This can reduce physical health and lead to a lack of school attendance as well as poor academic performance. The state of Michigan offers free and low-cost health insurance programs for low-income individuals; however, the majority of uninsured families are unaware of their eligibility for these programs. This study focuses on children's enrollment in public health insurance programs thereby improving access to healthcare services.

A Use of Retroviral Vectors in Chickens
Phillip C. Delekta, under the direction of Dr. Jerry Dodgson, Microbiology and Molecular Genetics

Replication incompetent retroviral vectors offer a highly desirable form of gene transfer. They have proven effective in mammalian species, but have been less successful in avian species. A major impediment to success in avian species has been the lack of an effective method of increasing the viral titer without inactivating the virus. In order to overcome this problem and improve the ability of transferring genes into chickens and their germ line, we are using the very durable HCMV-VSV-G envelope protein to package the replication defective retroviral provirus BBANSA-gfp. Unlike the fragile retroviral envelope proteins, the VSV-G envelope protein can withstand an ultracentrifugation process to concentrate the virions with little or no loss of infectious titer. Future application of this method may facilitate the generation of transgenic chickens with introduced traits such as increased resistance to certain avian diseases.

Guanosine Triphosphate Cyclohydrolase I is an Important Regulator of Blood Pressure in Salt-sensitive Hypertension
Alicia A. DeMarco, under the direction of Dr. Alex Chen, Pharmacology and Toxicology

Introduction: Cardiovascular disease is the leading cause of death in the United States. Hypertension affects more than 50 million Americans; a better understanding of disease pathology at the molecular level is essential to the development of new therapies. Our previous studies have shown that nitric oxide (NO), a potent vasodilator produced by the endothelial cells lining blood vessels, is decreased in deoxycorticosterone acetate (DOCA)-salt hypertension, a model of human hypertension. Tetrahydrobiopterin (BH4) is an essential cofactor of endothelial NO synthase (eNOS), the enzyme that synthesizes NO. BH4 is regulated by its rate-limiting enzyme guanosine triphosphate cyclohydrolase I (GTPCH I). In this study, we tested the hypothesis that augmentation of vascular GTPCH I reduces arterial blood pressure in DOCA-salt hypertensive mice. Methods: GTPCH I transgenic mice, a novel

mouse model with targeted endothelial overexpression of GTPCH I, and their wild-type littermates were divided into control and experimental groups. Both groups were rendered hypertensive following left uninephrectomy and subcutaneous implantation of DOCA pellets. Results: Hypertension developed gradually over a four-week period in this model. Compared to wild-type controls, GTPCH I transgenic mice exhibited significantly lower blood pressure. Conclusion: GTPCH I, the rate-limiting enzyme for BH4, is an important regulator of arterial blood pressure and may represent a novel therapeutic target.

Development of SINE and SNP Markers for Estimation of Linkage Disequilibrium in Purebred Dog Populations

Jennifer V. DenHouter, under the direction of Dr. Patrick Venta, Comparative Medicine

Genetic diseases in purebred dog populations can become relatively common due to the use of popular sires that unknowingly are carriers of undesirable mutations. Development of DNA-based diagnostic tests for mutant genes allows breeders to identify carriers and make informed breeding decisions to avoid producing affected offspring. An important way to find disease genes in dog populations is to find marker alleles that are associated with the chromosomal region containing the disease gene. The degree to which a marker allele remains associated with a disease gene is called linkage disequilibrium (LD). LD is a violation of Mendel's law of independent assortment. The degree to which a marker allele remains in LD with a disease allele is dependent upon how close the marker and the gene are, and how many opportunities for genetic recombination have occurred. Unfortunately, the identity of the sire is often unknown, and so the number of generations cannot be determined. By genotyping from the SNP's (single nucleotide polymorphisms) from the DMD gene on the X-chromosome and autosomal SINES (short interspersed nuclear elements), LD will be developed for the purebred dog populations. The SNPs have been identified in the DMD gene by use of a manual pool-and-sequence method. The autosomal SINE's, which were previously found by another researcher, will be used in a multiplex method to test the degree of LD in correlation to the LD of the X-chromosome.

Cognitive Factors in Reconstructing the Temporal Order of Events

Kara M. DeVlieger, under the direction of Dr. Erik Altmann, Psychology

The ability to reconstruct the temporal order of events can play an important role in everyday situations, for example if there is a dispute over who threw the first punch in a fight and a witness is called to testify. What are the cognitive factors that could affect the witness's ability to reconstruct the sequence of events in the correct order? One obvious candidate is memory for having experienced the events, but another is the presence or absence of constraints on what events can logically proceed or follow others. This study will assess the extent to which memory, logical constraints, or both contribute to the ability to correctly reconstruct the temporal order of a past sequence of events.

Commerce and Crime: Assessing the Impact of United States v. Lopez on Federal Criminal Jurisdiction

Christine M. DiClaudio, under the direction of Dr. Steven B. Dow, Criminal Justice

Criminal Justice When the United States Supreme Court invalidated the federal Gun-Free School Zones Act in the 1995 case of United States v. Lopez, the Supreme Court for the first time in sixty years found an act of Congress to be beyond the interstate commerce power. This new and much more restrictive interpretation of the commerce power draws into question an overwhelming portion of the more than 3,000 federal criminal statutes that are based on the commerce power. This project studies how the federal circuit courts are responding to "Lopez challenges." We will explore whether the circuit courts follow the

path set forth by the Supreme Court and declare various federal criminal statutes unconstitutional. Our research will examine the outcomes these challenges in light of the Lopez decision and analyze how these decisions reflect the Supreme Court's authority and control over the lower courts.

Characterization of Arabidopsis thaliana CBF Overexpression Mutants
Kathryn H. Diller, under the direction of Dr. Michael Thomashow, Plant Research Laboratory

The Thomashow Lab has shown that overexpression of the CBF transcription factors in transgenic Arabidopsis thaliana plants results in an increase in both freezing and drought tolerance. The CBF overexpressing plants, however, have distinctive altered phenotypes: they tend to be dwarf in stature, darker green, slower growing plants, with more rosette leaves and are later flowering when compared to wild-type plants at the same stage of development. Having cold and drought hardy plants is important for agriculture, but if those plants are tiny and bear less seed or fruit, the engineered plant is not generally useful. Thus, an experiment was performed to determine whether mutants of the transgenic plants could be isolated that grew more like wild-type plants, but were still more freezing tolerant. Such mutants were identified. My experiments have been directed at determining the nature of the mutations that suppress the negative phenotypes associated with CBF overexpression, but do not affect stress tolerance.

Measuring Viral Gene Expression in Herpes Simplex Virus Infected Cells
James R. Doroghazi, under the direction of Dr. Steve Triezenberg, Biochemistry and Molecular Biology

During herpes simplex virus infection, viral genes are classified according to their period of major expression using three categories: immediate early, delayed early, and late. Experiments exploring mechanisms of gene regulation depend on accurate measurements of mRNA levels. Here we present a method for quantitatively measuring herpes simplex virus gene expression using real time reverse-transcriptase polymerase chain reaction. This method can be used to normalize gene expression across several experiments and samples using standard curves and normal controls. This assay has been developed for two IE genes, one DE gene, two late genes and one cellular control. This method has been validated by establishing standard curves with replicable correlation coefficients. This assay has been applied to assess viral gene expression in presence of transcriptional inhibitors such as actinomycin-D; as expected, viral gene expression was blocked. We have also tested whether a dominant negative form of a transcriptional coactivator, ARC92VBD, blocked activation of viral IE gene expression. The preliminary results show a decrease in transcription showing the important role of this virion binding domain during infection.

Analysis of G746A Variation in Connexin 31
Meghan C. Drummond, under the direction of Dr. Karen H. Friderici, Microbiology and Molecular Genetics

Connexin 31 is a gap junction protein encoded by the GJB3 gene and is found in the plasma membrane of cells where it functions in intercellular communication. Mutations in Connexin 31 have been previously associated with sensorineural hearing loss and erythrokeratodermia variabilis. We identified a variation in GBJ3 that changes a G to an A at the 746 base pair position in the coding region of the gene which subsequently changes a glycine to a glutamine near the carboxyl terminus of the primary structure of the protein. To test the incidence of the G746A variation we assayed an extended family with known recessive genetic hearing loss. Of the 189 individuals tested, 12 were heterozygous and their origins could be traced to a single founding family. None of the individuals tested were homozygous, leading us to the hypothesis that the G746A variation may have serious consequences if present in the homozygous state.

To further study the effects of the G746A base pair change we have constructed green fluorescence protein vectors designed to express the wild type and mutagenized version of Connexin 31. The plasmid constructs were then transfected into HeLa cells. Using fluorescent microscopy analysis we were able to show that both the wild type and mutagenized constructs were expressed in the HeLa cells. Currently studies are underway to characterize the function of the G746A variation.

Effects of a Base-Pair Substitution in the Androgen Receptor Gene on a Sexually Dimorphic Neural Structure in Rats

Brittany N. Dugger, under the direction of Dr. Marc Breedlove, Neuroscience Program

Mammals exhibit several sex differences in the central nervous system that are influenced by gonadal hormones throughout development and adulthood. In the preoptic area of the rat brain, there is a prominent sexually dimorphic structure, the SDN-POA (male>female). Several lines of evidence suggest this area is critical for male sex behavior. Testosterone (T) must be present at a critical period, around the day of birth, for the dimorphic SDN-POA to differentiate in males. T, or its metabolites, can act at both androgen receptors (AR) and estrogen receptors. In XY rats a base pair substitution within the AR gene causes AR to be virtually unresponsive to androgen and leads to Androgen Insensitivity (AI). This model allowed us to parse the differential effects of T on SDN-POA morphology. Due to evidence that suggests estrogen is responsible for masculine differentiation, we predicted the AI rat SDN-POA would be fully masculine. To measure SDN-POA volume and soma size, a cell stain for Nissl was used on 40μm sections of 8 AI rats and 12 wild-type male and 8 female littermates. Our findings indicate the volume of the SDN-POA in AI rats did not differ from their wild-type male littermates. However, SDN-POA soma size was significantly smaller in AI rats compared to wild-type male littermates. These results support the estrogen mediated hypothesis, yet does not exclude the possibility that T acting via the AR mediates neuronal differentiation in the SDN-POA.

Job Expectation and Organizational Fit

Sarah A. Dutkowski, under the direction of Dr. Ann Marie Ryan, Psychology

Turnover is an issue that plagues the job of a Social Service Specialist. Many employees are hired then leave the position early on because of a misconception of the job duties. The Family Independence Agency (FIA) is attempting to remedy this problem by providing a Realistic Job Preview in the form of a video to all job applicants prior to hiring. This project will look at how the perceptions of the job contenders change after seeing the RJP, which depicts a typical day on the job. The subjects will be surveyed using three different fit measures before the RJP and after the RJP. The interviewers will also be surveyed. The study will focus on the amount of change seen in applicants' responses of job fit between the first and second time they fill out the survey. Additionally, the second set of responses will then be compared to the interviewers' assessments. The FIA hopes to gain insight on how to retain employees longer in the entry-level position.

MOCADI Simulation for the Transport of Ion Beams through the NSCL Beamline

Alfredo Estrade Vaz, under the direction of Dr. Hendrik Schatz, Physics and Astronomy

The experimental study of neutron rich nuclei can provide important data to better understand open questions about the r-process, and to improve its models. A Monte Carlo simulation for an experiment to measure the mass of r-process nuclei near the N=50 shell gap, by a simultaneous measurement of the time-of-flight and particle rigidity, is presented. The code MOCADI is used to simulate the transport of a projectile fragment beam through the A1900 fragment separator and the S800 mass spectrometer

beamline at the National Superconducting Cyclotron Laboratory at Michigan State University. The optics of the beamline are described by third order transfer matrices, and the interactions of the beam with matter (energy losses and scattering effects) are taken into account in the simulation. The results are used to improve the experimental set up, and to estimate systematic errors.

Extensive Sequence Diversity and Recombination within the Fim Locus of Enteropathogenic Escherichia coli
Susan M. Francisco, under the direction of Dr. Thomas Whittam, Microbiology

Pathogenic bacteria produce hair-like structures, called pili or fimbriae, which can play a role in virulence. In enteropathogenic Escherichia coli (EPEC), a leading cause of infantile diarrhea in developing nations, type 1 fimbriae are present but are not thought to have a critical role in EPEC virulence or cell adherence. Type 1 fimbriae are encoded by the fim operon, a cluster of 9 genes that is required for biosynthesis, and are composed primarily of the structural subunit FimA. Expression of these fimbriae is under the control of the fim switch, an invertible genetic element that contains the promoter for fimA. Here, we determined the nucleotide sequence for a ~1200-bp segment of DNA encompassing the fim switch and fimA in 23 EPEC strains representing the serotypes of the EPEC 1 and EPEC 2 clonal groups. The fimA gene in EPEC 1 was 7 times more variable in sequence than the comparable regions of seven housekeeping genes (7.2 ± 0.5% vs. 1.1 ± 0.2 %). The 3.7:1 ratio of synonymous to nonsynonymous substitution in the EPEC 1 fimA indicates that many amino acid replacements are nearly neutral or selectively favored. The EPEC fim sequences were compared to those of 16 strains representing other types of pathogenic E. coli, such as enterohemorrhagic E. coli and uropathogenic E. coli, and to the E. coli laboratory strain K-12. Phylogenetic analyses indicate a mosaic structure in the fim switch and fimA region, suggesting that multiple recombination events have occurred during the diversification of EPEC. For type 1 fimbriae, the allelic diversity generated by both point mutation and recombination may reflect the action of selection by the host immune system during EPEC infections.

Chaos Theory Applied to Quantum Mechanics
Avi Friedman, under the direction of Dr. W.C. McHarris, Chemistry

Several of the imponderables associated with the Copenhagen interpretation of quantum mechanics have alternative, parallel explanations in terms of nonlinear dynamics and chaos. For example, an exponential law for processes such as radioactive decay can be obtained by iterating unimodal maps operating in chaotic domains, utilizing their extreme sensitivity to initial conditions. Such alternative explanations raise the question of the possibility of underlying nonlinearities in quantum mechanics. This is a ‘from the bottom up’, empirical approach to the question and will be compared with other, more theoretical, ‘from the top down’ investigations into the possibility of nonlinear extensions to quantum mechanics. Nonlinear dynamics, although deterministic, in its chaotic extreme provides only statistical information about the outcomes of state-space orbits. Thus in principle it provides the determinism so dear to Einstein; yet in practice it exhibits the probabilistic behavior of Bohr. Perhaps Einstein and Bohr could both have been right.

The Africa in America
Selam Ghirmai, under the direction of Dr. Curtis Stokes, African American and African Studies

The United States is a nation characteristically described as a "melting pot" due to the diversity of its population. Through immigration, the steady growth of the foreign-born Black population is increasing the diversity within the African American community as well. Despite the fact that all Black people share

a common origin within Africa, the Black community is certainly an amalgamation of persons from different nations, religions, and cultural backgrounds. My personal experience as a foreign-born Black woman raised in the United States has generated many questions about race relations between native Black Americans and foreign-born Black Americans. My study investigates the creation and promotion of the stereotypes and misconceptions that permeate both the native and foreign communities of Blacks. My research involves interviews and observations of traditional, cultural, and social settings like the barbershop, where the diverse members of the Black community engage in meaningful interaction. Such exploration allows for a clearer understanding of how culture, religion, media, and other factors influence the answers to the multifaceted question: "What does it mean to be Black in the United States?"

Variations in Usage of the Present Perfect in Spanish
Dennis P. Glandon, under the direction of Cristina Schmitt, Linguistics

Both Spanish and English form the perfect forms with the auxiliary have and a past participle, as illustrated in (1) and (2): (1) John has sold his house. (2) Juan ha vendido su casa. It is well known however that the Perfect has many readings in English. Using Paul Kiparsky's (2002) terminology/interpretations, the readings are as follows: Resultative: Something happened in the past and continues to have a current relevance. John has broken his arm (he broke his arm and it's still broken). Universal: An action happened in the past and continues into the present. Sue has lived in Prague for five years (she currently lives there). Existential: This is true at least once in the past and the action may have been repeated. Fred has seen the ocean. (he has seen it at least once and maybe more than once). Recent Past: The action happened in the past but it is recent news to the listener. The president of the company has been fired today (he has just been fired and the listener did not know about it previously). In this paper we examine the Perfect in two dialects of Spanish in terms of its interpretations based on Kiparsky (2002). We will argue that there is not a perfect match in terms of its readings and that the Spanish perfect usage seems to be extending into the territory held by the simple past in English (Howe and Schwenter, 2002). We argue that the universal perfect reading seems to be absent in at least some dialects of Spanish and we provide an account in terms of Kiparsky's framework

Genetic Analysis of Emerald Ash Borer Populations
Michael A. Grillo, under the direction of Dr. Jim Smith, Zoology

Emerald Ash Borer (EAB; Agrilus planipennis Fairmaire), an invasive beetle native to Asia, was first identified in July 2002 in southern Michigan. Emerald Ash Borer larvae feed on the phloem and outer sapwood of Ash trees (Fraxinus spp.), often resulting in the death of the tree. Emerald Ash Borer is a serious threat to North American forests and has already destroyed over 6 million Ash trees in Michigan. Knowledge of the ecology of the EAB both here and from its origin will be useful in controlling this invasive pest. The objective of this study is to estimate the geographic origin of the Asian EAB populations that gave rise to the introduced EAB populations in North America. To accomplish this, we will analyze mitochondrial DNA sequences and amplified fragment length polymorphism (AFLP) fingerprints from individuals in native and introduced EAB populations.

Airway Surface Fluid Antibacterial Properties in Calu-3 Cells Demonstrate Characteristics of CFTR Presence When Compared With 2WT2 Cells
Daniel C. Gutteridge, under the direction of Dr. Douglas Luckie, Lyman Briggs School and Physiology

Cystic Fibrosis (CF) is a recessive genetic disease caused by a mutation of the cystic fibrosis transmembrane conductance regulator (CFTR) gene. Mutant f'F508-CFTR protein is misfolded and

destroyed by the cell and thus results in the inability of the cell to create working ion-permeable channels. The fact that airway epithelial cells are missing CFTR channels in the outer cell membrane is hypothesized to lead to a concomitant drying of airway mucus (Luckie et al., 2000). Recent reports indicate CFTR is primarily expressed in lung submucosal gland cells and the bacterial colonization of the lung in CF may be caused by more than just dry mucus. Evidence is mounting that there may be bactericidal compounds that are inactivated in patients with CF (Zhang et al., 2001). To examine the role that bactericidal compounds may play to combat bacterial growth in the lungs, we studied the effects of the apical surface fluid (ASF) secretions collected from Calu-3 (submucosal cell lines expressing normal CFTR) on the viability of cultured Escherichia coli. In cell culture Calu-3 cells were grown into a monolayer on suspended porous filters for a period ranging from 14-20 days. ASF secretions were allowed to accumulate for 48 hours before each collection. The collected ASF was then either administered to agar plates that already contained lawn growth of E. coli (strain mm294) or placed on plates prior to seeding with E. coli, and incubated for 12 hours upon which results were recorded. Preliminary results show a dramatic eradication of E. coli in all lawn areas exposed to ASF (n=2(6)), or complete inability of E. coli growth when applied to the plates prior to bacteria (n=2). This research is ongoing but the evidence supports the possibility that some type of active bactericidal compound is produced by airway epithelial cells on their apical side.

Effects of Chronic Estrogen Exposure on Neurotransmitters in the Paraventricular Nucleus: Comparison with Aging

David W. Hamman, under the direction of Dr. Puliyur Mohankumar and Dr. Sheba Mohankumar, Pathobiology and Diagnostic Investigation

A recent study demonstrated that hormone replacement therapy involving estrogens and progestins increases the risk of heart disease and stroke while estrogens alone increase the risk of stroke. Cardiovascular functions are regulated centrally by the paraventricular nucleus of the hypothalamus. Therefore, we hypothesized that estrogen could act on the hypothalamic paraventricular nucleus to affect the cardiovascular system. To test this, we implanted young female Sprague-Dawley rats with slow release estradiol pellets that released 20ng estradiol/day for 30, 60, or 90 days. Sham-implanted animals were used as controls. Estrous cyclicity was monitored daily by vaginal cytology. At the end of the treatment period, the animals were sacrificed and their brains were removed, frozen and sectioned. The paraventricular nucleus was microdissected and homogenized in 0.1M $HClO_4$ and analyzed for neurotransmitter concentrations using HPLC-EC. Trunk blood was collected, the serum separated and analyzed for corticosterone by radioimmunoassay. There were significant changes in estrous cyclicity with increasing estradiol exposure. While 30-day exposure did not produce marked changes in estrous cyclicity, 60- and 90-day exposure caused 80% and 95% of the animals to become acyclic respectively. Changes in neurotransmitter levels in the paraventricular nucleus and serum corticosterone levels are currently being analyzed. Supported by NIH AG 05980 and NSF IBN 0236385.

Thermal Tolerance of Trichophyton rubrum and its Exploitation for a Thermal Therapy of Onychomycosis

Patrick L. Harrington, under the direction of Neil T. Wright, Mechanical Engineering

Onychomycosis is a fungal infection of the nail that infects approximately 20% of the general population and 75% of those over 60 years of age. Patients stricken with onychomycosis tend to have compromised immune systems caused by age, human immunodeficiency virus (HIV), acquired immunodeficiency syndrome (AIDS), and diabetes. The current oral treatments of onychomycosis include the drugs Terbinafine and Itraconazole. In many cases these oral treatments may cause harmful interactions with common medications taken by those commonly infected with onychomycosis. The most common

dermatophyte associated with onychomycosis is Trichophyton rubrum and is associated with 70% of all cases of all infections. We have begun to design an effective thermal therapy for onychomycosis by comparing the thermal tolerances of human epidermal tissue with the thermal stability of T. rubrum. In addition to thermally shocking T. rubrum for various time-temperature relationships much quantitative information on the evolution of burns and biological heat transfer is available. We are able to predict the thermal damage to the epidermis and the dermatophyte by integrating the Arrhenius equation with respect to time and experimentally obtain the Arrhenius parameters. This modeling allows us to predict the effectiveness of the therapy prior to animal and human models. This is the first step towards designing an effective therapy for onychomycosis.

Portrait of Grandfather, Generations of Women, Transformation
Leah M. Harris

The self-portrait is actually a painting of my Grandfather. I wanted to represent all the love, humor and compassion that he embraces. This is a portrait of myself through the image of the most important person in my life. The painter, Lucean Freud was of influence for his style and intense clinical paintings. "Generations of Women" is a portrait series of a grandmother, her two daughters, and her granddaughter. I wanted to emphasize the importance of family and the closeness they share. I used black on white, dramatic lighting, and shadows to relate the intensity of their bonds. "Transformation" is a series about movement and time in relation to the subject's transformation. A very personal and sensitive series that reveals a new sense of self and the moment in between.

Technician Variation in Dairy Cattle Rump Fat Thickness Measurements Using Real Time Ultrasound
JoAnna M. Hay, under the direction of Dr. Thomas Herdt, Large Animal Clinical Sciences

The use of real time ultrasound measurements of rump fat thickness (RFT) is increasing in the dairy industry. Some researchers, however, have reported variation in RFT between ultrasound technicians. This study was designed to find the variation in RFT as determined by two technicians. Ultrasound images were captured by both technicians at four different points on the same cattle and the same day and then analyzed separately by each technician using a computer program called Dicom Works. Variations between image capture and analysis were evaluated. The results show that two ultrasound technicians with minimal training can indeed obtain very similar measurements, therefore demonstrating the reliability of the instrument and presenting a method by which farmers could potentially predict and prevent post partum metabolic disease.

Antoniazzo Romano and the Forgotten Renaissance in Rome
Joanna C. Hecker, under the direction of Dr. Stuart Lingo, Department of Art and Art History

Renaissance studies in the history of art tend to focus on aesthetic developments linked to the fourteenth- and fifteenth-century resurgence of interest in humanist philosophy and the imagery of antiquity. Scholars place emphasis upon individuals whose artworks demonstrate a progression toward one-point perspective, naturalism of form, and the employment of classicizing architectural elements, all of which are measured against a foil of stoic, Byzantine-style iconic religious imagery. Such canonical development is best illustrated in the fifteenth-century artistic produce of the city-state of Florence, where politics and art met in a uniquely volatile series of power struggles. The oft-forgotten artist Antoniazzo Romano, however, exemplifies an aesthetic trend that was of particular importance to the city of Rome in the second half of the fifteenth century; in his time he was considered one of the most important living artists, but because

his Byzantine-style imagery and icon copies fail to fit our Renaissance paradigm, modern scholars underestimate his relevance to the Roman—and, indeed, the Italian—artistic and political environment in the years before Michelangelo came to Rome. At the UURAF, I will discuss the Rome of Antoniazzo's time, and the ways in which his archaic religious imagery satisfied the needs of his patrons and therefore illustrates political, religious and aesthetic demands unique to the city of Rome at a crucial point in its history.

Nutrient-Isolation Efficiency of a Swine Manure-partitioning System
Erin M. Henderson, under the direction of Dr. R. D. von Bernuth, Construction Management

Nutrient management is key to optimizing economic efficiency in swine production. The MSU Swine Teaching and Research facility utilizes a unique manure handling system, with a sloped floor that partitions the solid and liquid fractions. Isolating the solid manure from the liquid manure allows for moisture reduction in the solid manure, and nutrient isolation. A four-month study was conducted to determine the effectiveness of this sloped-floor manure partitioning system, quantify the nutrient-isolation efficiencies of the system, and to monitor odorous gas levels in conjunction with this system's utilization. Each week, we collected and weighed the liquid and solid manure fractions produced in a 24-hour period. We tested representative solid and liquid samples for moisture/solids, macronutrients, micronutrients, and pH. From these test results we calculated the degree of nutrient-isolation (e.g., percent Phosphorus, Nitrogen, Potassium) in the solid fraction. Our results will ultimately allow for the design of effective Comprehensive Nutrient Management Plans.

Teachers' Classroom Accommodations: A Mediating Factor in the Relationship between Teacher Efficacy and Student Academic Achievement
Caroline C. Heubel, under the direction of Dr. Jean Baker, School Psychology

Colleges of education prepare dedicated students to teach the next generations. While the practices, skills, and techniques necessary to become qualified instructors can be taught through schooling, a number of personal factors largely contribute to success in their field. The construct of teacher efficacy, born from Bandura's work on self-efficacy and Rotter's social learning theory, is a factor which has been repeatedly shown to influence instructors' approach to teaching as well as their success in doing so. This project sets out to understand, in particular, the relationship between teacher efficacy, that is teachers' perceptions about their competence to help students learn, and their success in attaining positive outcomes in students as measured by grades. I propose that the classroom accommodations teachers engage in mediate this relationship because those who strongly believe that they can affect student learning will tend to work harder at trying to help their pupils succeed, which in turn, will increase student academic achievement. By using data collected through an existing project, I will focus on 3rd through 5th grade students who are at high risk of behavioral problems as measured on a standardized behavior rating scale. I predict that a teacher who has a strong sense of efficacy with children exhibiting challenging behaviors will have less trouble finding the same confidence in their teaching of students who do not exert problem behaviors.

Reinaldo Arenas: Dissidence and Silence in Cuba
Andrew L. Hickner, under the direction of Dr. Kristine Byron, Spanish and Portuguese

In Reinaldo Arenas's posthumously published autobiography *Before Night Falls*, the Cuban writer described his experiences under, and ongoing battle against, the Castro regime. I will examine Arenas's status in, and relationship with, Cuban society in each stage of his life, and its impact on the development of his character, sexuality, and work. I will also look at the Castro regime's perspective in silencing

Arenas, and set it in the context of Cuba's legal and informal discrimination against homosexuals. I'll discuss how Arenas viewed his identity in terms of right to self-expression, and resistance to classification and integration. Finally, I will look at reactions from Cubans and Cuban-Americans to *Before Night Falls* since its publication.

Reactions to Criticism: A Look at Personality Characteristics
Jennifer L. Hogoboom, under the direction of Dr. Lawrence Messe, Psychology

Everyone is criticized at some point in time, and many of us experience criticism in some shape or form multiple times a day. The purpose of this study is to expand upon a study previously done by Cupach and Carson in 2002 that looked at social and environmental factors that affect how people respond to criticism. My study focuses on the recipient of the criticism and how they respond to receiving that criticism in view of specific personal variables (attachment style, extroversion, neuroticism).

Altered Lifespan and Behavioral Aging in Drosophila Beta-Integrin Mutants
William J. Horton, under the direction of Dr. Michael Grotewiel, Zoology

Insulin-like growth factor receptor signaling regulates longevity in C. elegans and Drosophila. Integrins, a type of cell adhesion molecule, regulate growth factor receptor signaling. To determine whether integrins regulate key aspects of lifespan, we evaluated longevity and behavioral aging in adult Drosophila harboring mutations in the integrin beta-subunit gene myospheroid (mys). We found that lifespan under normal housing conditions is significantly extended in female mys mutants, whereas in male mys flies lifespan was not substantially altered. Additionally, we determined that declines in locomotor activity are delayed for these female mys mutants. However, resistance to environmental stressors was unaltered in mys flies. Unlike some lifespan extension mutants, mys animals had normal body sizes, indicating that the extension of longevity is not due to changes in body size or food consumption. Egg-laying in mys females was also unaltered, dissociating changes in longevity from decreased fecundity. Our results indicate that integrins are important regulators of lifespan and behavioral aging in Drosophila.

Inversion and Hydrogen Exchange in 1,2-Cyclopentanediols: A Geometrically Constrained Model for Aqueous-Phase "Green" Catalytic Carbohydrate Hydrogenolysis
Darya E. Howell, under the direction of Dr. James Jackson, Chemistry

Biomass-derived carbohydrates (general formula R(CHOH)nR') can be upgraded to desired chemicals via aqueous-phase hydrogenolysis. Cleavage of C-C and C-O bonds occurs via retro aldol and elimination reactions in hydroxyketone intermediates that arise via CHOH to C=O dehydrogenation (as shown for n=2). To probe functional group interactions and their effects on the geometrical nature of catalyst-bound intermediates, we have chosen to study two simple substrates with opposite stereochemical relationships: the cis and trans 1,2-cyclopentanediols. Beginning with the pure cis or trans forms, two changes are monitored: isomerization to the other form, and H/D exchange at the CHOH and the neighboring CH2 sites. These outcomes are explored as a function of time, temperature, hydrogen pressure, and catalyst amount. Our goal is to understand how the reactions are affected by a neighboring –OH group, positioned on either the same or the opposite ring face as the C-H under attack.

Comparative Analysis of Multiculturalism and Multilateralism in the U.S. and Canada
Robert A. Huber, under the direction of Dr. Michael G. Schechter, James Madison College

The same factors that encourage multiculturalism also lead to multilateral policies. Canada, strongly proven as a multicultural country views multiculturalism as economically beneficial. The United States, however, has encountered few victories in comparison to the united coalitions in Canada. This research project will study interest groups and the dynamics they present to the realm of international relations in terms of presenting factors that encourage multiculturalism, and consequently, lead to similar advocacies in multilateral policies. The study will focus strongly on policy construction/adoption concerning multiculturalism and multilateralism in the years between 1980 and the present.

Sequencing Osteocalcin Obtained from Fossils and Its Use in Determining Phylogeny
James F. Humpula, under the direction of Dr. Peggy H. Ostrom, Geological Sciences

Ancient DNA has been the primary focus of studies into the molecular phylogeny of species through time. Unfortunately, research performed in this area is made difficult by the ease at which a sample may be contaminated and the rapid rate at which DNA degrades. Currently, Osteocalcin, a protein used in the formation of bone, is being investigated as a potential source of genetic data from extinct species. Osteocalcin research does not suffer the same difficulties that DNA based research does. Because Osteocalcin is only present in bone, bacteria, skin cells, and other common contaminants will not affect the determination of the protein's sequence. It's robust structure and short sequence length give it a longer preservation time. Recently, Osteocalcin was obtained and sequenced from an extinct species of New World Equus. This discovery may have implications in determining the phylogeny of New World horses, which became extinct 10,000 years ago.

Wind
Carly J. Hursh, under the direction of Dr. Jon B. Burley, Landscape Architecture

We, as humans, build structures to serve our needs, but it is also important we be sensitive to the natural environment. My project illustrates a possibility of how a high-speed rail bridge could connect Ayamonte, Spain to Vila Real de Santo Antonio, Portugal. The bridge was designed to capture the essence of the Mediterranean wind. The twisting forms of the bridge convey the concept of the wind. For example, large spirals rotate around the bridge, allowing a distant observer to see the wind in the forms and to see the wind in the movement of the spiral. The spirals meld into the ground, creating the undulating feeling of the wind. Even the pedestrian pathways above the rail bridge weave in and out of each other vertically and horizontally as if the wind had guided their paths. To lessen the impact of the bridge on the environment as a whole, the bridge generates clean wind energy as the spirals are turned by the wind. My concept for this bridge is illustrated in two posters and two models. Hand renderings of the site inventory, the bridge and its components provide a visual of the bridge on the poster. Explanations of the bridge’s function are included.

The Clarinet: A History of Friendships
Mary Beth E. Huttlin, under the direction of Dr. Frank Ell, School of Music

While it is not unusual for composers to dedicate compositions to virtuosic performers, rarely do these musical collaborations result in very close personal friendships that significantly impact the history of the instrument and define its capabilities. For much of its early history, the clarinet was an unknown commodity. Although it was invented around 1700 by Johann Denner, thirty years passed before it was

mentioned in any writings and no solo works existed until 1740. Part of the reason for the slow assimilation of the clarinet into the musical culture of Europe was the dearth of clarinets and clarinetists. It is for this reason that the partnerships between composers and clarinetists proved to be symbiotic. By collaborating with a virtuosic composer, Mozart, Weber, and Brahms each had the opportunity to explore the capabilities of the instrument, learn to utilize the best features of the instrument and expand former performance boundaries by increasing the technical and musical demands of the works. It was also advantageous to have virtuosos traveling throughout Europe performing and promoting their works. The clarinetists benefited by receiving the honor of dedications and opportunities to perform works written to their own specifications. However, perhaps of greatest importance are the positive impact of these partnerships on the evolution of the clarinet as well as the resulting timeless, masterful works that now form the foundation of the clarinet repertoire.

Bridge Over the Rio Gaudiana: Two Countries United By The Water That Separates Them
Clare E. Jagenow, under the direction of Dr. Jon B. Burley, Landscape Architecture

Bridges aren't just engineered to cross bodies of water for easier travel, but sometimes are designed as an artistic statement sympathizing with the cultures that surround them. In my project, a new rail bridge will span the Rio Gaudiana between Ayamonte, Spain and Vila Real de Santo Antonio, Portugal. This bridge was designed to take the barrier that separates the two countries and make it a uniting factor. This common connection of water is incorporated into my concept "Riding Waves". Riding the train by way of this bridge will be not only be exciting, but will serve as a link, in which the water symbolically becomes the bridge, not a border which divides the two nations. In addition, a rail bridge is greatly needed in the area, since the train stops in Vila Real de Santo Antonio and travelers must take a ferry to cross the river to a bus station in Ayamonte. A rail bridge would increase commerce and tourism and serve as a gateway to the river valley. Finally, with the bridge located at convenient distances to both communities, those not taking the train would be able to use a pedestrian and bicycle accessway providing scenic views of the river environment to all who utilize it. A model and drawings of the bridge shown in the landscape are arranged in a poster which illustrates these features.

Interactions between Reward Systems and Perceptions of Fairness on Individual and Team Outcomes
Johanna E. Johnson, under the direction of Daniel R. Ilgen, Psychology

The increasing use of teams in organizations has, in the past two decades, spurred significant research. Researchers have looked at different ways of organizing, maintaining, motivating and rewarding effective teams. This study looked at the effects of and relationships between reward systems, individual characteristics, and perceptions of fairness, on individual and team outcome variables. Participants were 99 university students enrolled in psychology courses at Michigan State University. Students were asked to compete two on-line questionnaires via the Department of Psychology subject pool website. The first was completed during the beginning of the semester, before the participant had a team project due. The questionnaire asked primarily for individual characteristics about each participant, regarding individual orientation, team reward tendencies, as well as inquiries about their previous experience with teams. After each participants' project due date, they were asked to return to the subject pool website to complete the second questionnaire. The second questionnaire assessed outcome variables including satisfaction, cooperation, task interdependence, perceived fairness, and social reward aspects.

MSU Safe Place Ads
Rachel A. Johnstone, under the direction of Dr. Keith Adler, Advertising

Conceptual advertisements created for the MSU Safe Place by Rachel A. Johnstone, Advertising Junior. Advertising is an excellent tool to increase public awareness and, unfortunately, many non-profit groups have been unable to obtain fresh, interesting advertising. Encouraging students to design ads for such groups could lead to waves of change. Students could volunteer their services to non-profit organizations, gaining more experience and aiding others in the process.

Benevolent Sexism and Gender Role Identity: How Type of Victim is Related to Victim Blame In Rape Scenarios
Hillary A. Justin, under the direction of Dr. Gary E. Stollak, Psychology

Benevolent sexism refers to a set of attitudes towards women that places them in seemingly positive yet restrictive roles (Glick and Fiske, 1996). Individuals that are high on benevolent sexism (vs. low) have been found to attribute more blame to rape victims that are perceived to violate traditional gender roles of women, especially in instances of acquaintance rape (Abrams et al., 2003; Viki and Abrams, 2002). The proposed study will examine the relationships among benevolent sexism, gender role identity, and victim blame in stranger and date rape scenarios. It is hypothesized that high levels of benevolent sexism along with a traditional gender role identity will moderate the relationship between victim type and victim blame. More specifically, it is predicted that individuals that are high on benevolent sexism and identify a traditional gender role identity will attribute more blame to the date rape victim than those individuals with low scores of benevolent sexism and with scores of egalitarian gender roles. Conversely, it is proposed that scores of egalitarian gender roles will negatively correlate with high scores on benevolent sexism. Participants fitting these categories (egalitarian gender role scores and low scores of benevolent sexism) would not assign a significant amount of blame regardless of victim type. By adding the measure of an individual's gender role identity with the measure of benevolent sexism, it is hoped that the research will contribute to the understanding of benevolent sexism and its effects.

Racial Equality: Kalamazoo, Michigan 1960-2000
Kristie L. Keenan, under the direction of Dr. Joe T. Darden, Geography

This study examines the urban racial equality patterns of Kalamazoo, Michigan from 1960-2000. For each decade, each census tract within the city of Kalamazoo was researched to find the average family income, the average level of high school completion, the average age of residential housing, and the average percent of unemployed persons. These census tracts were divided between the predominantly African American and white census tracts (neighborhoods) within in the city of Kalamazoo. After gathering the data, a comparison and analysis was completed to answer the following question: Has equality increased or decreased between the African American neighborhoods and the white neighborhoods over the last forty years in Kalamazoo.

Eyewitness Identification Accuracy: Can It Be Improved?
Stephen G. Kemsley, under the direction of Dr. Thomas Carr, Psychology

The cognitive interview has shown to be effective in increasing the amount of correct recollections from eyewitnesses. Whether or not its principles can be applied to increase eyewitness identification accuracy from a lineup is still unclear. Undergraduate students from Psychology classes at MSU were shown a video of a staged crime. After viewing the tape, half the subjects completed a daily recall/study exercise over the Internet during the waiting period (the space of time between witnessing the event and

identifying the culprit from a lineup) that was based upon the principles of the cognitive interview. The other half of the subjects used no such method and served as a control group. One week after viewing the crime on tape, subjects were shown a sequential photo lineup over the Internet from which they needed to pick the culprit and rate how confident they were of their selection for each photo. Half of the subjects were shown a blank (culprit-absent) lineup and half were shown a filled (culprit-present) lineup. After identification, all subjects were given a free recall test by which they were tested for recognition of other incidental details from the video besides the culprit.

Chaos Theory Applied to Quantum Mechanics
Namir A. Khandker, under the direction of Dr. W.C. McHarris, Chemistry

Several of the imponderables associated with the Copenhagen interpretation of quantum mechanics have alternative, parallel explanations in terms of nonlinear dynamics and chaos. For example, an exponential law for processes such as radioactive decay can be obtained by iterating unimodal maps operating in chaotic domains, utilizing their extreme sensitivity to initial conditions. Such alternative explanations raise the question of the possibility of underlying nonlinearities in quantum mechanics. This is a 'from the bottom up', empirical approach to the question and will be compared with other, more theoretical, 'from the top down' investigations into the possibility of nonlinear extensions to quantum mechanics. Nonlinear dynamics, although deterministic, in its chaotic extreme provides only statistical information about the outcomes of state-space orbits. Thus in principle it provides the determinism so dear to Einstein; yet in practice it exhibits the probabilistic behavior of Bohr. Perhaps Einstein and Bohr could both have been right.

"Sticking around": Comparison of Adherence Genes and Biofilm Formation in Pathogenic E. coli
Sara M. Kienzle, under the direction of Dr. Thomas Whittam, Microbiology and Molecular Genetics

Enteric organisms, such as Escherichia coli, must be able to survive and reproduce in mammalian hosts, and endure the stresses outside the host to be transmitted by the fecal-oral route. One strategy for survival in the external environment is to form biofilms, which can enhance resistance to environmental stresses. Curli, an E. coli surface organelle, plays a key role in biofilm development. The purpose of my study was to investigate variation in Curli genes in pathogenic E. coli O157:H7 and other Shiga toxin-producing E. coli (STEC) that cause foodborne illness in the United States. E. coli O157:H7 is transmitted to humans from animals through contaminated food and water, and its ability to survive in food and water is critical in causing infections. Two genes, csgA and csgD, involved in Curli production were sequenced in 32 strains of STEC. Comparisons of csgA and csgD indicated that these genes are similar in sequence among strains of three serogroups of STEC (O157:H7, O26:H11, and O121:H19). Despite csgA and csgD being involved in the production of a surface structure, the proteins are conserved and followed a comparable phylogenetic route to E. coli housekeeping genes. The ability of strains from the three groups to form biofilms was assessed and it was found that O157:H7 strains had a significantly higher biofilm formation compared to the other groups, indicating that O157:H7 may have an increased ability to "stick together" and develop this resistant form of growth.

Amnionless (AMN) Antibody Production for Study of Canine Imerslund-Gräsbeck Syndrome
Adam Kilkenney, under the direction of Dr. John Fyfe, Microbiology and Molecular Genetics

Malabsorption of the essential vitamin B12 (cobalamin) leads to several clinical signs including megaloblastic anemia and growth failure in juveniles. Cobalamin malabsorption combined with proteinuria is known as Imerslund Gräsbeck Syndrome (I-GS). The root cause of this disease is the

absence of a functional multiligand receptor, cubilin, on the brush border of the distal small intestine and renal proximal tubules. Cubilin mediates absorption of the cobalamin-intrinsic factor complex in intestine and is involved in protein reabsorption in the kidney. Previously, I-GS been attributed to mutations in the gene (CUBN) which produces cubilin, though this is not the case in all instances. Mutations in another gene, AMN, have been found in I-GS patients from three Norwegian families and two Israeli families of Tunisian ancestry. The function of AMN is unknown. To study the function of AMN a polyclonal antibody is needed. To do this, the AMN cDNA will cloned into an expression vector, and the protein produced in a bacterial construct.

The Effect of Income on Male Grocery Shoppers' Habits
Kim Klein, under the direction of Patricia Huddleston, Human Environment and Design

As the number of male grocery shoppers continues to increase, it is apparent that this new target market can become highly profitable. As a result, the factors that drive the male shopper are a matter of question. The purpose of our study was to compare high-income and low-income male grocery shoppers to determine the similarities and differences in shopping habits between the two groups. This deeper understanding will give insight on what drives both high and low income male grocery shoppers' customer loyalty and its influences.

Spectinomycin Resistance in Chlamydomonas reinhardtii
Miriam D. Kleinman, under the direction of Dr. Barbara Sears, Plant Biology

Chlamydomonas reinhardtii can become resistant to a number of antibiotics through mutations that alter their binding sites on the chloroplast ribosome. Spectinomycin-resistant mutants were isolated, and a portion of the 16S rRNA gene was amplified by the polymerase chain reaction. DNA sequence analysis revealed point mutations as well as a novel deletion in this gene.

Anabolic Response to Testosterone in Transgenic Mice with Knocked-down Androgen Receptor in Skeletal Muscle Fibers
Cindy D. Knaff, under the direction of Dr. Cynthia Jordan, Psychology

Testosterone is an anabolic steroid hormone that increases muscle mass. The sexually dimorphic levator ani (LA) muscle is more sensitive to androgens like testosterone than are other skeletal muscles. Testosterone regulates both the size and number of LA muscle fibers. The LA therefore provides a useful model for understanding how anabolic steroids affect skeletal muscle. Previous research has shown that testosterone acts on androgen receptors (AR) in skeletal muscle to regulate the size and number of LA muscle fibers. Although LA muscle fibers express AR, other cell types found in skeletal muscle including, fibroblasts and endothelial cells, also express AR and can influence muscle fibers. We propose to determine whether the AR in LA muscle fibers themselves regulate LA muscle fiber size and number by studying a line of transgenic mice generated in our laboratory in which AR expression has been lowered in only one cell type, skeletal muscle fibers. We will compare the size and number of LA muscle fibers in these transgenic mice with their wild type brothers.

The Arabidopsis Protein SYT1 has Transactivation Activity
Katherine B. Krive, under the direction of Dr. Hans Kende, Plant Research Laboratory

The Arabidopsis SYT proteins (AtSYTs) are interacting partners of putative transcription factors AtGRFs in Arabidopsis plants. They are homologues of human SYT protein, which has been characterized as a putative transcription co-activator (Thaete et al., 1999). AtSYTs contain two regions, the SNH and QG regions, that are highly similar to the SNH and QPGY domains of human SYT protein. Because the QG and QPGY domains are highly similar in amino acid content, it is conceivable that the QG domain of AtSYTs may also have transactivation activity as the corresponding domain of human SYT does. Transactivation activity was tested with a Yeast GAL 4 system. Fusion plasmids were constructed, using cDNA fragments of SYT genes and vector pGBT8, which resulted in a protein product including various lengths of SYT protein and GAL 4 binding domain. DNA was incorporated into yeast cells, and transformants were selected. To assess transcription of reporter genes, HIS and LacZ, transformants were plated on minus histidine medium and checked by colony-lift assay. Yeast cells expressing full length SYT1 proteins showed strong transactivation activity, but neither QG nor SNH domains showed activity. Two more fusion constructs were prepared based upon different lengths of the QG domain. The longer fragment showed slight activity while the shorter showed none. These results demonstrate that AtSYT1 has transactivation activity in yeast GAL 4 system as does the human SYT; however, the full length of AtSYT1 is required for full strength of activity, whereas the full length of human SYT shows much less activity than the QPGY domain alone.

Airway Surface Fluid Antibacterial Properties in Calu-3 Cells Demonstrate Characteristics of CFTR Presence When Compared With 2WT2 Cells
Katherine E. Kruse, under the direction of Dr. Douglas Luckie, Lyman Briggs School and Physiology

Cystic Fibrosis (CF) is a recessive genetic disease caused by a mutation of the cystic fibrosis transmembrane conductance regulator (CFTR) gene. Mutant *ƒ*´F508-CFTR protein is misfolded and destroyed by the cell and thus results in the inability of the cell to create working ion-permeable channels. The fact that airway epithelial cells are missing CFTR channels in the outer cell membrane is hypothesized to lead to a concomitant drying of airway mucus (Luckie et al., 2000). Recent reports indicate CFTR is primarily expressed in lung submucosal gland cells and the bacterial colonization of the lung in CF may be caused by more than just dry mucus. Evidence is mounting that there may be bactericidal compounds that are inactivated in patients with CF (Zhang et al., 2001). To examine the role that bactericidal compounds may play to combat bacterial growth in the lungs, we studied the effects of the apical surface fluid (ASF) secretions collected from Calu-3 (submucosal cell lines expressing normal CFTR) on the viability of cultured Escherichia coli. In cell culture Calu-3 cells were grown into a monolayer on suspended porous filters for a period ranging from 14-20 days. ASF secretions were allowed to accumulate for 48 hours before each collection. The collected ASF was then either administered to agar plates that already contained lawn growth of E. coli (strain mm294) or placed on plates prior to seeding with E. coli, and incubated for 12 hours upon which results were recorded. Preliminary results show a dramatic eradication of E. coli in all lawn areas exposed to ASF (n=2(6)), or complete inability of E. coli growth when applied to the plates prior to bacteria (n=2). This research is ongoing but the evidence supports the possibility that some type of active bactericidal compound is produced by airway epithelial cells on their apical side.

Sequence Analysis of the Kinase Domain of c-KIT of Mast Cell Tumors in Dogs
Elizabeth L. Kruszewski, under the direction of Dr. Vilma Yuzbasiyan-Gurkan, Microbiology and Molecular Genetics

Cutaneous mast cell tumors are very common in dogs. Their behavior can be quite variable and occasionally aggressive. Currently, it is hard to predict whether the tumor will progress and which ones will respond to therapy. The c-KIT gene encodes for a tyrosine kinase receptor that is necessary for development, survival, and maturation of hematopoietic stem cells, melanocytes and mast cells. Previously, mutations have been identified in the juxtamembrane domain of the c-KIT gene in our laboratory. These mutations are predicted to result in constitutive activation, which leads to excessive growth and the formation of a tumor. In certain tumors in humans, mutations in other domains, especially the kinase domain of c-KIT, have been reported. Therefore, this study was developed to study the kinase domain in mast cell tumors in dogs. The kinase domain of c-KIT is encoded in four exons. In an effort to analyze potential mutations in this domain in mast cell tumors, DNA samples were extracted from paraffin embedded tissue samples and purified. Primers flanking the four exons of the kinase domain were designed and used for amplification of the DNA. Currently, amplification of the DNA is ongoing in preparation for sequence analysis.

Understanding Cognitive Mechanisms of Modular Arithmetic
Shakthi Kumar, under the direction of Dr. Thomas Carr, Psychology

This research investigates the cognitive mechanisms behind arithmetic problem solving in people of high and low arithmetic skill. It has been suggested that as people become more skilled at math, they shift from a verbal mode of problem solving in which they talk their way through problems to a visuo-spatial mode. This suggestion will be pursued by creating "selective interference" in a dual-task situation in which participants perform a mental arithmetic task, called modular arithmetic. Experiment 1 will use selective interference during dual tasking to identify performance decrements in participants of average arithmetic skill. Participants will undergo visuo-spatial interference (from an arrow-pointing task) and phonological loop interference (from an overt word repetition task) in separate blocks of trials, with order counterbalanced. It is hypothesized that in people of average skill, performance decrements in modular arithmetic will be shown mainly during phonological loop interference, demonstrating a high reliance on verbal working memory when performing the MA problems. Experiment 2 will explore the performance of people high in arithmetic skill in the same dual tasking conditions. It is expected that the high-skill participants will rely more upon visuo-spatial processing than average skill participants, using the visuo-spatial sketchpad of visual working memory more and the phonological loop of verbal working memory less than average-skill participants.

Chaos Theory Applied to Quantum Mechanics
Danielle M. Larese, under the direction of Dr. W.C. McHarris, Chemistry

Several of the imponderables associated with the Copenhagen interpretation of quantum mechanics have alternative, parallel explanations in terms of nonlinear dynamics and chaos. For example, an exponential law for processes such as radioactive decay can be obtained by iterating unimodal maps operating in chaotic domains, utilizing their extreme sensitivity to initial conditions. Such alternative explanations raise the question of the possibility of underlying nonlinearities in quantum mechanics. This is a 'from the bottom up', empirical approach to the question and will be compared with other, more theoretical, 'from the top down' investigations into the possibility of nonlinear extensions to quantum mechanics. Nonlinear dynamics, although deterministic, in its chaotic extreme provides only statistical information about the outcomes of state-space orbits. Thus in principle it provides the determinism so dear to Einstein; yet in

practice it exhibits the probabilistic behavior of Bohr. Perhaps Einstein and Bohr could both have been right.

Expression of Sprouty-2 in MSU-1.1, an Infinite Life Span Human Fibroblast Cell Strain
Jonathan D. Lenz, under the direction of Dr. J. Justin McCormick, Carcinogenesis Laboratory

The MSU-1 cell lineage is a model system that allows one to study the process of carcinogenesis in human fibroblasts in culture. To generate this lineage of cells, normal human fibroblasts were initially transfected with the v-Myc oncogene. From clonal populations of these cells, immortalized cells were isolated and designated MSU-1.0 cells. A spontaneously arising cell strain, named MSU-1.1, is also immortal but, unlike its precursors, can be transformed into tumor cells by carcinogen treatment or oncogene expression. MSU-1.1 cells transformed with the H-Ras oncogene (designated PH3MT cells) are capable of producing tumors with a short latency in athymic mice and have proved to be growth-factor independent. To determine genes that may be important in the process of malignant transformation, gene chip analysis was used to compare the expression profiles of MSU-1.1 and PH3MT cells with the expression profile of MSU-1.0 cells. sprouty-2 (spry2) was identified as having elevated expression in MSU-1.1 and PH3MT cells compared to MSU-1.0 cells. We hypothesize that spry2 functions as an oncogene. We are investigating whether expression of spry2 in MSU-1.1 cells causes these cells to become malignant. Our data show that expression of Spry2 leads to an increase in the activation of extracellular signal-regulated kinase (ERK). Additionally, MSU-1.1 cells that express Spry2 have increased growth rates under conditions of serum deprivation when compared to their parental cells.

Cloning the GCN5-Encoding cDNA from Tomato
Nathan D. Lord, under the direction of Dr. Steve Triezenberg, Biochemistry and Molecular Biology

The eukaryotic protein Gcn5 is a transcriptional coactivator with the enzymatic function of a histone acetyltransferase (HAT). GCN5 homologs have been identified in yeast, fruit flies, mice, and humans, but few have been identified in plant species. Our laboratory has characterized the GCN5 gene and protein from the plant Arabidopsis thaliana, an organism useful for molecular genetics experiments but less than optimal for biochemical research. The purpose of this study is to clone the GCN5 gene from Lycopersicon esculentum (tomato), a plant that offers advantages in biochemical study of protein complexes involved in transcriptional regulation. A cDNA encoding the complete leGCN5 open reading frame and putative 5' and 3' untranslated regions, approximately 2.0 kb, was cloned using a combination of phage library screening and 5'-RACE (rapid amplification of cDNA ends). Northern blot analysis of tomato total RNA indicated a GCN5 primary transcript of approximately 2.2 kb. The sequence of the leGCN5 cDNA clone revealed regions of conservation, such as the HAT catalytic domain and the bromodomain, and other features that exhibit greater diversity, such as the N-terminal region of Gcn5. This work provides a foundation for future biochemical efforts to identify components of the coactivator protein complex(es) containing Gcn5, and thereby to define one mechanistic aspect of transcriptional activation in plants.

Cultural and Historical Perspectives on Joan of Arc
Amber L. Luttig, under the direction of Dr. Tess Tavormina, English

The story of Joan of Arc has been debated for centuries. Was she a witch or a saint? A symbol of feminine power or a pawn of the French royalty? Drawing on the resources of the Early English Books Online database, this presentation will examine the life of the young peasant girl as seen through the eyes of her enemies, the English, in sixteenth- and seventeenth-century historical and literary sources. It will

also compare these English perspectives on Joan with the facts gathered at her trials and modern historical interpretations of the role she played in French resistance to English rule in the fifteenth century.

Signal Transduction in Induction of Alternative Oxidase in Arabidopsis thaliana
Cora A. MacAlister, under the direction of Dr. Lee McIntosh, Biochemistry and Plant Research Laboratory

Plant mitochondria, unlike their mammalian counterparts, contain a second pathway for electron flow via a nuclear encoded membrane associated homo-dimeric protein, the alternative oxidase (AOX). In Arabidopsis thaliana, AOX is encoded by a five-member family. For this reason, we are able to use AOX as a marker for mitochondrial-nuclear signaling, "retrograde regulation." Unfortunately, little is known about the signaling pathway from the initial mitochondrial stress to increased AOX synthesis. Following identification of 23 potential genes of interest in Arabidopsis based on microarray data, a total of 37 Salk Institute T-DNA insertion lines were obtained through the Arabidopsis Biological Resource Center (ABRC). Screening to identify aberrant regulation of AOX transcription was carried out on a number of individual members of each line. RNA was isolated 4 hours after treatment with the cytochrome pathway inhibitor Antimycin A (AA), which is known to induce AOX, and control and treated samples were compared using northern blotting with the AOX1a gene probe. Some members of an insertion line, SALK_130465, in At4g10270, have shown an inability to upregulate AOX in response to AA-induced oxidative stress. This result indicates this gene may encode a component of the signaling pathway. The elucidation of this pathway would be an important step in understanding retrograde regulation and plant cell response to stress.

Chaos Theory Applied to Quantum Mechanics
Neeaz M. Mahmud, under the direction of Dr. W.C. McHarris, Chemistry

Several of the imponderables associated with the Copenhagen interpretation of quantum mechanics have alternative, parallel explanations in terms of nonlinear dynamics and chaos. For example, an exponential law for processes such as radioactive decay can be obtained by iterating unimodal maps operating in chaotic domains, utilizing their extreme sensitivity to initial conditions. Such alternative explanations raise the question of the possibility of underlying nonlinearities in quantum mechanics. This is a 'from the bottom up', empirical approach to the question and will be compared with other, more theoretical, 'from the top down' investigations into the possibility of nonlinear extensions to quantum mechanics. Nonlinear dynamics, although deterministic, in its chaotic extreme provides only statistical information about the outcomes of state-space orbits. Thus in principle it provides the determinism so dear to Einstein; yet in practice it exhibits the probabilistic behavior of Bohr. Perhaps Einstein and Bohr could both have been right.

Intracellular Trafficking Regulation Involved With Cystic Fibrosis Using Microphysiometry
Vishal B. Malhotra, under the direction of Dr. Douglas Luckie, Lyman Briggs School and Physiology

Previously we have shown that mouse mammary epithelial cell lines expressing wild-type (2WT2) and mutant F508 (508-8) CFTR can be detected using the Microphysiometer. It can detect changes in extracellular pH (pHo). It was discovered that glycerol (10% glycerol for 24 hours prior to the experiment), acting as a chemical chaperone, can correct the trafficking of F508 CFTR and lead to a significant decrease in acidification of pHo. The administration of cAMP elevating agent (10 uM forskolin) increased the acidification rates of 508-8 cells not treated with glycerol by 28% while the same forskolin stimulus decreased the acidification rates of glycerol treated 508-8 cells by 36%. Thus treatment

with glycerol and the resulting increased expression of CFTR at the surface was detected by microphysiometry as a 64% increase in pHo alkalinization for 508-8 cells. These results indicate that the expression of functional CFTR (or lack thereof in CF) may significantly alter extracellular pH. A known transcriptional enhancer, 4-phenylbutyrate (2.5mM), combined with low temperature incubation at 26°C (increased trafficking due to mutant protein stabilization) for 72 hours is shown to increase surface expression of F508 CFTR. Genistein, increases the probability of CFTR being open. We observed that the acidification rates of 4-PBA treated mutant 508-8 cells behaved more like wild type than the control. It was shown there was only a small effect of temp on acidification rates of 508-8 cells.

Do galectin-1 Mutants Defective in Carbohydrate-binding Interact with gemin-4?
Andrew J. Malowney, under the direction of Dr. Ronald Patterson, Microbiology and Molecular Genetics

In previous studies, it has been shown that galectin-1 is a pre-mRNA splicing factor. Other studies have identified galectin-1 as a lectin (protein that binds to specific carbohydrate groups on glycoproteins or on cell membranes). These findings together prompted an obvious question: is galectin-1 splicing activity related to its carbohydrate-binding activity? Another series of experiments determined that it is not. However, galectin-1 is known to bind to gemin-4 in an interaction that appears related to pre-mRNA splicing. The experiments presented will determine whether galectin-1 mutants that are deficient in carbohydrate binding activity are still able to interact with gemin-4. This will be done using the yeast two-hybrid system. In this system, cells from two different yeast strains, one producing mutant galectin-1 and one producing gemin-4, will be mated. The culture will be plated on SD/-Trp/-Leu/-His plates, which will select cells in which the two proteins interact. An assay using x-galactosidase will screen for false positives by turning candidate colonies blue if there is a true interaction between the two proteins.

Characterization of Pseudomonas syringae HrpA via protein-protein crosslinking.
Michelle B. Manente, under the direction of Dr. Dennis N. Arvidson, Microbiology and Molecular Genetics

Pseudomonas syringae is a plant pathogenic bacterium that delivers effector virulence proteins to the extracellular milieu or directly into the host cell by way of the type III secretion system. The hrpA gene encodes HrpA, the structural subunit of the Hrp-pilus. The Hrp pilus functions as the type III secretion conduit and is required for virulence. HrpA can self-assemble in solution to form a pilus-like structure. We have identified negative-dominant mutations of the HrpA protein that inhibit formation of the functional Hrp pilus and the secretion of effector proteins. Current research goals are to express wild-type and mutant HrpA proteins in Escherichia coli, purify them by liquid chromatography and assay the oligomeric state of each variant with protein-protein crosslinking in conjunction with SDS PAGE and immunoblotting. Non-assembling mutants were identified and are being subjected to crystallization trials. We hypothesize that mutants of HrpA that no longer self-assemble are more likely to crystallize.

Equine Urine Handling Procedures Affects Calcium and Nitrogen Concentrations
Marti A. Mayack, under the direction of Dr. Brian D. Nielsen, Animal Science

Four mature geldings were used to study the effects of temperature, time, location, and acidification on N and Ca concentrations in urine. The purpose of this study was to determine if various urine collecting techniques and storage impacted the concentration of Ca and N. Urine was collected in a clean 18.9 L bucket and immediately transferred into smaller airtight bottles. The urine was then immediately transported back to the lab. Urine was measured into 5 ml increments and pipetted into tightly capped 7-ml vials. Twenty-one total treatments were used. The treatments were combinations of the following

variables: urine held in total collection apparatus (yes or no), acid (none, added immediately, or added after urine was frozen and thawed), time held and temperature until freezing (frozen immediately, 6 h at 30º C, 6 h at 10º C, 12 h at 30º C, or 12 h at 10º C). Acid was added at a rate of 20 µl 37% HCl/ml of urine. The vials were frozen at –4º C until analyzed. When acid was added urine had much higher Ca levels compared to no acid ($P < 0.01$). There was a trend for acid added before freezing to have higher Ca concentrations then when acid was added after thawing ($P < 0.1$). Urine N was unaffected by the addition of acid to the sample ($P=0.22$). There was a trend for N concentration to be lower when urine was placed in a total collection apparatus for either 6 or 12 hours than urine not placed in the apparatus ($P < 0.1$). In conclusion, different methods of storing urine have an impact on concentration of N and Ca. A universal method should be implemented when determine N and Ca urine concentration levels.

Identification of ER-Interacting Proteins
Amanda M. McClure, under the direction of Dr. Susan Conrad, Microbiology and Molecular Genetics

The activity of ERa, in response to estrogen, is mediated through its interactions with other proteins. Since many breast cancer cells are ERa positive and require estrogen for proliferation, anti-estrogens, like Tamoxifen, are used for treatment. However, over time, many of these cancers become anti-estrogen resistant, possibly due to changes in signaling pathways involving ERa. Thus, it is important to identify different ERa-interacting proteins and identify which ones could be involved in the development of Tamoxifen resistance. Two cell models will be used in this study: MCF-7, a well characterized estrogen-dependent breast cancer cell line, and, LCC2, a Tamoxifen resistant cell line, derived from MCF-7. Our strategy involves Flag-tagging the ERa, transfecting it into the studied cell lines, and immunoprecipitating it using an anti-Flag antibody to purify the ERa in complex with its interacting proteins. For this purpose, I have cloned a 5'Flag-ERa cDNA into a mammalian expression vector, stably transfected it into MCF-7 cells and analyzed several clones by immunoblotting for expression of the tagged ERa. I also successfully immunoprecipitated the 5'Flag-ERa in these clones, suggesting that larger scale immunoprecipitations could be performed to obtain the 5'Flag-ERa complexes. These samples could then be analyzed by Mass Spectroscopy and compared to other samples similarly obtained from LCC2 cells to identify novel proteins involved in Tamoxifen resistance.

Effect of Decreased Levels of hRev7 on UV-induced Mutagenesis in Human Fibroblasts
Andrew M. McCoy, under the direction of Dr. Veronica M. Maher, Carcinogenesis Laboratory

Recently, specialized DNA polymerases were discovered that are able to bypass DNA damage, unlike the replicative polymerase delta. These specialized polymerases are unique in that they can be error free or error prone depending on the type of DNA damage encountered and the enzyme involved. DNA polymerase zeta in yeast cells has been shown to be composed of a catalytic subunit (REV3) and a putative non-catalytic subunit (REV7). To investigate the potential role of the human homolog of yeast Rev7, called hRev7, in mutagenesis, our goal is to reduce this protein in human fibroblasts and determine the effect of its reduction on UV-induced mutation frequency. Six siRNA constructs against hRev7 were created and stably transfected into a human fibroblast cell line. Clones will be screened for reduced hRev7 protein by Western blot analysis and clones with decreased hRev7 protein will be subjected to UV radiation to determine the effect of reduced hRev7 on mutation frequency and spectrum.

Airway Surface Fluid Antibacterial Properties in Calu-3 Cells Demonstrate Characteristics of CFTR Presence When Compared With 2WT2 Cells

Andrew M. McCoy, under the direction of Dr. Douglas Luckie, Lyman Briggs School and Physiology

Cystic Fibrosis (CF) is a recessive genetic disease caused by a mutation of the cystic fibrosis transmembrane conductance regulator (CFTR) gene. Mutant *ƒ*´F508-CFTR protein is misfolded and destroyed by the cell and thus results in the inability of the cell to create working ion-permeable channels. The fact that airway epithelial cells are missing CFTR channels in the outer cell membrane is hypothesized to lead to a concomitant drying of airway mucus (Luckie et al., 2000). Recent reports indicate CFTR is primarily expressed in lung submucosal gland cells and the bacterial colonization of the lung in CF may be caused by more than just dry mucus. Evidence is mounting that there may be bactericidal compounds that are inactivated in patients with CF (Zhang et al., 2001). To examine the role that bactericidal compounds may play to combat bacterial growth in the lungs, we studied the effects of the apical surface fluid (ASF) secretions collected from Calu-3 (submucosal cell lines expressing normal CFTR) on the viability of cultured Escherichia coli. In cell culture Calu-3 cells were grown into a monolayer on suspended porous filters for a period ranging from 14-20 days. ASF secretions were allowed to accumulate for 48 hours before each collection. The collected ASF was then either administered to agar plates that already contained lawn growth of E. coli (strain mm294) or placed on plates prior to seeding with E. coli, and incubated for 12 hours upon which results were recorded. Preliminary results show a dramatic eradication of E. coli in all lawn areas exposed to ASF (n=2(6)), or complete inability of E. coli growth when applied to the plates prior to bacteria (n=2). This research is ongoing but the evidence supports the possibility that some type of active bactericidal compound is produced by airway epithelial cells on their apical side.

Rapid Detection Biosensor Versus Standard Plating for Bacteria Detection

Shannon K. McGraw, under the direction of Dr. Evangelyn Alocilja, Biosystems Engineering

Biosensors represent a new and unique technology with capabilities for direct, sensitive, and real-time detection. A biosensor is an analytical device that integrates biological sensing elements with electronic transducers. The general function is to convert biological events, such as the binding between antibodies and antigens, into a quantifying electrical response. The objective of this study is to compare the performance of the biosensor for detecting bacteria with the standard plating method. We hope to be able to determine at what concentration of antigen the biosensor will give an accurate reading, therefore making it the more efficient choice.

Regulation of MLK3 by Binding to Pin1

Tony I. McHerron, under the direction of Dr. Kathleen Gallo, Physiology

Mixed-lineage kinase 3 (MLK3) is a serine/threonine protein kinase that activates the JNK signaling pathway. Our lab has been interested in the interaction between MLK3 and the peptidyl-prolyl cis/trans isomerase (PPIase) Pin1. Pin1 specifically binds and isomerizes only the phosphorylated Ser/Thr-Pro bonds in certain proteins. As a proline-directed kinase, JNK is able to phosphorylate Ser or Thr residues that are followed immediately by Pro. The goal of this project was to identify the specific phosphorylated amino acid sequences in MLK3 that mediate its interaction with Pin1. To do this we first tested the ability of truncated versions of MLK3 to interact with Pin1 in an in vitro assay. After the interacting region of MLK3 was defined, potential Ser/Thr-Pro phosphorylation sites in this region was mutated to nonphosphorylatable Ala residues and tested for their ability to bind Pin1. This information will be important for understanding how Pin1 may regulate MLK3.

BluJag: A Raytraced Rendering System
Casey L. Meekhof

3D rendering and animation are two exciting areas of research and development in the computer graphics field. These technologies are now beginning to permeate mainstream culture, evident from their emergence in the latest animated feature films and the hottest new video games. The BluJag rendering system is one such technology in this field, serving as a complete 3D rendering and animation solution developed in C++. It operates as a 3d studio max model viewer, a mesh animation player, a scripting engine, and a raytracer with the ability to render sequential frames. To showcase BluJag's capabilities, we created a short video. Also, to display its scalability, we developed a basic side-scrolling video game using BluJag. The video demonstrates the rendering capabilities by utilizing the high-quality software raytracer, while the side-scroller highlights BluJag's flexibility as a basis for more advanced software projects.

Fluorescent Red Gene Expression in Human Tumor-derived Cells
Bryan D. Mets, under the direction of Dr. J. Justin McCormick, Carcinogenesis Laboratory

To test whether transformed human cells are tumorigenic they are typically injected subcutaneously into athymic nude mice. Tumorigenic cells form a measurable mass at the site of injection over a period of time. Without serial sacrifice of the injected mice, it is impossible to determine whether metastases, (secondary tumors that occur when cells from the primary tumor break off and start growing away from the injection site) have occurred. Metastases formed by tumorigenic human cells transfected with a protein that codes for the red fluorescent gene (DsRed) can be visualized using noninvasive imaging equipment. The red fluorescent gene was originally obtained from reef coral. Human tumor-derived cells were transfected using the red fluorescent gene. Cells that express the red fluorescent gene were selected using drug resistance. Their level of fluorescence was determined microscopically. Those with a high level of fluorescence were isolated and have been expanded for injection into athymic nude mice. If we are successful visualizing the metastatic tumors formed by these human tumor-derived cells, we will have a technique that will allow us to determine the metastatic potential of oncogene or carcinogen transformed human derived cells.

Looking Through a Clearer Frame: The Reparations Debate
LaToya S. Morgan, under the direction of Dr. Bill E. Lawson, Philosophy

The question of reparations for African Americans for slavery has been debated since slaves were emancipated. The politics of reparations is a complicated issue colored by ideas of morality, politics, and American ideals. In trying to understand these underlying issues, this paper seeks to provide a conceptual analysis of the movement. Essentially, we will analyze the underlying assumptions of advocates and critics of this issue. It is our goal in this paper to do a conceptual analysis of the different assumptions of the African American experience that both of these groups are basing their arguments. This paper is unique in that it is not making new arguments for or against reparations, it seeks to understand the reasons or ideologies that underlie the debate. I believe that while the arguments for both sides are different, they are all based on similar ideas of the status of African Americans in this country and the extent to which slavery and Jim Crow has affected African Americans. Therefore, the question becomes: what do you have to believe about America and the African American experience to be for or against reparations? This paper will have three parts: in the first part, I will lay out the arguments put forth by advocates of reparation, and analyze the assumptions that underlie their arguments. In the second part, I will lay out the arguments put forth by critics of the debate, and analyze the assumptions that underlay their arguments. Finally, I will analyze the different options for the success of this movement. The third section will fully

layout the importance of the research on this issue, because if we do not understand the reasons for this movement it will not be successful. In these three parts it is my goal to analyze the reparations debate from a social, political, and philosophical assumptions. I believe that all of these theories tie into the underlying assumptions of the reparations debate. I believe that critics and advocates of this movement are operating on some of the same assumptions, but their arguments differ because of social, political, and philosophical ideals.

Personality Assessment: Beyond Traits
Alison R. Murray, under the direction of Dr. Rich Lucas, Psychology

A dominant personality model in many academic personality departments is the Five Factor Model (FFM) as typified by NEO-PIR which was developed and researched by Costa and McCrae (1992) and others who support the trait approach. Basically, they purport that personality is best understood by using a model based upon a factor analysis of linguistic descriptors that describe personality traits, which seem to cut across cultures and situations. They suggest that most, if not all, personality tests can be subsumed by the FFM, which is composed of the five factors of openness, conscientiousness, extraversion, agreeableness and neuroticism. Since the FFM subsumes most other tests the assumption is that the FFM can be seen as a comprehensive and unified theory of personality (Digman, 1990). However, some researchers suggest that trait theory has utility primarily for descriptive purposes but seems somewhat insufficient in explanatory and predictive power. Individuals with this alternative view posit that personality must consider underlying motivational (dynamic), situational and behavioral issues. Therefore a listing of trait descriptors based on factor analysis seems atheoretical and consequently may have less utility in predicting behavior in both clinical and real world situations. The purpose of this research is to determine if a motivational or dynamic model of personality might be useful to augment the standard FFM model.

Physical and Behavioral Assessment of Rai1 BAC Transgenic Mice
Tiffany L. Newton, under the direction of Dr. Sarah Elsea, Zoology

Smith-Magenis syndrome is a multiple congenital anomalies/mental retardation disorder and possible contiguous gene deletion syndrome. Through mutation analysis we have concluded that mutations in the gene RAI1 likely contribute to many of the craniofacial and behavioral abnormalities associated with Smith-Magenis syndrome (SMS). We are interested in determining if Rai1 is a dosage-sensitive gene and whether overexpression of Rai1 will produce phenotypic results. In order to generate Rai1 BAC transgenic mice, RPCI-23 326M22 DNA was linearized and injected into fertilized mouse ovocytes. These eggs were surgically transplanted into surrogate mothers, and offspring were tested for the presence of the BAC using polymerase chain reaction (PCR) specific for the unique T7 and SP6 bc326M22 ends. Transgenic males were assessed for BAC copy number by Southern analysis. Currently, we are studying the F1 offspring of stably transmitting founder males using genetic, physical, and behavioral assessments including: weight and body measurements, general health observations, dominance/submissiveness tests, and response to stimuli. We will also study the gross internal anatomy of the transgenic mice in comparison to that of normal sibling mice. With the exception of subtle weight and body length differences, few phenotypic differences between transgenic and normal mice have been observed thus far. The data from these assessments will be statistically analyzed for significance.

Identification of Proteins that Bind Specifically Phosphorylated CTD of RNA Pol II Using a Tethered Catalysis/Yeast Two-hybrid System
Sze-Ling Ng, under the direction of Dr. Min-Hao Kuo, Biochemistry

Many protein-protein interactions are facilitated or inhibited by post-translational modifications. These modifications are frequently critical for the functions, stability, structures, and localization of the underlying proteins. While research into protein-protein interactions is quite prevalent, the studies on those that are regulated by post-translational modifications are still in their infancy, mainly due to the lack of a suitable experimental approach. The tethered catalysis/yeast two-hybrid system was designed to study this gap in the proteomic puzzle. This system is an extension of the yeast-two hybrid system, where the incorporation of the "tethered catalysis" allows for the study of interactions induced by post-translational modifications. For example, phosphorylation of the carboxyl terminal domain of RNA Pol II contributes to its selective recruitment of different proteins and plays a critical role in regulation of transcription. The identification of phospho-CTD-interacting proteins will help to further elucidate the molecular mechanisms as to how CTD phosphorylation exerts its function in regulating transcription, and even its links to certain human diseases.

Quantifying Heat-Induced Muscle Tissue Shrinkage
Tolam T. Nguyen, under the direction of Dr. Bradley P. Marks, Agricultural Engineering and Dr. Neil T. Wright, Mechanical Engineering

Previous studies have shown the need to quantify muscle tissue shrinkage due to heat-treatment. We present an experimental system to measure changes in length of bovine muscle tissue subjected to thermal treatment by moist air using a custom convection oven that controls dry-bulb and wet-bulb temperature. Results indicate good repeatability of the data and a clear relationship between time, temperature, and shrinkage; however, an unexpected decline in shrinkage was observed at long heating times. These data set the foundation for a subsequent mathematical description for the complex thermomechanical response of muscle tissue to its temperature and moisture content histories.

Synthesis
Steve P. Nowaczyk, under the direction of Dr. Jon B. Burley, Landscape Architecture

Connections between people and places are becoming increasingly more important as globalization continues its rising trend. Natural barriers such as rivers or canyons create an arrest in direct interaction, and bridges or tunnels are the most common means of sealing the gap. Specifically, the Guadiana River separates the cities of Villa Real de Santo Antonio, Portugal and Ayomonte, Spain. In order to provide an ecologically and culturally sensitive design solution to unite these two cities, the surrounding landscape, architectural influences within each city, and each city's respective ways of living must be examined. A synthesis of these factors represented within the design of a bridge will not only portray an eloquent visual union of the cities, but also a physical link. The intended bridge connecting the two cities will be supporting a 180 mile-per-hour train. This display of advancing technology in combination with the train's impact on intercontinental relations inspired the concept for this particular bridge resolution. Much in the same way as the future of our cultural evolution relies on the combinations of efforts to create a unified whole, the future of technology also relies in interactions between what we already deem as our technological advancements. This bridge design contains a synthesis of materials, where iron beams in an intricate grid format support partial rings of glass, seemingly fusing within the center of the bridge, creating simplistic unification.

Role of Ubc13 in DNA Damage Avoidance in Human Fibroblasts
Hilary E. Ogden, under the direction of Dr. Veronica M. Maher, Carcinogenesis Laboratory

It was recently discovered that normal DNA replication polymerases are unable to use damaged DNA as a template. When lesions block DNA replication in human fibroblasts, the damage can be circumvented by using the genetic information from an undamaged homologous copy of the DNA. One protein that has been implicated in this error-free pathway is Ubc13. The Ubc13/Mms2 protein complex was initially identified in yeast for its unique role in ubiquitin chain assembly at the Ub Lys-63 residue instead of the conventional Lys-48 residue. Subsequent studies showed that yeast cells with mutations in the Ubc13 gene show a much higher frequency of UV-induced mutations, suggesting that UBC13 is involved in an error-free recombination repair pathway. To determine whether lack of the human homolog, hUbc13, has the same effect on mutation frequency following exposure to DNA damaging agents, an hUbc13 RNA antisense construct was transfected into immortalized human fibroblasts using a vector that contains a gene for puromycin resistance. Eighty-four puromycin-resistant clones were isolated and are being assayed by Western blot analysis to determine if hUBC13 expression has been reduced or eliminated. Using a protocol established in the Carcinogenesis Laboratory, clones that exhibit reduced levels of hUbc13 protein will be analyzed for their ability to avoid UV- or carcinogen-induced DNA damage when this error-free pathway is disrupted.

Role of Crk-Associated Substrate (CAS) in Arterial Contraction to 5-HT
Kevin K. Ogden, under the direction of Dr. Stephanie W. Watts, Pharmacology and Toxicology

CAS, a tyrosine kinase substrate, is a regulator of the actin-associated protein profilin. Contraction of smooth muscle cells induces tyrosine phosphorylation of CAS, suggesting CAS plays a role in contraction. We hypothesized that CAS is involved in 5-HT-induced arterial contraction. Western blot analysis of rat aorta demonstrated that CAS protein was present. In immunohistochemistry studies, specific staining of smooth muscle cells was observed as a competing peptide to CAS reduced the amount of staining. To determine the functional role of CAS, measures of isometric contraction were made in isolated tissue baths. Endothelium-intact aorta contracted to 5-HT (10-9 - 3x10-4 M) (maximum arterial contraction=100.3±3% of phenylephrine contraction; -log EC50 [M]=5.8±0.01) and the 5-HT2 receptor agonist alpha-methyl 5-HT (10-9 – 3x10-5 M) (89.8±2%; -log EC50 [M]=6.7±0.008). Incubation with latrunculin-B (10-7 and 10-6 M), an actin filament inhibitor, reduced 5-HT-induced contraction (43.6±4% and 13.4±5% of control maximum, respectively), and alpha-methyl 5-HT-induced contraction (35.9±2% and 6.2±3%). Collectively, these data suggest the involvement of CAS in the signal transduction cascade stimulated by 5-HT in the aorta, adding to our knowledge of 5-HT signal transduction in the cardiovascular system.

Foods Contributing the Most Fat, Sugar, Calcium, and Vitamin D to the Diets of Collegiate Football Players
Chioma C. Okeafor, under the direction of Dr. Sharon Hoerr, Food Science and Human Nutrition

The purpose of this study was to determine the foods consumed most frequently to identify those contributing the most fat, sugar, Vitamin D and calcium to intakes of collegiate football players. This was a secondary data analysis of data from 3 days of dietary recalls of 50 players. Previous nutrient analysis revealed that players averaged 4000 kcal with 59% from fat and sugars, but 30% of the players were low in Calcium and 60% were low in Vitamin D. For this study, foods from the dietary data entered into Nutritionist Pro were matched with food descriptions in the USDA Codebook Search. The Codebook Search matched foods into food groupings based on main ingredients and classified by a number code. The foods were merged and sorted into a frequency list and the top foods from each major group analyzed

for nutrient content. The frequently eaten foods containing the most added sugar were Gatorade, Powerade, fruit punch, sugar cereals, and waffles, with total sugars providing 24% of energy. Most frequently eaten high fat foods were ground beef, French fries, potato chips, pork sausage and fried shrimp. The foods most frequently consumed that were good sources of calcium were milk, cheese, cheeseburgers, waffles prepared with milk and lasagna. Good sources of Vitamin D were infrequently consumed other than milk, eggs and two fortified cereals. This food source analysis supports the earlier nutrient analysis by demonstrating frequent choices of calorically dense foods, many of which were low in key nutrients for bone health and muscle performance.

Image Assembly for the i-EDA System
Charles A. Otto, under the direction of Dr. Clark Radcliffe, Mechanical Engineering

The Internet Engineering Design Agent (i-EDA) System allows assembly of models of systems comprised of multiple components while protecting their proprietary data. Components and subsystems exist as agents distributed across the internet registered on the i-EDA system; they publish their functional response data in answer to predefined queries that do not reveal proprietary model data such as lists of components. The functional response data from different agents can be assembled using join operations to link the subcomponent data into a model of the system. The purpose of this project is to develop one of these component-linking join operations for pictures of physical components. The pictures of components are to be assembled creating a picture of the system in the same way that the functional responses of components are assembled to a create model of the system. Such an operation must be able to take images representative of physical objects (e.g., beams, trusses, etc.) and combine them into a single image representative of the mechanical system created by combining the respective objects. I wrote functions in MATLAB that do this by altering the images, stacking them in a controlled manner, and, most importantly, by maintaining the relationships between image and physical properties for all the components while doing so. While still under development, this can be considered a prototype for the join operation described above.

Progressive Retinal Atrophy in Canines
Gail J. Pallister, under the direction of Dr. Simon Petersen-Jones, Small Animal Clinical Sciences

Progressive retinal atrophy (PRA) causes eventual blindness in canines. The gene containing the mutation responsible for this condition has been identified in Cardigan Welsh Corgis. Now, research is in progress to identify the gene mutations that cause PRA in other breeds. In order to do this, regions of retinal genes are sequenced then examined for insertions, deletions, or other abnormalities. Further testing with a large pool of canine DNA compares the incidences of mutations with the known PRA status of each dog. Identification of gene mutations would allow screening for PRA in young dogs and the development of drug and gene therapies for PRA.

Post- 911 Changes for Public Broadcasting and the Digital Transition
Namsoo Park, under the direction of Dr. Joel F. Clark, MSU Washington DC Program

The United States is one of the few countries where broadcasting was originated from private funding, instead of government funding. Still, the gigantic commercial networks do not seem to be able to substitute for public broadcasting's unique role in the U.S. First, they are focused on financial gains. Second, they follow the quickest way to accomplish these financial gains—entertainment. Public television in the U.S. is owned and operated by the nation's 349 public television stations. Their networks are available to 99 percent of American homes, serving nearly 90 million people each week (data by

Public Broadcasting Service). Currently, the broadcasting industries in the U.S. are facing two influential events: the 'September 11 Attacks' and the digital transition. The 'September 11 Attacks' not only brought massive tragedy, but they also challenged America's communication infrastructure. Regarding the digital transition, the federal law states that all televisions stations including both private and public must broadcast solely in digital after December 31, 2006. By utilizing various sources including Congressional Hearings, legal guides, interviews, and my internship experience at APTS (Association of Public Television Stations), I have tried to investigate what the public broadcasting industry is planning in the face of these two events.

Increased Expertise and Spatial Ability Result in Better Coherence Pattern Recall in Indoor Scenes
Angela S. Peeper, under the direction of Dr. Aude Oliva, Psychology

Cognitive psychology and interior design will merge in this study concerned with visual coherence recall in indoor scenes. The goal of this research is to define how coherence, the spatial arrangement of objects, is influenced by spatial/spatial working memory ability and expertise. Experts in interior design and novices will both take spatial ability tests. Then, both groups will perform an experimental task. In the experiment (Recreating a scene), novices and experts will recreate a coherent or incoherent control scene from memory. They will be shown a template scene for 10 seconds and will be asked to organize a set of objects shown on the screen to replicate the template. The results should help to understand the visual representations that experts and novices (with different spatial ability) form when recreating a scene from memory.

Western Blot Analysis of the Pathway to Tumor Formation in Human Fibroblasts
Daniel C. Peltier, under the direction of Dr. J. Justin McCormick, Carcinogenesis Laboratory

Human fibroblasts require six to eight genetic mutations in order to progress to a tumorigenic or malignant state. An infinite lifespan cell lineage, derived following up-regulation of the myc gene and up-regulation of the telomerase gene, was developed in the Carcinogenesis Laboratory and has been used to model the genetic progression of normal human fibroblasts into tumorigenic cells. Infinite life span normal human cells are selected for their ability to form morphologically-altered cells following either the introduction of an overexpressed oncogene or a brief exposure of the cells to a carcinogenic agent. Changes in gene expression in fibroblasts that were malignantly transformed by oncogene-transfection have been found to differ from those in cells transformed by carcinogen treatment. Western blotting analysis has been used to examine these changes. Genes involved in two different pathways, specifically, the Rb, mdm2, p53, and p21 proteins as well as the Sp1, Sp3 and cMET proteins, which are known to be causally involved in fibroblastic cancer, were examined.

BluJag: A Raytraced Rendering System
Mihai L. Peteu

3D rendering and animation are two exciting areas of research and development in the computer graphics field. These technologies are now beginning to permeate mainstream culture, evident from their emergence in the latest animated feature films and the hottest new video games. The BluJag rendering system is one such technology in this field, serving as a complete 3D rendering and animation solution developed in C++. It operates as a 3d studio max model viewer, a mesh animation player, a scripting engine, and a raytracer with the ability to render sequential frames. To showcase BluJag's capabilities, we created a short video. Also, to display its scalability, we developed a basic side-scrolling video game using BluJag. The video demonstrates the rendering capabilities by utilizing the high-quality software

raytracer, while the side-scroller highlights BluJag's flexibility as a basis for more advanced software projects.

The Effects of Retail Store Atmosphere on Consumer Behavior
Karen Pfeiffer, under the direction of Dr. Nam-Kyu Park, Human Environment and Design

The environment of a retail store is composed of a number of factors that influence the behavior of individuals who visit the space. The factors that influence behavior we will focus on are ambient factors, which include sound and lighting, design factors such as color, and social factors such as crowding. To investigate the effects of these factors, a number of shoppers at retail stores will be asked to complete a short survey to determine the influence they have on their behavior in the space.

Synthesis of a Novel Alphahydroxyester for use in Biodegradable and Biorenewable Lactide Polymers
Vinayak K. Prasad, under the direction of Dr. Mitch Smith, Chemistry

Biodegradable polymers made from renewable resources have been used in practical medical applications such as dissolvable sutures and drug-delivery matrices since their inception in the late seventies. However, their use in high-volume consumable plastics remains limited. Instead, petroleum-based products have dominated these industrial and packaging markets. Poly(lactide) or polylactic acid is one biodegradable polymer that holds promise for industrial use based on early economic studies and general structural properties. Previous research in our group explored the synthesis of polylactic acid from lactide and the physical properties of the resulting polymer. We found that, though polylactic acid could be incorporated in a variety of plastic products, its physical properties hindered it from the most demanding industrial uses. In other words, despite the purest enantiomeric syntheses, poly(lactide) could only be made so strong, so flexible, and so resilient. The purpose of this investigation is to synthesize a chiral alphahydroxyester, whose dimerization will resemble the lactide molecule, but whose methyl side groups can be substituted with any desired olefin. All the while, we attempt to preserve stereochemistry. This synthesis is an attempt to modify the poly(lactide) molecule to achieve a polymer with the structural stability needed for aggressive industrial use. What results is a molecule whose implications for creating viable chemical polymers are quite dramatic.

Genetic Investigation of Molecular Chaperones Involved in Protein Import into Chloroplasts
Sowkya Rangarajan, under the direction of Dr. Kenneth Keegstra, Plant Biology

Molecular chaperones participate in protein transport within organelles in cells. Hsp 93, a chaperone protein in the Hsp 100 family, is thought to play a role in the translocation of preproteins into chloroplasts. To better understand the function and mechanism of Hsp93, we have used T-DNA insertional mutant lines of Arabidopsis thaliana to create mutant plants for both isoforms—at chromosome III and V. Hsp93-V knockout mutants display a pale yellow-green phenotype and are small in size. This implies that the Hsp 93-V isoform plays a significant part in Arabidopsis development. Hsp 93-III knockout mutants display a phenotype similar to wild-type plants suggesting that this isoform does not have such a considerable role as Hsp 93-V. Further study through crosses of the two mutant lines have led to the development of partial double knockout mutants mutant at Hsp 93-V and heterozygous at Hsp 93-III. These plants exhibit a pale yellow-green color, irregular leaf shape, and small stature.

Investigating Race/Ethnicity, Culture, and Acculturation as Factors Influencing Pain Assessment within the U.S. Healthcare System
Nancy F. Rayel, under the direction of Dr. Fred Oswald, Psychology

As the U.S. population grows older and longevity increases, healthcare priorities have shifted toward quality-of-life issues such as pain management and control. Although recent improvements in technology and medication have been implemented in the treatment of pain, many sufferers are still not treated in the most efficient yet individualized way. Research cites inadequate assessment of individuals' pain as one of the primary barriers in accurate and successful pain treatment, and unfortunately inaccuracies and inconsistencies in pain assessment tend to be more profound within ethnic minority groups. This study proposed that lower levels of acculturation in an individual are associated with a greater likelihood of miscommunication and dissatisfaction on the part of the pain sufferer, as well as a more inaccurate pain assessment and management by the attending physician or healthcare staff. Subjects included students of representative ethnic and cultural backgrounds at Michigan State University. Questionnaires included an acculturation scale (some of the content being dependent upon the students' self-identified ethnicity) and a survey of health beliefs and behaviors in response to a vignette. Data collected in this study will contribute to increased knowledge of pain management and will aid in the proposal of changes in the assessment of pain, particularly in the United States.

Modulation of Osteoblast AP-1 Levels by Hypoxic Conditions
Andrew R. Reinink, under the direction of Dr. Laura McCabe, Physiology

The maintenance of bone is a dynamic process that involves a constant resorption of old bone and formation of new bone. The cells responsible for the formation of new bone are the osteoblasts. We are able to culture these cells in dishes in the lab and use them to follow the stages of development that osteoblasts undergo in order to make bone. Initially, cells undergo proliferation until they cover the surface of the plate and become confluent. Then, osteoblasts begin to differentiate. Early stages of differentiation are marked by increases in expression of collagen, runx2, and alkaline phosphatase. Important regulators in the differentiation pathways are the AP-1 transcription factors. Several factors have been demonstrated to regulate expression of these genes, particularly force. Forces such as vibration, shear, and hyper-gravity have all been shown to promote bone formation, while conditions of decreased force (micro-gravity in outer space) have been shown to lead to bone loss. During studies of micro-gravity, our lab discovered that some of the effects on markers of differentiation might have been caused by a lack of oxygen in the incubation chamber. My project is to determine whether hypoxic conditions change the levels of the AP-1 transcription factors cFos and cJun. We predicted that levels of these proteins would be decreased in hypoxic cells, and so far, our results support the hypothesis. We hope that the elucidation of the molecular mechanisms involved in regulating expression of these genes may lead to a better understanding of how activities generating increased force on the human body, such as athletics, lead to the formation of new bone. This in turn can help contribute to determining how bone loss pathologies occur.

Communicating Changes in Horizontal Alignment: Current Results
Hannah S. Remtema, under the direction of Dr. Richard Lyles, Civil Engineering

Rural roads make up 80% of the US road system and account for 40% of the vehicle miles traveled every year. However, the budget for signing and marking rural roads is small in most states. Methods for communicating changes in horizontal alignment to the rural road driver through signs, markings, and advisory speeds are often inconsistent between (and within) jurisdictions. This National Cooperative Highway Research Program (NCHRP) project has evaluated the current signing practices on rural roads

and is in the process of creating universal guidelines. A literature review was performed to evaluate the state of the art. State of the practice was assessed through a national mail survey of practitioners and focus groups in Michigan, Indiana, and North Carolina. State Manuals of Uniform Traffic Control Devices (MUTCDs) were evaluated and different advisory speed determination methods were applied to a wide range of curves in the area. Finally, drivers' opinions of current curve signing practices were obtained through mail surveys in Michigan and North Carolina and a focus group in Michigan. The results of this research show that drivers find the current curve signing methods helpful when negotiating curves. However, not all drivers are completely clear about what the signs mean. Practitioners felt that current signing guidelines were sufficient, and that any inconsistencies were the result of "Engineering Judgment."

Identification of Single Nucleotide Polymorphisms in Candidate Tumor Suppressor Genes in Canines

Sandra R. Richardson, under the direction of Dr. Patrick Venta, Microbiology

Cancer is one of the most common causes of death in dogs, and it is by far the leading cause of canine death due to disease. When a dog is diagnosed with cancer, it is helpful to know the molecular cause of the cancer before deciding on a treatment option. If it can be determined that a copy of a tumor suppressor gene was lost in the cells which developed into a tumor, a phenomenon known as loss of heterozygosity (LOH), it can be inferred that the cancer was caused, at least in part, by the loss of tumor suppressing function. Conversely, if a candidate tumor suppressor gene shows loss of heterozygosity in the cancer cells of an afflicted individual, this is evidence that the gene does indeed have tumor suppressing functions. Single nucleotide polymorphisms (SNPs) are genetic markers which can be used to determine if loss of heterozygosity has occurred. The goal of this study is to characterize SNPs, and any other polymorphisms, within candidate tumor suppressor genes. Thirty candidate tumor suppressor genes were selected and primers were designed to amplify an intronic region from each gene. Of these fourteen gene fragments were successfully amplified and were sequenced using pooled dog DNA as the template. SNPs were detected in the genes STAT5B and TSC1. A bimorphic SINE (short interspersed nuclear element) was found in the gene FEZ1 and a microsatelite was discovered in the gene CDKN1B. In future experiments, these polymorphisms will be used to test tumors for LOH.

Propagation of Replication-incompetent Adenoviral Vectors Encoding Human Superoxide Dismutase Gene for Experimental Gene Therapy

Anjali Rohatgi, under the direction of Dr. Alex Chen, Pharmacology and Neurology

Replication-incompetent adenoviral vectors are promising vehicles for human gene therapy. In cardiovascular diseases, an oxygen free radical, superoxide, is overproduced, causing dysfunction in blood vessels. Extracellular superoxide dismutase (EC-SOD) is an important endogenous scavenger of superoxide. Our long-term goal is to treat cardiovascular disease with gene therapy. This study was aimed at generating and propagating an adenoviral vector encoding human EC-SOD in order to perform gene therapy experiments in hypertensive and diabetic rodents. Human embryonic kidney carcinoma cells (HEK 293) transformed with the left end of human adenovirus type 5 DNA to complement the deleted early 1 region of the recombinant adenovirus, were used to propagate viral vectors in cell culture. The viral stock was used to infect a confluent monolayer of 293 cells in T175 flasks. Harvested viruses were purified by cesium gradient ultracentrifugation and were dialyzed against 10 mmol/L Tris, 1.0 mmol/L MgCl2, 1.0 mmol/L HEPES and 10% glycerol for 4 hours at 4°C. The viral titer was determined by plaque assay. Our results indicate that vectors of sufficient titers were generated. Future EC-SOD gene therapy using these vectors in hypertensive and diabetic rodent models may facilitate the development of human gene therapy. This project was supported by grants from the National Institutes of Health, the

American Heart Association, and the American Diabetes Association to Dr. Alex Chen.

Development of Augmented Reality System for AFM Based Nanomanipulation
Ali Saeed, under the direction of Dr. Ning Xi, Electrical and Computer Engineering

The use of Atomic Force Microscopy (AFM) as a nanomanipulation tool has been researched for more than a decade. However, the lack of real-time visual feedback during manipulation has hindered its otherwise vast potential. To overcome this problem, a novel Augmented Reality Enhanced AFM Nanomanipulation System has been developed in the Robotics and Automation Laboratory at Michigan State University. By locally updating the AFM image based on real-time force information during manipulation, not only can this new system provide real-time force feedback, but it can also provide real-time visual feedback. This visual feedback coupled with real-time force information creates a powerful augmented reality environment, which allows the operator to feel the interaction forces and observe real-time changes in the nano-environment. This augmented reality system enables the operator to perform several tasks such as nanolithography, and manipulations of nano-particles without the need of a new image scan. This presentation will be concentrated on further development of the augmented reality system. The ability of the system has been extended from manipulations of nano-particles to manipulations of nano-rods, nano-tubes, nano-wires and DNA molecules. These developments will facilitate the use AFM based nano-assembly in an increasingly wider range of applications.

Climate Change Effects on the Structure of Southern Beach (Nothafagus spp.) Forests in Southern Tierra del Fuego, Argentina
April J. Sanders, under the direction of Dr. Patrick J. Webber and Dr. Craig Tweedie, Plant Biology

Understanding how forest structure will alter in response to climate change is important for assessing the future state of the Earth system and the way in which humans will need to adapt. Southern beach (Nothafagus spp.) is present in the fossil record of India, Africa, Australia, Antarctica, and South America, which comprised the former southern hemisphere super continent Gondwana. Palaeo evidence suggests this important and relict species responded to climate change by 'migrating' northwards and downwards in altitude during periods of glaciation and southward and upward during interglacial periods. This study investigated how the trends in climate change could impact the structure of southern beach forest in the southern Andes. Aspects of forest structure were measured along a 400m altitudinal gradient and altitudinal trends were modeled against lapse rate. Models were then combined with climate change forecasts for the region and the change in forest structure was assessed. Results suggest a significant alteration to the present structure of southern beach forests will take place over the next century. These impacts are discussed with reference to the alteration of regional patterns of carbon cycling and species diversity.

Design of Novel Ansamycin Antibiotic Derivatives as Inhibitors for Parasitic Hsp90
Erica L. Scheller, under the direction of Dr. Leslie Kuhn, Biochemistry and Molecular Biology

Over the past twenty years, the importance of protein structures to biomedical research has become little more than an accepted generalization. This is reflected not only by the presence of many structural research labs but also by the quickly increasing number of entries in the protein data bank or PDB. The preferred result of the submissions to the PDB would be to gather at least one structure for every protein sequence family. This would allow virtually any structure to be determined by techniques such as homology modeling. Based on the structures from the PDB, complementary ligands can be designed to inhibit or enhance the activity of a protein. In my project I have been working mainly with Heat Shock

Protein 90, the goal of which is to design a ligand which will inhibit the Hsp90 of P. falciparum but not that of humans. P. falciparum is one of four protozoans than can infect and cause Malaria in humans; it is also the most lethal and can cause up to two million deaths per year. My work has involved the creation of computer homology models of the P. falciparum Hsp90, and mapping of the main interactions of the ligands. From these models, I have designed derivatives of an ansamycin antibiotic scaffold that serve as potential inhibitors of P. falciparum Hsp90 activity. Our goal is to design derivatives that will selectively bind and inhibit the parasitic Hsp90 while leaving that of the human active.

Hemispheric Differences in Selective Attention
Julie M. Schiller, under the direction of Dr. Alessandra Passarotti, Psychology

There is limited knowledge on whether there are hemispheric differences in attention processes. Past studies utilizing the flanker paradigm have been confounded regarding hemispheric asymmetries for processing distracters. The flanker paradigm includes a target with two side distracters. Performance typically improves when distracters are similar to the target and decreases when they differ. In this study, presentation to visual fields was lateralized to examine which hemisphere processed the stimuli, to examine possible differences in hemispheric processing for the traditional flanker paradigm. This study will help clarify the existence, as well as the size, of hemispheric specialization in processing flanker stimuli.

Society's Control of Gender: More than a Penis or Vagina
Jennifer M. Schmidt, under the direction of Dr. Danielle DeVoss, Writing, Rhetoric, and American Culture

The first question asked when a baby is born is "girl or boy?" We typically make judgments based on the norms of society and assign one of two genders to each and every person. We are taught to live up to and meet these norms so that we are a "functioning" part of society. With this in mind, our study addresses the question: To what extend does society limit or enhance gender expression? To answer this question, we developed and conducted a survey of the MSU community to try to explore how various individuals developed their notions of gender and how these notions affect their everyday lives.

Prediction of Host Disease Phenotype Based on Genetic Anaylsis of the Capsid Protein Gene of Feline Calicivirus
Isaiah A. Scott, under the direction of Dr. John M. Kruger, Small Animal Clinical Sciences

Feline calicivirus (FCV) is a common respiratory pathogen of cats. However, FCV has been associated with other extra-respiratory illnesses including lameness, cystitis, abortion, and hemorrhagic fever-like syndromes. Viral genetic or antigenic features that consistently predict disease phenotype have not been identified. The purpose of this study was to identify genetic features of the FCV capsid protein gene that could better predict disease phenotype. Amino acid sequences for region E of the capsid protein were obtained for 39 FCV strains with known disease phenotypes. Strains were divided into two groups; those involving only the upper respiratory tract, and those involving other organ systems. Multiple amino acid sequence alignments and phylogenetic trees were constructed for (1) the entire region E of the capsid protein gene, and (2) a conserved portion of region E. While clustering of FCV strains based on disease was not apparent in phenograms based on the entire region E, clustering was readily apparent in the phenogram based on the conserved portion of region E. Sequence analysis revealed that FCV strains with lysine (K) and serine (S) residues in the 4th and 5th positions respectively of the conserved portion of region E were significantly more likely to be associated with extra-respiratory tract illnesses ($P<0.03$).

The KS genotype of the conserved portion of region E appears to be predictive of the extra-respiratory disease phenotype in infected cats.

Utility of Survey Grade Differential Global Positioning System (DGPS) Technology for Monitoring Coastal Erosion
Shawn P. Serbin, under the direction of Dr. Craig Tweedie and Dr. Patrick Webber, Plant Biology

On-going research has documented the coastal dynamics within the Barrow area, using a combination of GIS and remotely sensed imagery interpretation to estimate coastal loss and accretion (Brown et al. 2003). The objective of the current project was to demonstrate the viability of Differential Global Positioning System (DGPS) technology in monitoring coastal position and changes. The result is a high-resolution outline of the entire coastline of the Elson Lagoon ACD key site located on the eastern boundary of the Barrow Environmental Observatory. The development of this baseline data set is intended to help confirm prior conclusions of erosion, update the estimated rates for the four contiguous segments of the key site coastline, and develop a protocol to track future shoreline changes. This methodology may also contribute applicable standards to other studies of erosion in coastal regions in the Arctic.

Educational Video Games
Khalifah K. Shabazz, under the direction of Dr. Brian Winn, Telecommunication, Information Studies, and Media

Do you think you could enjoy learning math, or reading, or even science? If your answer is no, then you have not played any series of educational video games. The game industry is booming, but educational video games still do not get enough attention. I plan to end that with a new series of educational video games. These games are specifically geared to teach people of all ages, while giving them the satisfaction of a normal video game, which is the "have fun" factor.

BluJag: A Raytraced Rendering System
Saini Shailesh

3D rendering and animation are two exciting areas of research and development in the computer graphics field. These technologies are now beginning to permeate mainstream culture, evident from their emergence in the latest animated feature films and the hottest new video games. The BluJag rendering system is one such technology in this field, serving as a complete 3D rendering and animation solution developed in C++. It operates as a 3d studio max model viewer, a mesh animation player, a scripting engine, and a raytracer with the ability to render sequential frames. To showcase BluJag's capabilities, we created a short video. Also, to display its scalability, we developed a basic side-scrolling video game using BluJag. The video demonstrates the rendering capabilities by utilizing the high-quality software raytracer, while the side-scroller highlights BluJag's flexibility as a basis for more advanced software projects.

How Personality Moderates Binge Drinking Behavior
Karen L. Sharrow-Reabe, under the direction of Dr. Bruce Burns, Psychology

There is currently a great deal of research investigating why some people are more likely to drink alcohol than others. Binge drinking, in particular, is a great concern. By better understanding why some people

are more likely to binge drink than others, more dynamic approaches can be made to reduce potentially harmful behavior. Current literature suggests that binge drinking is related to a risk-taking component of personality. A second approach to understanding drinking behaviors includes decisional-balance. This is the concept that when there are more pros to a given action than there are cons, a person will engage in a given behavior. If the cons outweigh the pros, the person will not engage in the behavior. Using the decisional-balance theory, people who drink more perceive the benefits of drinking to outweigh the risks. The current study examined the effects of each personality and decisional-balance on binge drinking behavior.

Characterization of Polyaniline for Improving an Antibody-based Biosensor
Marita L. Sheldon, under the direction of Dr. Evangelyn Alocilja, Biosystems Engineering

Pathogens in food sources are a potential means by which human and animal populations may obtain various illnesses. The first step in eliminating these pathogens is detecting them in a fast, accurate manner. Antibody-based biosensors are developing tools for achieving this rapid detection, but there are still many steps to be taken in optimizing the performance of these devices. Specifically, it is necessary to increase the sensitivity of these biosensors in order to detect the lowest concentration of pathogen possible. This project aimed at characterizing the attributes of polyaniline, a conductive polymer used in an antibody-based biosensor, in order to make the biosensor more sensitive and function with greater accuracy than previously possible.

The Guadiana Bridge: A Cultural Integration
Adam M. Shissler, under the direction of Dr. Jon B. Burley, Landscape Architecture

Bridges are important to a nation and its people. They promote commerce and the linking of people and ideas. Bridges are an essential element of the landscape that can make a profound cultural statement. With this in mind, I designed a high-speed rail bridge, which crosses the Guadiana River at the border of Spain and Portugal. Within the design, I reflected a sensitive yet progressive view of these two nations' landscapes and cultures. This project emphasized the concept of a diverse past, a diverse people, and a single future. The implementation of this concept entailed a detailed transition of forms and materials representing various cultural influences through time. At the entrances to the bridge, forms were constructed to symbolize the classic architecture of the Phoenicians. The forms quickly move into those of the Romans and then the Moors. The bridge compliments Villa Real Saint Antonio and Ayamonte, the cities through which this bridge is to be constructed. It is not intended to impose. At the water’s edge, colorful tile work takes center stage as modern Iberia is represented. Centered directly at the border of the two nations a vertical spire rises above all other structures. The future. It is a spire that draws together the flowing and separate forms representing the intertwining destinies of Spain and Portugal. Representing the common good and the hopes of Europe as a whole. This bridge is a testament to what was, what is, and what may be.

Getting Skin Deep: Skin Color Perceptions in the African American Community
Latanya T. Simpson, under the direction of Dr. Denise E. Troutman, Writing, Rhetoric, and American Cultures

It is a known fact that discrimination occurs amongst people of color. Prior to the African American race, such a notion evolved during colonization, and is still prevalent. The variation of skin tones amongst this race has become the burden of self-images. This study will present quantitative and qualitative results on several African Americans’ perceptions of beauty within their race.

Role of Caveolae in endothelin-1 (ET-1)-induced Contraction in Arteries and Veins
Charles T. Smark, under the direction of Dr. Stephanie Watts, Pharmacology and Toxicology

Cholesterol rich caveolae are important signaling domains. We hypothesized that ET-1-induced contraction in arteries and veins was caveolae-dependent. We validated our treatment by demonstrating in rat tail artery that cholesterol depletion with methyl-B-cyclodextrin (mBCD) (10 mM) reduced serotonin-induced contraction (mBCD: 10-fold rightward shift). Effects of mBCD in tail artery were partially reversible by cholesterol repletion (-log EC50 [M] control = 7.07+/-0.56, -log EC50 mBCD = 6.08+/-0.01, -log EC50 cholesterol = 6.51+/-0.02). By contrast, in rat thoracic aorta and vena cava, mBCD (10 mM) increased ET-1 potency (aorta: 9-fold leftward shift, vena cava: 20-fold leftward shift). Cholesterol repletion partially corrected the leftward shift in ET-1-induced contraction in vena cava, but did not do so in aorta. mBCD leftward shifted KCl-induced contraction in aorta and vena cava and increased maximum KCl contraction in vena cava (maxcontrol = 198.4+/-32.8% of initial 10-5 mol/L norepinephrine contraction, maxmBCD = 273.1+/-58.3). Electron microscopic analysis revealed that mBCD incubation removed caveolae on the membrane of smooth muscle cells and cholesterol repletion reformed caveolae. These results suggest that in vena cava, cholesterol in caveolae inhibits contractility and that ET-1-induced contraction may be negatively influenced by caveolae; the role of caveolae in aorta is less clear.

The Effects of Caregiver Role Strain on Depressive Symptoms in Chronically Ill Children with Pets
Katherine A. Smith, under the direction of Dr. Linda J. Spence, College of Nursing

Perhaps the most important relationship in life is the parent-child bond. Parents influence many aspects of their children's lives, including habits, attitudes, and mental health, including depression. Many researchers have established a link between genetics and depression, but this paper looks beyond the hereditary nature of parents' depression and considers other parental factors that could be correlated with depressive symptoms in children. This research uses a diathesis-stress model to examine the relationship between caregiver role strain in parents of chronically ill children and the depressive symptoms these children experience. It is predicted that a regression analysis will show that as caregiver role strain increases, there will be an increase in child's depressive symptoms also. Participants are 81 children aged 7-13 years, with at least one legal guardian reporting. Children have been diagnosed with Type 1 Diabetes for at least a year, with no other chronic conditions or developmental disabilities, have a companion animal present in the home, and can read English.

The Role of hRev7 Over-expression on Mutagenesis in Human Fibroblasts
Ankoor B. Soni, under the direction of Dr. Veronica M. Maher, Carcinogenesis Laboratory

Carcinogenesis, the process by which normal human cells are changed into tumor forming cells requires that a cell undergo a series of mutations, each followed by clonal expansion of the mutated cell. It is known that normal DNA replication polymerases are unable to use damaged DNA as a template. Instead, specialized polymerases, able to incorporate nucleotides opposite such damage, i.e., carry out translesion synthesis (TLS), are required. TLS can be error-free or error-prone, depending on the polymerase involved and the type of DNA damage encountered. One of these is DNA polymerase zeta, composed of hRev3 and hRev7. The Carcinogenesis Laboratory found that human cells expressing antisense hREV3 show a reduced frequency of UV-induced mutations, suggesting that pol zeta plays a role in mutagenic TLS past UV-damage. Whether hRev7 also plays such a role is not known, as attempts to reduce its expression have been unsuccessful to date. However, in vitro studies on yeast Rev7 have shown that addition of yeast Rev7 to the reaction increased the polymerase activity of yeast Rev3. Based on this, I have stably transfected a plasmid construct containing the hREV7 gene into human fibroblasts. I am currently assaying transfectants to identify for clones that over-express the protein using Western blot

analysis and will UV irradiate clones with over-expressed hRev7 to determine the effect of over-expressing hRev7 on mutation frequency.

Effect of Heating Rate on Thermal Inactivation of Salmonella in Turkey
Matthew J. Stasiewicz, under the direction of Dr. Bradley Marks, Agricultural Engineering

Traditional first-order kinetic models for predicting thermal inactivation of bacteria consider only the current state of the product. The purpose of this study was to investigate whether heating rate, an aspect of temperature history, affects inactivation rate of Salmonella in actual meat products. The project entailed inoculating irradiated ground turkey thigh with salmonella, programmed heat treatments with five heating rates, recovery of survivors and comparison of predicted and observed lethality. Predicted lethality was calculated by a modified Arrhenius equation and significant error was found between the model and observed lethality. Slower heating rates returned large under-reduction where as the effect of faster rates approached zero. The magnitude of the error was seen to vary with a negative inverse relationship to heating rate. These results are significant for industry food safety where current models predict the maximum possible kill by ignoring heating rate effects and therefore could return inadequate, fail-dangerous, thermal reduction profiles.

Effect of Poloxamer 188 in Long-term Survival of Damaged Bovine Articular Cartilage Cells
Aaron D. Stewart, under the direction of Dr. Roger Haut, Osteopathic Manipulative Medicine

Cell necrosis in articular cartilage after blunt trauma is thought to lead to osteoarthritis—a major issue in terms of both medical cost and personal health for those afflicted. Cell necrosis results from a ruptured cellular membrane, in this case caused by the shearing forces induced by blunt trauma. Our lab has been investigating Poloxamer 188, a polymer that can insert itself into a damaged cell's membrane, thereby sealing the membrane and preventing cell necrosis. We have been investigating if treating bovine articular cartilage explants with P188 post-impact will result in saving cells. This lab has already shown that at 24 hours post-impact, P188 treated explants did have a higher percentage of live cells than those explants not treated with P188. Whether the cells saved by treatment with P188 continue to survive past the first 24 hours post-impact had not been pursued, until now. We are currently running experiments in which explants are impacted, after which some explants are treated with P188 for 18 hours and some explants are not. We then evaluate cell necrosis at 24 hours and 4 days post-impact and compare the percentage of live cells in P188 treated and non-treated groups of explants. We will present our findings in this regard. If safe and effective, it is hoped that P188 may be used for human patients after blunt trauma to joints, such as knee-dashboard impacts in car crashes, to mitigate possible effects of osteoarthritis by reducing cell necrosis.

Modeling Bean Texture as a Function of Time and Temperature
Andrew W. Stoeckle, under the direction of Dr. Kirk Dolan, Agricultural Engineering and Food Science

The purpose of this research is to select a model to predict the texture of beans as a function of arbitrary cooking time and temperature. Beans were cooked for different times at variable temperature and then tested for firmness. The rate constants and activation energies were determined for first-order and nth-order decreases in firmness.

Modeling Protein Folding
Andrew W. Stumpff-Kane, under the direction of Dr. Leslie Kuhn, Biochemistry and Molecular Biology

One of the most active current areas of biochemical investigation involves understanding the process by which proteins, once synthesized by cellular machinery, assume the correct 3-dimensional structure necessary for proper functionality (that is, how proteins "fold"). "FIRST" (for "Floppy Inclusions and Rigid Substructure Topography") is a computer technique our lab developed (with Mike Thorpe and Don Jacobs) to explore the structural and folding properties of proteins. Given the structure of a protein (as determined, for example, by x-ray crystallography), FIRST identifies those regions of the molecule that are rigid, based on the constraints placed on each atom by intra-molecular interactions. FIRST can then be utilized to model thermal denaturation of the protein, by simulated breaking of each of the protein's hydrogen bonds, from the weakest to the strongest, and testing the molecule at each stage for remaining areas of rigidity. In this way the elements of protein structure that are most stable can be identified. The lab has shown that the durable areas of structure identified using FIRST may predict components of the "folding core" representing important elements of structure formed early during protein folding—the region of a protein experimentally most stable, for example, with respect to hydrogen-deuterium exchange.

Life or Death: How John Campbell's *Astounding* Survived the Great 1950's Die-off
Aimee B. Sutherland, under the direction of Dr. Lister Matheson, English

Is the science fiction magazine dying? The short story digest magazine has been experiencing a downward trend in circulation. Whether or not this trend proves to be fatal to the genre, magazine editors should consider the best ways to bolster magazine sales. The Editorial Policy Project compares a winner and loser in the 1950's science fiction magazine die-off. This project seeks to determine if and how editorial policy influenced that die-off by comparing John Campbell's *Astounding* to *Planet Stories*, one of the many failed magazines of this era. Editorial policy determines the quantity, length, and quality of stories, the presence and content of other departments (including science fact articles), letters to the editor, editorials, the use of advertising, and the general look and feel of the magazine. We will discuss specific reasons why *Astounding* survived, including Campbell's reader-oriented editorial policy; and apply these findings to make recommendations to the editors of today's *Analog*.

Protein Expression and Deletion Mutagenesis of Hepatitis Delta Antigen
David J. Taggart, under the direction of Dr. Zachary Burton, Biochemistry and Molecular Biology

Hepatitis Delta Antigen (HDAg) is a viral protein required for the replication of the Hepatitis Delta Virus, a satellite virus of Hepatitis B. HDAg exists in two forms, HDAg-S (195 amino acids long) and HDAg-L (214 amino acids long) that stem from the editing of a common mRNA. HDAg-S binds RNA polymerase II (RNAPII), stimulates RNAPII transcription, and promotes RNAPII elongation, however, the mechanism for such stimulation is not yet known. Our lab has studied HDAg-S in millisecond phase kinetic studies of RNAPII to determine how HDAg-S stimulates elongation. HDAg-S has well-characterized interactions with RNA and many defined functional domains including: a coiled-coil domain that participates in protein oligomerization, a helix-turn-helix domain that participates in RNA binding and a C-terminal region that binds RNAPII. In order to determine the relationship of RNA binding by HDAg-S to the stimulation of RNAPII transcription, deletion mutants of HDAg-S were created. Deletion of increasing portions of the RNA binding domain while leaving the RNAPII binding region intact had little effect upon the stimulation of transcriptional elongation of RNAPII by HDAg-S. However, deletion of the HDAg-S region involved in RNAPII binding while leaving the RNA binding domain intact eliminated elongation stimulation. We conclude that RNA interaction has little or no

importance for stimulation of RNAPII elongation by HDAg-S.

Black Womanhood on the Cover: The Historical Evolution of *Essence* Magazine, 1970-2004
Geneva S. Thomas, under the direction of Dr. Pero Dagbovie, History

Since its founding in 1970, *Essence* magazine has been regarded as the, "country's leading lifestyle magazine for African American women." Created during the Black Power era, *Essence* has undergone a host of transformations, corresponding with the broader changes in the African American experience for the last three and a half decades. It is pictured on covers to advertisements the Black nationalistic images of dark-skinned Black girls with naturals, Black couples and families with African attire and accessories and the timeless photography of Gordon Parks. Yet as the popularity of Black Nationalist ideologies weaken with the destructive systematic tactics of Cointelpro, so did the literary consciousness of *Essence* magazine. This presentation seeks to address several research questions regarding the historical evolution of *Essence* magazine's journalistic portrayal and representation of the images and conditions the surround the Black woman. Who founded *Essence* magazine and why was it created? How do the images in the publication change overtime from the 1970s to the present? Beginning in its founding, how has the editorial direction of Black men affected Black woman representation? Are the images a consistent mirror of the Black woman experience from the 1970s to the present? This research will essentially demonstrate and describe the change in the nationalistic consciousness of *Essence* magazine represented through the images of the Black woman.

Why Duchamp? Marcel Duchamp's Influence on Contemporary Architecture
Amanda G. Tigner, under the direction of Dr. Phylis Floyd, Art and Art History

Marcel Duchamp was a French painter turned conceptual artist, film maker, erotic guru, and chess player. He was, however, never an architect, nor specifically interested in architecture, and yet, he has exerted a tremendous influence over a generation of architects practicing after 1975, as well as over current architectural historians and theorists. Contemporary literature in architectural theory has gone so far as to argue that architectural works created before many of the works of Duchamp, such as La Città Nuova, be understood within the context of Duchamp's works. Architects have, in roughly the past twenty-five years, picked up on concepts in which Duchamp was interested and integrated them into their works. This has been possible largely because of dramatic shifts in the way that art is defined in this new postmodern era. Indeed, several prominent architects have incorporated Duchampian concepts such as eroticism as metaphor and the infra-thin into their work. This discussion seeks to establish why and how Marcel Duchamp has been so influential in contemporary architecture by exploring Duchamp's ideas alongside the work of two postmodern architects upon whom Duchamp has been extraordinarily influential: Robert Venturi and Diller + Scofidio.

A Search for Distant Clusters of Galaxies: Mining "Old" NASA Data for New NASA Discoveries
Christine M. Trombley, under the direction of Dr. Megan Donahue, Physics and Astronomy

Clusters of galaxies are the most massive, gravitationally-bound systems in the universe. Cluster studies reveal how much and what kind of matter is in the universe. At first, clusters were discovered by examining optical "plates" for high galaxy densities. This technique revealed many clusters, but some were false, mere projections of otherwise unrelated galaxies. With X-ray imaging and computers, automated searches of X-ray and optical images are now possible. But automated searches using different strategies do not necessarily return the same results. For my project, I have mined the X-ray Multi-Mission (XMM) data archive for observations of candidate optical clusters of galaxies from the ROSAT-

Optical X-ray Survey (ROXS). ROXS candidates were selected from X-ray and optical images. XMM, a far more capable telescope than ROSAT, serendipitously re-imaged ROXS candidates. I will describe the preliminary results of my investigation of the images and catalogs, including interesting updates to the ROXS catalog.

Optimized Detection of Bacteriuria
Judith A. Turnbull, under the direction of Dr. Cheryl Swenson, Pathobiology and Diagnostic Investigation

The purpose of the present study was to evaluate the diagnostic accuracy of detection of bacteriuria using two bacterial isolates over a range of bacterial and urine specific gravity concentrations in whole urine vs. urine sediment and heat fixed vs. non-heat fixed slides compared with quantitative aerobic bacterial culture as the gold standard. Our hypotheses were that the number of bacteria enumerated on Wright-stained slides: 1) from whole urine would not differ from that in urine sediment, eliminating the need for sedimentation with resultant concentration of cellular and other confounding debris; 2) that are heat-fixed prior to staining would be greater due to improved bacterial adherence. Urine samples collected by cystocentesis were serially diluted, then spiked with logarithmic dilutions of two common bacterial isolates. Twenty microliter aliquots from these prepared urine samples were placed onto replicate glass slides, air dried, +/- heat-fixed, Wright-stained, and examined by light microscopy to quantify the mean number and morphologic types of bacteria observed.

Expression of Genes in the Adrenal Gland of Cattle Under Stress
Michael J. Van Andel, under the direction of Dr. George Smith, Animal Science

Exposure to stress has a negative impact on health and well being of animals. The adrenal gland of cattle secretes the steroid hormone cortisol in response to stress. The purpose of this research was to determine the effect of transportation stress on expression of genes in the adrenal gland of cattle. RNA was isolated from adrenal glands of cattle collected at 0, 2, 4, and 10 hours after initiation of transport and changes in gene expression analyzed using cDNA microarrays. Work is still in progress.

Regulation of a Developmental Myxococcus xanthus Gene that Depends Absolutely on C-signaling for Expression
Kartik Viswanathan, under the direction of Dr. Lee Kroos, Biochemistry and Molecular Biology

Myxococcus xanthus is a gram-negative soil bacterium that undergoes multicellular development. Normal development requires cell-cell signaling, including the A-signal, which acts early to monitor cell density, and the C-signal, which acts later to coordinate cell movement, resulting in rippling and aggregation, and still later to trigger sporulation within fruiting bodies. 4406, one of several developmentally regulated genes identified by Tn5 lac insertions, for which lacZ depends on C-signaling. To begin to understand regulation of the 4406 promoter in response to C-signaling, the promoter region was identified previously. In the present study, an attempt has been made to define the minimal promoter region using deletion analysis. Different segments of DNA were fused to lacZ, the fusions were integrated into the M.xanthus chromosome, and expression was measured during development. The –500 to +50 bp region of 4406 showed no promoter activity, but a segment from –500 to +500 bp showed much higher activity, suggesting that there is a positive regulatory element between +50 and +500 bp. A comparison of segments with 5’ ends at –100 and 3’ ends at +50 or +500 bp, also supported this idea. However, both segments with 5’ ends at –100 bp exhibited considerably higher activity than those with 5’ ends at –500 bp. This suggests that a negative regulatory element lies between –500 and –100 bp, which appears to act independently of the downstream positive element.

Pheromone Pre-exposure Modulates Subsequent Behavioral Responses to Pheromone in Two Species of Tortricid Moths
Kevin J. Vogel, under the direction of Dr. Larry Gut, Entomology

Application of synthetic pheromones in agricultural environments is an important biorational tactic for controlling populations of insect pests that rely on long-distance sex pheromones for communication. In a controlled laboratory wind tunnel, two apple pest moth species, Choristoneura rosaceana and Argyrotaenia velutinana, were presented with various blends and concentrations of their sex pheromone, either impregnated in rubber septa or in dispensers used for mating disruption. Moths were initially exposed to pheromone and then assayed either 15 minutes or 24 hours later. The proportion of moths flying upwind to pheromone sources and the duration of the flights were recorded. The proportion of C. rosaceana responding to pheromone sources after pr-exposure was much higher than that of naïve controls. The average flight duration of pre-exposed C. rosaceana was also longer than that of the naïve controls. In contrast, the results obtained for A. velutinana differed in that pheromone pre-exposure decreased responsiveness relative to naïve control moths. Electroantennograph assays proved that pre-exposure had no long term (24 h) impact on antennal responsiveness. Thus, the behavioral modifications observed were likely due to changes in the central nervous system. These data may provide insight into why it is more difficult to disrupt the mating of C. rosaceana with A. velutinana using field-applied pheromone in agricultural settings compared.

A Computer Interface for Playing Checkers
Maxwell D. Walter, under the direction of Dr. George Stockman, Computer Science and Engineering

Human-computer user interfaces have traditionally been constrained by hardware that is often not suited for the task at hand. This study is an attempt to create an interface that is more intuitive for the user, using the game of checkers. Games are an interesting problem, because most people are familiar with the physical setup of the game, including the board and the pieces. Playing checkers using a computer, however, requires a virtual abstraction of the physical board that is manipulated using a hardware interface, such as a mouse or keyboard. However, this forces the player to interact with the game on the level of the computer through the computer's interface. Using aspects of computer vision, this study aims to create a method to play the game of checkers with a computer while still using the physical checkers board and pieces. This would have the effect of allowing the computer to play the game on the level of the player.

Role of the Metallochaperone UreE in Ni-Dependent Activation of Urease
Sarah K. Ward, under the direction of Dr. Robert Hausinger, Microbiology and Molecular Genetics

Urease is a Ni-containing enzyme critical to the virulence of several pathogens of the urinary and gastrointestinal tract. Klebsiella aerogenes, a non-pathogenic soil organism, has seven urease-related genes. Three are structural genes (ureA, ureB, and ureC) and four are accessory genes needed for urease activation (ureD, ureE, ureF, and ureG). UreE is a dimeric protein and is proposed to function as a metallochaperone by delivering Ni ions to UreDFG-apourease. UreE consists of two domains: the first 70 amino acids resemble known molecular chaperones such as Hsp-40 and the remaining 88 amino acids form a Ni-binding domain. The role of the two domains of UreE was investigated by creating four deletions using PCR: a deletion of the Hsp-40-like domain (Δ2-69), a deletion of the metal binding domain (Δ70-158), and two variations of a deletion of the entire UreE gene (Δ2-158 and Δ2-136f). Cells possessing plasmids containing these UreE deletions as well as the other six urease genes were grown overnight in Ni-containing medium. Results showed activity in all cultures except for the Δ2-158 and Δ70-158 deletions. Rates of activation of apourease in cultures grown in Ni-free medium and treated with

spectinomycin to inhibit protein synthesis were also examined. After addition of 1mM Ni to these cells the Δ2-69 deletion showed the fastest activation, with somewhat lower rates for wild type and Δ2-136f. The Ni-binding domain was also purified and found to be a dimer that binds Ni.

Race and Resegregation in Southfield, Michigan
Malaika G. Ward, under the direction of Dr. Louise Jezierski, James Madison College

Southfield, Michigan, long known as a successfully integrated suburb, now appears to be experiencing White flight. White flight has increased segregation in the city. The purpose of this study is to explore how and why White flight occurs. One reason why White flight occurs is the perception of "structural strength," which measures resegregation in a city, given three components: crime, property value, and educational value. Most White flighters are motivated to move due to their perception that blacks will increase crime, decrease property values, and decrease the value of an education in Southfield. My findings show the opposite of these measures. However, to increase the structural strength of Southfield, the school board, churches, and neighborhood associations need to work together to promote and create diversity.

Western Blot Analysis of the Pathway to Tumor Formation in Human Fibroblasts
Kathryn G. Williams, under the direction of Dr. J. Justin McCormick, Carcinogenesis Laboratory

Human fibroblasts require six to eight genetic mutations in order to progress to a tumorigenic or malignant state. An infinite lifespan cell lineage, derived following up-regulation of the myc gene and up-regulation of the telomerase gene, was developed in the Carcinogenesis Laboratory and has been used to model the genetic progression of normal human fibroblasts into tumorigenic cells. Infinite life span normal human cells are selected for their ability to form morphologically-altered cells following either the introduction of an overexpressed oncogene or a brief exposure of the cells to a carcinogenic agent. Changes in gene expression in fibroblasts that were malignantly transformed by oncogene-transfection have been found to differ from those in cells transformed by carcinogen treatment. Western blotting analysis has been used to examine these changes. Genes involved in two different pathways, specifically, the Rb, mdm2, p53, and p21 proteins as well as the Sp1, Sp3 and cMET proteins, which are known to be causally involved in fibroblastic cancer, were examined.

Altered Lifespan and Behavioral Aging in Drosophila Beta-Integrin Mutants
Heather A. Wolf, under the direction of Dr. Mike Grotewiel, Zoology

Insulin-like growth factor receptor signaling regulates longevity in C. elegans and Drosophila. Integrins, a type of cell adhesion molecule, regulate growth factor receptor signaling. To determine whether integrins regulate key aspects of lifespan, we evaluated longevity and behavioral aging in adult Drosophila harboring mutations in the integrin beta-subunit gene myospheroid (mys). We found that lifespan under normal housing conditions is significantly extended in female mys mutants, whereas in male mys flies lifespan was not substantially altered. Additionally, we determined that declines in locomotor activity are delayed for these female mys mutants. However, resistance to environmental stressors was unaltered in mys flies. Unlike some lifespan extension mutants, mys animals had normal body sizes, indicating that the extension of longevity is not due to changes in body size or food consumption. Egg-laying in mys females was also unaltered, dissociating changes in longevity from decreased fecundity. Our results indicate that integrins are important regulators of lifespan and behavioral aging in Drosophila.

Effects of DNA in the GTP Hydrolysis Activity of the Neisseria gonorrhoeae Signal Recognition Particle Protein PilA

Daniel J. Wood, under the direction of Dr. Cindy Arvidson, Microbiology and Molecular Genetics

Gonorrhea, which is caused by Neisseria gonorrhoeae, is the second most prevalent bacterial sexually transmitted disease in the United States. In gram-negative bacteria such as N. gonorrhoeae, up to 20% of proteins are exported out of the cytoplasm, and of these, approximately 10% use a protein targeting system called the Signal Recognition Particle (SRP). PilA is the receptor for the gonococcal SRP and has an intrinsic GTPase activity that is essential for its functioning. PilA GTP hydrolysis is stimulated by DNA in a sequence specific manner which has been previously shown in studies performed with the pilE promoter region (Arvidson, et al. 1999). The objective of the current study was to determine if other DNA sequences would also cause a stimulation of PilA GTP hydrolysis. DNA sequences associated with zipA, mtrC, and mexB were studied because these genes encode proteins known to utilize the SRP for targeting. In this study, I showed that the 5' upstream regions of zipA and mexB stimulate GTP hydrolysis of PilA 8-10 fold, while the 5' upstream region of mtrC increased the activity 6-8 fold. I also analyzed 12 additional DNA sequences previously identified in a PilA DNA-binding assay. I have observed variability in the capacity of these DNA fragments to stimulate PilA GTP hydrolysis, with some fragments able to stimulate activity and others not at all. Together, these data support a model in which DNA plays a role in targeting proteins through the gonococcal SRP.

Relationships Between Dietary Restraint, Stress, and Binge Eating Behaviors in a Female College Sample

Amanda M. Woods, under the direction of Dr. Kelly Klump, Psychology

Previous research has found significant positive relationships between binge eating and both dietary restraint and stress. However, few studies have examined interactions between dietary restraint and stress and their relative influence on binge eating behaviors. The purpose of this study was to examine subjects' self-reported stress levels and investigate whether the interaction of stress and restrictive dieting serves as a better predictor of binge eating behaviors than either stress or restrictive dieting alone. Participants included 497 undergraduate female students from a large Midwestern university. Binge eating was assessed using the bulimia scale of the Eating Disorder Inventory-2 (EDI-2). Stress levels of the previous year were assessed with the Social Readjustment Rating Scale (SRRS) and daily stress levels were assessed with the Daily Stress Inventory (DSI). Restraint was assessed using the Dutch Eating Behavior Questionnaire (DEBQ). Pearson product moment correlations indicated significant positive relationships among binge eating, stress, and restraint. Multiple regression analyses yielded restraint as the only significant predictor of binge eating behaviors, suggesting that neither stress nor the interaction of stress and restraint serve as significant predictors of binge eating behaviors. These findings are significant in suggesting that self-reported stress levels are not significant predictors of binge eating behaviors. Future research should extend these findings by utilizing multiple forms of stress assessments to further investigate if there are differences between relationships of stress and binge eating behaviors dependent upon the assessment of stress.

Is CFTR an Exchanger or a Channel: Determination via Amino Acid Sequence Analysis and Microphysiometry

Angela K. Wright, under the direction of Dr. Douglas Luckie, Lyman Briggs School and Physiology

Cystic Fibrosis is a genetic disease that results in the mutation of the Cystic Fibrosis Transmembrane Conductance Regulator (CFTR), which is thought to be a cAMP-activated anion channel found in apical membranes of wet epithelia (Luckie et al., 2001). Recently, work done by Joo Young

Choi and others support CFTR as a Cl-/HCO3- coupler or exchanger (Choi et al., 2001), instead of the currently accepted idea that CFTR is solely a chloride channel. Given these findings, we decided to test the "Choi hypothesis" that CFTR is a Cl-/HCO3- exchanger. We manipulated the extracellular concentrations of Cl- and HCO3-, to create conditions where a net efflux of HCO3-, would only occur if CFTR is a channel. We then monitored the extracellular pH of BPV (no CFTR) and 2WT2 (expressing CFTR) cell lines. Through this, we found that by stimulating the cell lines with 10μM Forskolin the acidification rate increased in both cell lines in our 24mM HCO3- media (normal extracellular HCO3- concentration); and in the 5mM HCO3- media, our BPV cell lines decreased 38% in acidification rate, while the 2WT2 increased by 18%. We also looked into the amino acid sequences of CFTR, DRA, a Cl-/HCO3- Channel, and an Anion Exchanger to compare and contrast them to further our understanding of CFTR in relation to other exchangers and couplers. Unfortunately, our analysis was inconclusive, as there were limited regions of homology between CFTR, DRA, the Cl-/HCO3- Channel, and Anion Exchanger.

Society's Control of Gender: More than a Penis or Vagina
Kyle W. Wyrick, under the direction of Dr. Danielle DeVoss, Writing, Rhetoric, and American Culture

The first question asked when a baby is born is "girl or boy?" We typically make judgments based on the norms of society and assign one of two genders to each and every person. We are taught to live up to and meet these norms so that we are a "functioning" part of society. With this in mind, our study addresses the question: To what extend does society limit or enhance gender expression? To answer this question, we developed and conducted a survey of the MSU community to try to explore how various individuals developed their notions of gender and how these notions affect their everyday lives.

An Exploration of Perspectives in Early Childhood Inclusive Education
Bethany A. Zimmerman, under the direction of Dr. Esther Onaga, Family and Child Ecology

Children with developmental delays are often placed in classes that separate them from their typically developing peers. Michigan has recently made efforts to learn more about preschools that include children with developmental delays in classrooms with typically developing children. This study explores the perspectives of parents whose children have participated in an inclusive early childhood program and represents parents of typically developing and developmentally delayed children. Perspectives of early childhood schoolteachers and administrators are also explored.

Olfactory and Vomeronasal Responses in a Salamander
Julie M. Ziobro, under the direction of Dr. Heather Eisthen, Zoology

The function of the vertebrate vomeronasal system is largely unknown, although it is hypothesized to be specialized for the detection of pheromonal cues. I am studying differences in responding to many chemical stimuli in the olfactory and vomeronasal epithelia of axolotls (Ambystoma mexicanum), which are large, non-metamorphosing aquatic salamanders. I used electrophysiological field potential (electro-olfactogram, EOG) recordings to measure the relative responses to L-amino acids, volatile odorants, bile acids, conspecific body odorants, and food odorants. I did not observe any consistent differences in responding between the olfactory and vomeronasal epithelia of either males or females, which raises questions concerning the relative functions of each of these systems in aquatic salamanders.

Regulation of Translocation by Transcription Factor IIF

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Transcription factor IIF (TFIIF) is involved in both initiation and elongation by RNA polymerase II (RNAPII). TFIIF is composed of two subunits, RNAPII associating protein 74 (RAP74) and RAP30. Our lab has previously shown that mutations in the alpha1 helix of RAP74 cause a serious defect in elongation. It has also been found that TFIIF and Stimulatory factor II (SII) can cooperate to suppress transcriptional pausing by increasing the rate for the elongation complex to escape from the highly paused state. Mutations in RAP74 that limit transcription stimulation allow for pause suppression in the presence of SII. Wild type RAP74 stimulates elongation by supporting the post-translocated elongation complex, while a mutant RAP74(1-158) deleted for the alpha1 helix re-distributes the elongation complex into the pre-translocated state. In the presence of SII the RAP74(1-158) mutant causes RNAPII to advance slowly but efficiently, further demonstrating that TFIIF supports translocation and pause suppression.