

# UURAF

University Undergraduate Research and Arts Forum



April 8<sup>th</sup> 2005

12:00 - 5:00 PM

Sponsored by

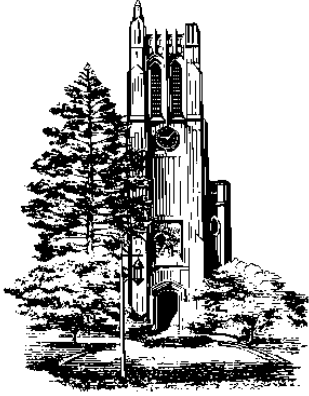
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# University Undergraduate Research and Arts Forum

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 Lou Anna K. Simon for her 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 Acting Provost John Hudzik, Assistant Provost June Youatt, Dean Ronald Fisher, undergraduate associate and assistant deans, Dr. Kelly Funk, Melissa Fraser, 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 8, 2005**

**MSU Union Building  
Michigan State University**

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## ***SCHEDULE OF EVENTS***

<b>Time</b>	<b>Event</b>	<b>Location</b>
12:00.- 12:10	Welcome Message from Dr. June Youatt, Assistant Provost for Undergraduate Education	Parlor Rooms B and C
12:15- 12:10	<b><i>Session One:</i></b> Oral and Poster Presentations	See schedule on following pages
2:10 – 2:30	Refreshments	Second Floor Concourse
2:30– 4:10	<b><i>Session Two:</i></b> Oral and Poster Presentations	See schedule on following pages
4:20. - 4:50	Awards Ceremony Dr. Ronald Fisher, Director of the Honors College	Parlor Rooms B and C

## ***ACKNOWLEDGMENTS***

We would like to offer special thanks to Jamie McClintock, Jeff Domeyer, Alex Fine, Lindsey Oehmen, Robin Pline, and Lauren Hamel for their support of the 2005 University Undergraduate Research and Arts Forum.

We would also like to thank General Electric for Sponsoring this event.

# ***ORAL PRESENTATIONS***

## **Parlor Room A**

### **Session One: Physical Sciences & Business Communication Arts**

<b><u>Time</u></b>	<b><u>Presenter</u></b>	<b><u>Title</u></b>
12:15- 12:25	Victoria A. Moeller	Characterization of the Multicusp Filament-Driven Ion Source in the Small Isochronous Ring Project
12:30- 12:40	Aaron Chester	Time of Flight Technique for Nuclear Lifetime Measurements
12:45- 12:55	Darya E. Howell	Catalytic Hydrogenation of 1, 2 Cyclopentanediols: Applications in Green Industrial Chemistry
1:00- 1:10	Janelle C. Shane	Pulse Shapes and Patterns: Mapping Coherent Control Problems
1:15-1:25	<i>BREAK</i>	
1:30-1:40	John W. Phillip III, Andres S. Galarza, Adam R. Clegg, Tyler C. Smeltekop Deborah R. Grace	Redesigning the Career Services and Placement Website
1:45-1:55	Paul Summers	Establishing Communication in Rural Markets in Michigan
2:00- 2:10	Lucie J. Richards	Smoking Cessation & Theory of Planned Behavior

### **Session Two: Humanities**

<b><u>Time</u></b>	<b><u>Presenter</u></b>	<b><u>Title</u></b>
2:30- 2:40	Lindsey A. Bertolini	Understanding Aesthetic Development
2:45- 2:55	Justin M. Carroll	Novgorod: An European Middle Ground or "The Post-Modernist Told Me to Footnote My Lies"
3:00- 3:10	Mary Beth E. Huttlin	A Look at Music Advocacy for the Twenty-first Century
3:15-3:25	Stephanie E. Bruining	The Benefits of Process Writing to ESL students in English-only Classrooms
3:30- 3:40	Aimee Sutherland	We Really Do Read for the Stories!
3:45-3:55	Kate L. Fedewa	Making Classics Current: Student-friendly Magazines as Supplementary Materials
4:00-4:10	Megan M. Carroll	The Ideal Beauty

# ***ORAL PRESENTATIONS***

## **Gold Room A**

### **Session One: Engineering & Biochemistry and Molecular Biology**

<b><u>Time</u></b>	<b><u>Presenter</u></b>	<b><u>Title</u></b>
12:15-12:25	Michelle K. Foncannon	Effects of Increasing Heel Stiffness in Athletic Shoes on Impulsive Loads while Running
12:30-12:40	Zachary T. Kaltz	Design of a Mechanical Loading System to Exercise Articular Cartilage In Vitro
12:45-12:55	David A. Bendert	Aggregate Interlock in Reinforced SCC Members
1:00-1:10	Drew Kim	Wireless Remote Controlled Artificial Fish Using ICPF Smart Material as an Actuator: An Innovative Engineering Educational Approach
1:15- 1:45	<i>BREAK</i>	
1:30-1:40	Monica Markoviski	Thermal Folding Studies of the Cholera Secretion Protein EpsG
1:45-1:55	Jeff S. Hakim	DNA Genotyping of GTP Cyclohydrolase Transgenic Mice for Cardiovascular Research

### **Session Two: Biochemistry and Molecular Biology**

<b><u>Time</u></b>	<b><u>Presenter</u></b>	<b><u>Title</u></b>
2:30- 2:40	Adam J. Gobetti	RNAi Conferred Genetic Resistance to Viral Infection in Poultry.
2:45- 2:55	Aimee B. Sutherland	Surface Plasmon Resonance Detection of Kinetics of mRNA Editing in <i>Trypanosoma brucei</i>
3:00-3:10	Timothy Howes	Silencing Conserved Plant Genes with Tobamoviral Vectors
3:15- 3:25	Kirk B. Burkhart	Connexin 26 Hearing Loss: Searching for a Novel Mutation
3:30-3:40	Anjali Rohatgi	Chronic PPAR $\alpha$ Activation Increases Vascular Tetrahydrobiopterin Levels in Salt-Sensitive Hypertensive Rats
3:45-3:55	Sowkya Rangarajan	Examining the Role and Function of Various Domains of Tic40 during Protein Import into Chloroplasts
4:00-4:10	Sandra R. Richardson	Evolution of the APOBEC3 Genes: Innate Immunity to Retroviruses

# ***ORAL PRESENTATIONS***

## **Gold Room B**

### **Session One: Cell Biology and Microbiology**

<b><u>Time</u></b>	<b><u>Presenter</u></b>	<b><u>Title</u></b>
12:15-12:25	Brittany N. Dugger	Improving the DiOlistics Imaging Technique: Visualizing Ventral Horn Spinal Motor Neurons in the Western Mosquitofish, <i>Gambusia affinis affinis</i> .
12:30-12:40	Nicholas O. Schroeder	Inhibitory Effects of Pravastatin on 3T3-L1 Preadipocyte Interleukin-6 (IL-6) Secretion
12:45-12:55	Sarah K. Ward	Purification and Properties of the <i>Klebsiella aerogenes</i> UreE Metal-Binding Domain, a Functional Metallochaperone of Urease
1:00-1:10	Crystal M. Tobin	Microarray analysis of <i>Bacillus subtilis</i> cells defective in translation
1:15-1:25	Mark J. Koenigsnecht	Analysis of the Cellular Function of the Universally Conserved GTPase YqeH in <i>B. subtilis</i>
1:30-1:40	Nikola Vuljaj	Identification of <i>Burkholderia cepacia</i> Complex Members and Virulence Genes Necessary for Infection and Disease Causation in Humans, Animals, and Plants
1:45-1:55	Elizabeth A. Bartlett	Characterization of the Gene Responsible for Bovine Hereditary Zinc Deficiency
2:00- 2:10	Kathryn M. Gonyea	Role of hUbc13 in Damage Avoidance during DNA Replication by Human Fibroblasts past Fork-blocking Lesions

### **Session Two: Agriculture and Natural Resources**

<b><u>Time</u></b>	<b><u>Presenter</u></b>	<b><u>Title</u></b>
2:30- 2:40	Julia N. Letoutchaia	The Surprising Ability of Malaria Mosquitoes to Survive and Develop in Moving Water
2:45- 2:55	Emily J. Townsend	Heritability and Genetic Relationships Among Arabian Type Traits
3:00-3:10	Kristen A. Pratt	MSU's Project FISH (Friends Involved in Sportfishing Heritage) Program and Its Impacts on Different Stakeholders
3:15- 3:25	Allison M. Meyer	Effect of age on antioxidant activity in muscle and identification of iron regulatory proteins in liver of cattle
3:30-3:40	Andrew F. Knowles	Experimental Method to Quantify Sand Residual Sand in Produce
3:45-3:55	Mason R. Bradbury	Long-Term Household Dynamics across the Globe

# ***ORAL PRESENTATIONS***

## **Green Room**

### **Session One: Social Sciences**

<b><u>Time</u></b>	<b><u>Presenter</u></b>	<b><u>Title</u></b>
12:15-12:25	LaToya L. Faulk	UNFINISHED BUSINESS: Perceptions of Race Among White and Black Students at Michigan State University
12:30-12:40	Candice J. Wu	Gender Differences in Content and Form in Drawings by Children and Adults
12:45-12:55	Chenai J. Muzamhindo	Culture, Self-Concept and Self-Esteem in Depressed Japanese and American Women
1:00-1:10	Jeri M. Bertapelle	Older Adults Look Back
1:15-1:25	Jennifer M. Schmidt	Society's Control of Gender: A Look at MSU's Gender Notions
1:30-1:40	Michelle L. Cox	Diversity and Art in Education and the Future
1:45-1:55	Brittany G. Naber	The GM Scholarship Program – 1955-1975
2:00-2:10	Amy Creyer	Understanding the Social and Cultural Context of India-A Perspective

### **Session Two: Social Sciences**

<b><u>Time</u></b>	<b><u>Presenter</u></b>	<b><u>Title</u></b>
2:30- 2:40	Shanti A. Zaid	Reading Between Sacred Lines: Status of Regla de Ifá Leadership in Santiago de Cuba
2:45- 2:55	Alicia Ratterree	A Wolf at the Door: The Re-emergence of European Anti-Immigration Parties
3:00-3:10	Nate M. Cummings	Through the Fortress Walls: Human Smuggling in Post-Cold War Europe
3:15- 3:25	Justin J. Gengler	On Religion and War
3:30-3:40	Arthur R. Sandt	Investigating the Ecological Validity of Emotion Induction Using Pictorial Stimuli in the Laboratory: A Psychophysiological Assessment
3:45-3:55	John R. Rood	Evangelical Christianity and American Foreign Policy: Policy, Power and Resistance
4:00-4:10	Erin K. Biebuyck	Youth Global Conversations



# ***POSTER PRESENTATIONS***

Each poster has been assigned a number. The list of participants, their poster titles, and the numbers assigned to their posters can be found on pages 9-14. In order to identify categories of posters clearly, the numbers of the posters have been color-coded to match the appropriate categories.

The list below identifies the numbers and colors assigned to each category and the session during which categories will be judged. Participants will be available at their posters to answer any questions during that time.

## ***Session 1 (12:15-2:10)***

<b>Poster #</b>	<b># Color</b>	<b>Category</b>
1-6	Yellow	Molecular Biology
7-17	Pink	Agriculture and Natural Resources
18-21	Red	Humanities
22-37	Blue	Biochemistry
38-46	Green	Social Sciences (1)

## ***Session 2 (2:30- 4:10)***

<b>Poster #</b>	<b># Color</b>	<b>Category</b>
47-53	Grey	Cell Biology
54-67	Orange	Business and Communication Arts
68-75	Lilac	Physical Sciences
76-81	White	Microbiology
82-89	Green	Social Sciences (2)

# ***POSTER PRESENTATIONS***

## ***Session 1***

### **Molecular Biology (Yellow)**

- |   |                                     |   |
|---|-------------------------------------|---|
| 1 | Mary Beth L. Riblett                | UTP Increases Extracellular Acidification Rate of NIH/3T3 Cells via Interaction with P2Y2 Receptors                               |
| 2 | Jamey L. Hardesty<br>Katie E. Sowle | Phosphodiesterase Inhibitor Stimulation of Calu-3 Cell Monolayers, and Its Effects on CFTR Activation                             |
| 3 | Zachary A. Zalewski                 | Influence of Mismatches and Amplicon GC-Content on the Success Rate of Cross-Species PCR Primers                                  |
| 4 | Nathan D. Lord                      | Isolation of Gcn5-Containing Coactivator Complexes from Tomato and <i>Arabidopsis thaliana</i>                                    |
| 5 | Steffany M. Kerkstra                | Site-directed mutagenesis of the catalytic domain of Mixed Lineage Kinase MLK3  |
| 6 | Bryan D. Mets                       | The role of Sprouty-2 in the transformation of human cancer cell lines in the presence or the absence of Ras-activating mutations |

### **Agriculture and Natural Resources (Pink)**

- |    |                     |   |
|----|---------------------|---|
| 7  | Jennifer Spilotro   | Childhood Obesity: Initiatives to Promoting Better Nutrition and Physical Activity in Michigan's Schools                                |
| 8  | Rachel L. Carpenter | Exogenous Dietary Cellulase Does Not Increase Fiber Digestibility in Mature Horses  |
| 9  | Tara L. Franey      | Development of Silicon-based DNA Biosensor for Salmonella Detection   |
| 10 | Shannon K McGraw    | Use of a Conductometric Biosensor for Detection of Foodborne Pathogens  |
| 11 | Emma B. Hummel      | Is Trans Fat a Significant Component of Commercial Pet Foods?   |
| 12 | Amy M. Hendricks    | Thermal Resistance of Salmonella in Whole Muscle Versus Ground Pork   |
| 13 | Jennifer L. Carroll | At-sea Surveys of Marbled Murrelets- Methodological Considerations  |
| 14 | RajReni Kaul        | <i>Pygoscelis papus</i> , Gentoo Penguin, and <i>Pygoscelis antactica</i> Chinstrap Penguin Hatching Success on the Antarctic Peninsula |
| 15 | Matthew J. Nelson   | Fabrication of an ITO-PANI biosensor for detection of BVDV  |
| 16 | Gail M. Bornhorst   | Kinetics of Thermally-induced Shrinkage of Beef Muscle During Cooking   |

- 17 John T. Roasa The Effects of Residential Shoreline Development on Lake Zooplankton Assemblages

### **Humanities (Red)**

- 18 Colleen M. Crawford South Pacific Serenity
- 19 Kate L. Fedewa, Kristen D. Schalm Children's Literature in the Secondary Classroom
- 20 Mary A. Helmic Career Studio--Designing Your Life's Work
- 21 Jacqueline M. Kinney, Andrew R. Sewick Plurality and Maximality in Children's Comprehension of Definite Noun Phrases

### **Biochemistry (Blue)**

- 22 Katherine M. Ruby The Proline- and Glycine-rich Domain of Galectin-3. Epitope for the Mac-2 Monoclonal Antibody and Its Functional Significance in pre-mRNA Splicing
- 23 Jennifer M. Edwards Increased Nitric Oxide Synthase Expression in the Kidney of Renal Wrap Hypertensive Rats
- 24 Stephen Bowman Use of Homologous Nucleophiles Improves Recognition of Cyanylation-Induced Cleavage Products during Disulfide Mass Mapping of Cystinyl Proteins
- 25 Sze-Ling Ng CtBP as a Candidate Phospho-CTD Interacting Protein
- 26 Waleed Brinjikji Binding of S'Adenosyl Methionine to DNA Repair Enzyme Spore Photoproduct Lyase
- 27 Jamie N. Slater A Zinc Binding Site Defines the Entrance of a Proton Uptake Pathway in Cytochrome c Oxidase
- 28 Greg T. Costakes Crystallization of human Asparaginyl tRNA Synthetase for Negative Drug-design
- 29 James R. Doroghazi Effect of VP16 Phosphorylation-Site Mutations on Immediate-Early Gene Expression During Infection by Herpes Simplex Virus
- 30 Ishan Mahapatra Helical Structure of Type III Secretion Pili and Its Disruption
- 31 Rachel C. Jacobson Cloning and Expression of the SET Domain of the EZH2 Protein
- 32 Zafar A. Sayed Quantitative Analysis of the Neuroprotective Agent Apocynin in a Murine Model of Parkinson's Disease using HPLC-ED
- 33 Deborah R. Barney Probing p53 Autoinhibition s Uing X-ray Crystallography
- 34 Hugh J. Crosmun Modeling of Human DNA Mismatch Repair Recognition Enzyme
- 35 Samuel A. Molina Cloning, Expression and Characterization of the Polycomb Group PRC2/3 Complex
- 36 Kartik Vismanathan Regulation of Mixed Lineage Kinase 3(MLK3) by Peptidyl Prolyl cis/trans Isomerase (Pin1)

- 37 Andrew M. McCoy hRev7 is Involved in Mutagenic Translesion Synthesis of UV-induced DNA damage

### **Social Science (1) (Green)**

- 38 Nancy B. Carlisle Celebrity Spotting
- 39 Anvi K. Vora The Influence of Facial Features on Occupational Selection
- 40 Ameer M. Amin Executive Function and Visual Spatial Dysfunction in Adolescents and Adults with ADHD, using the Rey
- 41 Michael P. Hoerger Individual Differences in the Pursuit of Happiness
- 42 Kendal Holtrop Relationship Variables and Ideal Romantic Partner Preferences
- 43 Shannon J. McKenney Validation of Group Administered Tasks of Working Memory Capacity
- 44 Andrew T. Mattarella-Micke Chess Perception
- 45 Jeffrey E. Pink Why Are Some People More Knowledgeable Than Others? A Longitudinal Study of Individual Differences in Knowledge Acquisition
- 46 Daniel Moore Examining the Effects of Training on Working Memory Processes in the Tower of Hanoi Game

# ***POSTER PRESENTATIONS***

## *Session 2*

### **Cell Biology (Grey)**

- |    |                       |   |
|----|-----------------------|---|
| 47 | Adam Jablonowski      | PDEI's and Cystic Fibrosis  |
| 48 | Kevin Ogden K.        | The Cytochrome P4503A4 Inhibitor Ketoconazole Does Not Reveal 5-HT-Stimulated Superoxide in Rat Aorta |
| 49 | Cindy D. Knaff        | Brain Cytoarchitecture in a Large Grazing Marsupial, Rufous Wallaby <i>Thylogale billardieri</i>      |
| 50 | James S. Howard       | UTP Increases Extracellular Acidification Rate of NIH/3T3 Cells Via Interaction with P2Y2 Receptors   |
| 51 | Michelle A. Gilmer    | Isolation of Clonal Breast Cancer Cell Lines That Inducibly Express Mixed Lineage Kinase 3 Variants   |
| 52 | Allison E. Stone      | The Mutagenic Effects of Polymerase Kappa Overexpression in Human Cells                               |
| 53 | Lindsey A. Hendershot | Cell Culture Methods for Zebrafish Caudal-Fin Cells   |

### **Business and Communication Arts (Orange)**

- |    |  |  |
|----|--|--|
| 54 | Laleah H. Fernandez                      | Workplace Experiences of Entry-Level Female PR Practitioners in the U.S. Auto Industry                               |
| 55 | Tim E. Bograkos,<br>Nicholas A. Godlesky | Development of a Coding Scheme to Assess Source Credibility  |
| 56 | Ara J. Howrani                           | Bulldog Joe Character Study  |
| 57 | Stephanie A. Pittman                     | Censorship   |
| 58 | Stephanie A. Pittman                     | Paula Scher  |
| 59 | Jessica J. Godell                        | For Focal Point, this is Jessica Godell. (student reporting for MSU)   |
| 60 | Joanne Tyes Briseno                      | Football Footprint: How MSU Tailgating Impacts the Environment   |
| 61 | Alison E. Himelhoch                      | The Demands of Television News   |
| 62 | Charles B. Pudrith                       | A Molecular Pathologic Review of Mohr-Tranebjaerg Syndrome (DFN1) from Gene Mutation to Audiometric Data             |
| 63 | Amber L. Zmick                           | Speech Production Abilities of a 9-year-old Cochlear Implant User with Partial Insertion Due to Mondini Malformation |
| 64 | Ebony R. Davis                           | Horse Chores   |
| 65 | Lucy Xing                                | Accamentary  |
| 67 | Allison K. Chamberlain                   | The Power and Impact of Feminist Art   |

## Physical Sciences (Lilac)

- 68 Shankar Arul Simulations of effusion rates from generic ISOL target geometries
- 69 Katherine C. Rabidoux Type II Cepheids in the Globular Cluster M5
- 70 Royce P. Grewer Designing a Magnetic Lens for Femtosecond Electron Microscopy
- 71 Benjamin R. Lott Baseline Characterization of the Beta Counting System
- 72 Julie A. Krugler A New Analysis of the Bidelman & MacConnell Low-Metallicity Candidates
- 73 Allison R. Rober Size Class Identification of Algal Groups within Muskegon Waterhed, Michigan
- 74 Sayee Kiran Why Do We See Colors?: Trying to Understand Color Vision
- 75 Michaela Kopka Electrostatics and the Folding of Type III Secretion Pili

## Microbiology (White)

- 76 Remy L. Brim Mapping the 5' End of Trypanosoma brucei's Mitochondrial Maxicircle Precursor Transcript
- 77 Jonathan D. Lenz Global Gene Expression in Neisseria gonorrhoeae in Response to Antibiotic Stress
- 78 Andrea M. Hingst The Role of Pentatricopeptide Repeat Proteins in Mitochondrial Biogenesis of Trypanosoma brucei
- 79 Adam Richard EpsG Crystallization
- 80 Kristy A. Bachus Identification and Analysis of an Actinobacillus pleuropneumoniae Serotype 1 Operon Homologous to the NQR Operon
- 81 Andrea C. Kendzierski Using Gene Recombination to Investigate Pathogenic Type II Secretion Systems

## Social Sciences (2) (Green)

- 82 Carolyn E. Smith The Role of the State in Second Wave Feminism: A Comparison of the United States and France
- 83 Jasmine D. Gary The Dilemma of Local Control in Urban Education: Comparing State Takeover in Chicago and Detroit School Districts
- 84 David B. McClintick The Simon and Ehrlich Wager: a Historical Perspective
- 85 Megan R. Greeson Economic Abuse and Depression
- 86 Leslie A. Crimin Perceptions of the Overweight and Psychological Well-being: Variations by Gender and Weight Status
- 87 Anand Sharma Death & Discrimination: The Effect of Mortality Salience on Reactions to Discrimination Claimants
- 88 Terrell D. Frazier Black is Beautiful: Civil Rights to Black Power



# ***ORAL PRESENTATION ABSTRACTS***

## **Characterization of the Gene Responsible for Bovine Hereditary Zinc Deficiency**

Elizabeth A. Bartlett, under the direction of Dr. Vilma Yuzbasiyan-Gurkan, Microbiology

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, immunodeficiency 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. DNA sequences revealed that mRNA transcripts in affected animals are shortened, lacking an exon. This aberrant transcript results in a frameshift and a premature stop codon, resulting in a truncated protein. To understand why this alternative splicing of the RNA transcript occurs, it has been necessary to characterize the genomic sequence at the boundaries between the relevant introns and exons. Using banked tissue from affected and normal animals, RNA and DNA samples were isolated and amplified by polymerase chain reaction (PCR) using primers directed at the regions bordering the splice junctions. Ongoing sequence analysis of the resulting fragments has so far uncovered no differences between genomic DNA from affected and unaffected animals in the introns bordering the skipped exon. Continued research into the cause of the alternative splicing should provide insight into both BHZD and the process of RNA splicing. In addition, our studies should yield a DNA based diagnostic test that could be used to identify carrier animals as well as help determine whether BHZD has a role in undiagnosed calf deaths.

## **Aggregate Interlock in Reinforced SCC Members**

David A. Bendert, under the direction of Dr. Rigoberto Burgueno, Civil Engineering

Concrete has been used as a building material since the Romans first began using it in approximately 200 B.C. Since that time, concrete has undergone many changes to increase its ability to serve as a reliable and effective building material. The continued evolution of this material requires research to be conducted that ensures the safety of reinforced concrete structures. Research also provides the concrete industry with information about the use of new types of concrete. Self Consolidating Concrete (SCC) is one new development in concrete that was developed in Japan in the 1980's. It has the ability to compact under its own weight and therefore requires no vibration to fill molds. This improvement can reduce the cost of production by reducing the amount of workers required to cast this concrete. The lack of vibration also reduces noise associated with casting which is beneficial especially in urban areas. Finally, because of the improvements of SCC more intricate molds can be used. The required changes to the mix design that make this self consolidating phenomenon possible may lead to changes in some hardened properties of a reinforced concrete member utilizing SCC. Specifically, reduction to aggregate proportions may cause a member cast with SCC to lose the ability to transfer shear stresses across cracks. One method of shear transfer across cracks is known as Aggregate Interlock. Push-off tests were conducted to study the effects of SCC on Aggregate Interlock. The results were verified with small-scale beam tests.

## **Older Adults Looking Back**

Jeri M. Bertapelle, under the direction of Dr. Nielsen and Dr. Cross, Social Work

This study explores older adults' memories of child discipline techniques from throughout their lifetimes. Older adults in a variety of living situations, all in the Lansing area, agreed to a one on one interview with the student researcher. The majority of the participants were widowed, white women between the ages of 71 and



90. Most of the respondents identified with various Christian denominations and were born in mostly rural areas as opposed to urban areas. Responding to questions about their memories of the discipline techniques used in their childhood families as well as with their own children and grandchildren, these older adults offer insights into changing perceptions of discipline and child maltreatment.

### **Understanding Aesthetic Development**

Lindsey A. Bertolini, under the direction of Dr. Bill Charland, Art Education

Aesthetics and aesthetic development are two of the primary components of discipline-based art education. It is imperative that educators know how to assess aesthetic growth as well as how to initiate it. Despite its importance in art education, how one develops aesthetically is still unclear, making it a difficult area to approach when teaching. How, when, and why do aesthetic processes and concepts develop? Using Abigail Housen's research on the stages of aesthetic development, I designed an experiment that analyzed the responses of art majors vs. non art majors. In doing so, we get feedback on the effectiveness of art education today based on the advanced observations, or lack thereof, of those concentrating in art in comparison to those that did not have the concentrated education in art. By studying the effectiveness of today's methods, in initiating aesthetic development, we can better teach students tomorrow.

### **Youth Global Conversations**

Erin K. Biebuyck, under the direction of Dr. Elizabeth Knox, 4-H Youth Development

Many people in today's society, especially youth, find it difficult to discuss contentious issues in a constructive way. Either because they find it difficult to be open to other points of view, or because they are unsure of how to express their own ideas, conversing about global issues can be difficult for many people. We have developed a 90 minute workshop which will: 1) provide participants with a model of how to have a positive/constructive conversation on an issue, 2) give participants useful insight and skills into dealing with media presentation and biases, 3) give participants the skills needed to re-teach this model of communication to others. Our goal is for the participants in the workshop to leave eager to seek out opinions other than their own and engage in friendly debate and conversation on global issues.

### **Long-Term Household Dynamics Across the Globe**

Mason R. Bradbury, under the direction of Dr. Jianguo Liu, Fisheries and Wildlife

In their 2003 study, Liu and Daily, et al showed that household size across the world has decreased, resulting in a greater number of total households and increased pressure on global ecosystems. Due to the study's limited time span (1985-2000), however, it is impossible to gauge any long-term trends from their findings. I have, therefore, studied changes in average household size and total household numbers over the past two centuries, and in some cases as far back as the 1500's. Primarily using census documents as references, I found that, with only a few exceptions, household size across the globe has been steadily decreasing for the last 100 years. My results have also shown differences in this trend across region and developmental status that will require further analysis.

### **The Benefits of Process Writing to ESL Students in English-only Classrooms**

Stephanie E. Bruining, under the direction of Dr. Marilyn Wilson, Writing, Rhetoric and American Culture

Recent trends in state and federal educational policies are focused on mainstreaming ESL students into English-only classrooms. While this approach may work for younger students, older students past the critical period of language acquisition are struggling to learn English without attention to form. Teachers in English-

only classrooms struggle with wanting to address language issues, but cannot take class time to do so. Current research shows that process writing is an effective way for ESL students to receive feedback and pay attention to form. This research project condenses linguistic research on the effectiveness of process writing in the ESL classroom. This evidence offers solutions to the issue of mainstreaming because process writing is beneficial for ESL students as well as native speakers.

### **Connexin 26 Hearing Loss: Searching for a Novel Mutation.**

Kirk B. Burkhart, under the direction of Dr. Karen Friderici, Microbiology and Molecular Genetics

Many deafness genes have been identified, but the most common cause of hearing loss in human populations is the result of mutation in GJB2, the gene coding for the gap junction protein Connexin 26 (Cx26). The purpose of this project is to identify haplotype boundaries containing a novel regulatory mutation of GJB2 present in a large Michigan family. Previous SNP and microsatellite genotyping identified 20 haplotypes around Cx26 within this family and set the minimum length of this haplotype block at 160kb. Analyzing data from a genome scan I found the maximum extent of the telomeric boundary to be less than 3Mb upstream of Cx26. I have used PCR and resequencing of published SNPs within this 3Mb region to determine the extended haplotype associated with the mutation in our family. This effort is essential for efficiently directing resources to search for and identify the specific causative mutation in our affected individuals.

### **Novgorod: An European Middle Ground or "The Post-Modernist Told Me to Footnote My Lies"**

Justin M. Carroll, under the direction of Dr. Elvira Wilbur, History

The "middle ground" is a system of created cultural, economic, and political hybridism, where people invent new ways of interaction where none existed previously. When two groups come together in a region, many things can occur: cooperation, dominance or assimilation, but in the majority of cases, power defines which outcome will take place. The "middle ground" is a situation where neither side has the ability or means to subjugate or control the other, and vice versa. Cooperation in this context is more successful (especially in terms of economic, political, and social security), and more so if the two nations face a mutual enemy e.g. the French and Huron in the Great Lakes against the powerful British and Iroquois. The "middle ground" paradigm, hitherto, has been applied only to the Great Lakes Region of the United States and found predominately in the work of New Western Historians such as Professor Richard White and Professor Susan Sleeper-Smith. However, the crux of this research and speech is to demonstrate that the middle ground paradigm is bound less by time and place than by manner, and its application to other regions is inherently possible, and medieval Novgorod is a perfect example of such.

### **The Ideal Beauty**

Megan M. Carroll, under the direction of Dr. Estelle Lingo, Art History

Michelangelo Merisi di Caravaggio was the most influential artist in Italy during the early 1600s. His pioneering work has been the subject of much debate since the early 20th century, when works of the Baroque period became a focus of art historical research. Caravaggio's sensual imagery and repetitive depictions of young male nudes in provocative poses has most often been given a homoerotic label. Further investigation of Caravaggio's life, artistic commissions, and works produced may lead us away from this hasty categorization and provide clues into other possible reasons for the depiction of his males as such. It is possible that Caravaggio intended his figures to represent an idealized type, rather than the blatantly homoerotic.

## **Time of Flight Technique for Nuclear Lifetime Measurements**

Aaron Chester, under the direction of Dr. Krzysztof Starosta, Physics and Astronomy

There are four fundamental interactions currently known to physics: gravity, electromagnetism, and the strong and weak nuclear force. Two of these, gravity and electromagnetism, are well understood. The nuclear forces however, are not. At the NSCL, the nuclear interactions are studied by investigating nuclear structure. Important information about the structure of nuclei can be determined by studying nuclear lifetimes. One way nuclear lifetime can be studied is by the time of flight or “plunger” method. With this technique, a fast beam passes through a target, and excited nuclei of interest emerge from the target and decay in flight after a certain distance on the order of a few millimeters. A movable degrader positioned downstream is used to further slow the nuclei. Consequently, gamma rays emitted during the de-excitation process before and after the degrader are measured at a different Doppler shift. The gamma-rays are detected by the SeGA array of segmented germanium detectors. The ratio of intensities of the measured peaks yields information about the lifetime at the measured velocity. The application of this method at the NSCL can provide a promising insight into the nature of nuclear interactions. The results of these experiments will be presented and discussed.

## **Redesigning the Career Services and Placement Website**

Adam R. Clegg, under the direction of Dr. Jeff Grabill, Writing, Rhetoric in American Cultures

Career Services and Placement (CSP) at Michigan State University needs a new web presence due to changes within the organization and evolving user needs. The largest and most critical inadequacy of the site is that it portrays an overly narrow view of what CSP offers the University community. Our project is to give them research-based ways to solve these problems. To achieve this end, we conducted usability research on the current CSP site. [Usability.gov](http://Usability.gov) defines usability as “the measure of the quality of a user's experience when interacting with a product or system.” Our usability evaluations enabled us to determine exactly where problems existed in the CSP website, our “product.” Our team designed tasks to reveal issues contained within the “identity” projected by the CSP site and the “ease of wayfinding,” that is, the ease with which the site could be navigated by the average user. Our presentation will focus on our results, which portray the advantages and disadvantages of the current site. The audience will be given a more in-depth explanation of our usability evaluation that will encompass our methods, our findings, and their implications for the subsequent direction of our project. The audience will learn the importance of such usability evaluations when building or reconstructing a website, as well as receiving an overview of the processes behind conducting a successful evaluation.

## **Diversity and Art in Education and the Future**

Michelle L. Cox, under the direction of Dr. Bill Charland, Art and Art History

Sociological researchers are predicting that by the year 2050 the United States will have had a dramatic racial transformation. If this is the case, Americans are going to be forced to learn new cultures and show more compassionate understanding than they have been in the past. Some regions of the United States are well on their way to the path for this diverse utopia, while others are nearly as backwards as when the civil rights act had not yet been ratified. Racism is not something that a nation can be cured of over night, it is a rather long grueling process. One might wonder how any of this relates to art. It is really quite intertwined. Art is thought of as many things. The aesthetics and emotions that art contains are two important aspects. It is the position for this paper that art has the potential of being an important component in the meshing of cultures and races in America and across the globe. I focused on how does race, culture and the ethnicity of students determine success in visually artistic environments, such as the classroom. I observed affects of peer interactions and perceptions, and how informed students are on such issues as cultural differences and stereotypes. Artistic images should be used as a medium to bridge racial gaps and misunderstandings among

multi-racial cultures. In this forever-changing culture, responsibility to open students' minds and encourage them to better understand people that are different from their families is

### **Understanding the Social and Cultural Context of India - A Perspective**

Amy Creyer, under the direction of Khalida Zaki, Sociology

In sociological terms culture is defined as the values, norms and beliefs of a given society. These are important in understanding the history of a given society because as technology changes and time passes cultures transform. Franz Boas defined culture as "all the manifestations of social habits of a community, the reactions of the individual as affected by the habits of the group in which he lives, and the products of human activities as determined by these habits." Members of given societies are usually completely unaware of how culture serves as a guide to both interpret and construct reality. I spent three weeks in India where I underwent culture shock from the experience of being in a culture so different from my own. I gathered information about some aspects of Indian culture more deeply than others, such as concepts of ethnicity, the caste system and Hijab in India, mainly through participant and personal observations. This gave me the opportunity to compare Indian culture with American culture, and from this experience I gained a greater understanding of the importance of culture in creating a social reality and the importance of questioning one's own cultural norms. In this presentation I will use the relative cultural and social context to explain my experience.

### **Through the Fortress Walls: Human Smuggling in Post-Cold War Europe**

Nate M. Cummings, under the direction of Dr. Leslie P Moch, History

With the fall of the Soviet Union, the countries of Western Europe began to fear a mass immigration from the former communist countries. Whereas during the Cold War, Western Europe could offer a warm welcome to the very few immigrants that made it across the Iron Curtain. This more recent fear has been met with increasingly strict immigration and asylum policies, and the creation of what many call a "Fortress Europe". Yet these policies have not significantly decreased levels of immigration. Instead they have increased the number of immigrants entering Europe illegally, particularly through "human smuggling". In an attempt to define this rather ambiguous form of illegal immigration, I have made use of the small but growing field of research surrounding human smuggling. I have also explored the policies of the European Union and the United Nations on human smuggling, which has allowed me to examine the significant effect that it has had on the social, economic and political structures of Europe.

### **Improving the DiOlistics Imaging Technique: Visualizing Ventral Horn Spinal Motor Neurons in the Western Mosquitofish, *Gambusia affinis affinis***

Brittany N. Dugger, under the direction of Dr. Eduardo Rosa-Molinar, University of Puerto-Rico Piedras, San Juan, Biology and Neurobiology

We describe modifications to the DiOlistics technique for rapid delivery, labeling, and visualization of ventral horn spinal motor neurons innervating the sexually dimorphic musculature of the anal fin of the western mosquito fish (*Gambusia affinis affinis*). We analyzed the dendritic branching topology, dendritic varicosities, and fine spine morphology of the motor neurons. Although a plethora of dyes have been available for neural tract tracing for 27 years, only recently has the gene gun been used for that purpose. The DiOlistics technique is similar to the ballistic transfer used by DNA vaccines and other gene bombardment with the gene gun, but it uses colloidal metal particles coated with a lipophilic dye instead of genetic material. As demonstrated in this study, the major advantage of the DiOlistics technique is that it makes it possible to conduct experiments in different parts of the nervous system of the same animal, decreasing the number of animals used for experimentation and presenting the experimenter with a system that is free from

biological processes. However, the major disadvantages are limited tracing distances and long incubation times.

### **UNFINISHED BUSINESS: Perceptions of Race Among White and Black Students at Michigan State University**

LaToya L. Faulk, under the direction of Dr. Clifford Broman, Sociology

This study examined black and white student's social interaction at Michigan State University by evaluating racial perceptions of faculty, staff and students. In addition to evaluating racial perceptions, this project evaluates the implications of social interaction among "exclusive" black groups and events e.g Black Caucus, Black Student Alliance and The African American Celebratory. The researcher investigated student perceptions of these events and groups through semi-structured interviews. Lastly, this project provided suggestions from faculty, staff and students on ways to increase social interaction among white and black students at Michigan State University.

### **Making Classics Current: Student-friendly Magazines as Supplementary Materials**

Kate L. Fedewa, under the direction of Carl Anderson, French, Classics, and Italian

Students of classical culture, history and language at both the high school and college level often voice a common complaint: the memorization of lists of ancient names and dates seems tedious and completely unrelated to modern life. With further study, students realize that classical studies provides not only relevant but often enlightening correlations with the contemporary world. However, creating interest in students which encourages further study is a dilemma facing teachers and students alike. I believe that a greater access to classical information in a modern format would help to generate immediate engagement and interest among students of classics. To that end, I would like to present two original magazines that depict classical culture. These magazines—organized and composed in the style of Time or Newsweek—aim to provide students with information on topics ranging from political leaders to popular hairstyles. The magazines incorporate a variety of ways by which information is presented. Articles and interviews provide detailed reporting of specific subjects. Letters to the editor and short summaries give students basic information on a variety of cultural topics. Advertisements (selling chariots and other classical commodities) and comics provide a light-hearted glimpse at classical culture. A bibliography details further sources of study for interested students. Full color illustrations, maps, and charts also allow visual references to accompany the reported material. There are numerous ways in which these magazines can be used to generate classroom discussion and assignments. The articles are designed to encourage comparison between classical events and modern ideas, and could be read individually, in pairs, or as a class. In addition, the magazines could be used as a starting point for collective and independent research, creative and analytical writing, reading and creating charts, and several other assignments. These magazines could serve as useful and exciting supplementary sources for the secondary Greek and Roman history and language classroom. My immediate hope is that the material found in them could be useful in ending the complaints of frustrated students; it is my long-term goal that these sources could encourage a lively and continued interest in classical languages and history at all levels of instruction.

### **Effects of Increasing Heel Stiffness in Athletic Shoes on Impulsive Loads while Running**

Michelle K. Foncannon, under the direction of Dr. Roger C. Haut, Osteopathic Manipulative Medicine

Previous experimental data on the mechanical role of athletic shoes during running has been received with much controversy. The American Society for Testing and Materials (ASTM) has sanctioned an impact testing protocol for evaluation of cushioning characteristics in athletic shoes. Since its inception, this standard testing procedure has been implemented to categorize shoes into varying degrees of heel stiffness.

Yet, little has been done to verify the applicability of such measurements and find corresponding relationships to real world situations. The current study sought to correlate cushioning values of running shoes with experimental gait analysis data generated on one subject. For eleven shoes of varying heel stiffness, a correlation was established between cushioning values and the heel impact loading rates during running. These results help validate the use of mechanical impact testing (ASTN tests) on running shoes for the classification of heel cushioning characteristics of athletic shoes.

### **Redesigning the Career Services and Placement Website**

Andres S. Galarza, under the direction of Dr. Jeff Grabill, Writing, Rhetoric, and American Cultures

Career Services and Placement (CSP) at Michigan State University needs a new web presence due to changes within the organization and evolving user needs. The largest and most critical inadequacy of the site is that it portrays a overly narrow view of what CSP offers the University community. Our project is to give them research-based ways to solve these problems. To achieve this end, we conducted usability research on the current CSP site. Usability.gov defines usability as “the measure of the quality of a user's experience when interacting with a product or system.” Our usability evaluations enabled us to determine exactly where problems existed in the CSP website, our “product.” Our team designed tasks to reveal issues contained within the “identity” projected by the CSP site and the “ease of wayfinding,” that is, the ease with which the site could be navigated by the average user. Our presentation will focus on our results, which portray the advantages and disadvantages of the current site. The audience will be given a more in-depth explanation of our usability evaluation that will encompass our methods, our findings, and their implications for the subsequent direction of our project. The audience will learn the importance of such usability evaluations when building or reconstructing a website, as well as receiving an overview of the processes behind conducting a successful evaluation.

### **On Religion and War**

Justin J. Gengler, under the direction of Dr. Michael G. Schechter, James Madison

It is often asserted that there remain today very few examples of genuinely "religious" wars, whether understood as conflicts fought on the basis of religion or wars used to propagate a given faith, among other sorts. International and political theorists increasingly downplay or ignore religious factors in global conflicts in favor of more "complex" explanations — i.e., they espouse the view that, especially in today's modern, globalized context, one must look beyond outdated notions of religious differences or incompatibilities to discover the "true" sources of disagreement and conflict. This project seeks to investigate that claim. It investigates the sacred religious texts of the five major religions (Buddhism, Christianity, Hinduism, Islam, and Judaism) and examines how entire states and individuals appeal to them not merely to justify warfare *ex post facto* but to gain strength and courage during the course of actual hostilities. Finally, it tests this hypothesis quantitatively by analyzing modern wars with a view toward discovering whether states' religious characteristics or makeups can be shown to influence, determine, or otherwise affect the likelihood and nature of their engagement in armed conflict.

### **RNAi Conferred Genetic Resistance to Viral Infection in Poultry.**

Adam J. Gobetti, under the direction of Dr. Jerry Dodgson, Microbiology

The first stage of a new effort to combat viral infection in poultry by means of RNAi gene silencing has been completed. The long term goal is to use RNAi to confer viral resistance to poultry by targeting viral RNA or by blocking expression of the cell receptors that allow viral entry. The short inserts are to be introduced by means of the RCAN vector. The initial stage of this research was to select several sequence targets and to insert corresponding RNAi genes into the pENTR3C-mU6 vector. Exactly correct sequence is vital. Once

sequence is confirmed the inserts can be recombined into the RCAN-X DV vector by means of the Invitrogen gateway system. A first run of four vector inserts were initially created. The expected difficulties arose with sequencing due to the secondary structure of the genes but most of these problems have been solved. This is done by means of cutting the plasmid outside the hairpin, using optimal primers, and notifying the Genomics Technology Support Facility of the unusual sequence. The recent work on this project is creation of additional insert plasmids including a control insert that theoretically does not target any of the viruses under investigation. The upcoming phase will be to use the inserts for genetic modification and subsequent observation of eukaryotic cells.

### **Role of hUbc13 in Damage Avoidance During DNA Replication by Human Fibroblasts Past Fork-blocking Lesions**

Kathryn M. Gonyea, under the direction of Dr. Veronica M. Maher, Biochemistry and Molecular Biology and Microbiology

When cells encounter fork-blocking lesions during DNA replication, they have at least two ways to continue. One, translesion synthesis, uses specialized polymerases that can replicate past the damage, but can lead to errors. The other, damage avoidance, is error-free. It involves a recombination event whereby the DNA replication polymerases circumvent the damage by using an undamaged copy of the same gene. In yeast, a ubiquitin conjugating enzyme, Ubc13, was shown to be important for this error-free pathway. Ubc13 catalyzes polyubiquitin chains on Lys-63, rather than on the conventional Lys-48. Ubc13 also forms a complex with another ubiquitin-conjugating enzyme in yeast, Mms2, which is known to play a role in damage avoidance. To determine whether hUbc13, the human homolog of the yeast protein plays a similar role when such cells encounter fork-blocking lesions, we are investigating what effects loss of this protein has on recombination following damage to DNA. We stably transfected immortalized human fibroblast cells with a plasmid that codes for hUbc13 antisense RNA and a drug resistance gene. Nineteen drug resistant clones were isolated and are being characterized by Western Blot analysis for their levels of hUbc13 protein. Clones that exhibit a reduction of hUbc13 will be exposed to BPDE, a carcinogen that causes a specific type of damage. These cell lines will be compared to their parental line for differences in survival, recombination, and mutagenesis.

### **Redesigning the Career Services and Placement Website**

Deborah R. Grace, under the direction of Dr. Jeff Grabill, Writing, Rhetoric, and American Cultures

Career Services and Placement (CSP) at Michigan State University needs a new web presence due to changes within the organization and evolving user needs. The largest and most critical inadequacy of the site is that it portrays a overly narrow view of what CSP offers the University community. Our project is to give them research-based ways to solve these problems. To achieve this end, we conducted usability research on the current CSP site. Usability.gov defines usability as “the measure of the quality of a user's experience when interacting with a product or system.” Our usability evaluations enabled us to determine exactly where problems existed in the CSP website, our “product.” Our team designed tasks to reveal issues contained within the “identity” projected by the CSP site and the “ease of wayfinding,” that is, the ease with which the site could be navigated by the average user. Our presentation will focus on our results, which portray the advantages and disadvantages of the current site. The audience will be given a more in-depth explanation of our usability evaluation that will encompass our methods, our findings, and their implications for the subsequent direction of our project. The audience will learn the importance of such usability evaluations when building or reconstructing a website, as well as receiving an overview of the processes behind conducting a successful evaluation.

## **DNA Genotyping of GTP Cyclohydrolase Transgenic Mice for Cardiovascular Research**

Jeff S. Hakim, under the direction of Dr. Alex Chen, Pharmacology

Background: Nitric oxide (NO) produced in the endothelium by endothelial nitric oxide synthase (eNOS) is a key mediator of normal vascular function. NO bioavailability is reduced early in cardiovascular disease states such as hypertension and diabetes. A critical determinant of eNOS activity is the availability of its essential cofactor tetrahydrobiopterin (BH<sub>4</sub>). BH<sub>4</sub> biosynthesis is controlled by its rate-limiting enzyme GTP cyclohydrolase I (GTPCH). Accordingly, we sought to investigate the importance of BH<sub>4</sub> availability in experimental hypertension and diabetes using a novel transgenic mouse model with GTPCH overexpression. Because GTPCH transgenic (GCH-Tg) mice are heterozygote, the objective of the present study was to genotype the positive offspring of GCH-Tg mice. Methods and Results: Male transgenic mice were bred with normal female mice to produce the heterozygote offspring. Polymerase chain reaction (PCR) method was used to identify the positive transgenic mice containing the human GTPCH gene. DNA was isolated from the mouse tail biopsies using the Promega DNA Purification Kit. Genomic DNA analysis was performed by PCR using primers designed specifically for human GTPCH gene. The primer for beta-actin gene was run as a negative control. After amplifications, the PCR product was electrophoresed on an agarose gel containing ethidium bromide, which attaches to DNA and fluoresces in orange color under UV light. As a result, positive transgenic mice were identified as those with a florescent orange band on the gel corresponding to the known size and weight of the human GTPCH gene. Conclusion: These data indicate that DNA genotyping by PCR identifies the positive GTPCH transgenic mice, which represent a novel animal model for mechanistic research of human cardiovascular disease.

## **Catalytic Hydrogenation of 1, 2 Cyclopentanediols: Applications in Green Industrial Chemistry**

Darya E. Howell, under the direction of Dr. James Jackson, Chemistry

To gain insight to the way polyols cleave, we are studying the isomerization and deuterium incorporation in cyclopentanol and the 1,2 cyclopentanediols. The study of the cleavage of polyols is important because this knowledge would allow us to break the carbon-carbon bonds of carbohydrates, which are complex polyols, at specific sites. This would allow production of industrially useful compounds from organic sources. We focus on the cyclopentanediols and cyclopentanol because the cyclic framework in these compounds places the alcohol groups in a geometrically constrained relationship, and it is the geometrical requirements for reaction that we seek to understand. We have determined that the rate of isomerization and deuterium incorporation of both cyclopentanol and the diols is dependent on reaction pressure and temperature. These findings and the comparison between the rates of isomerization and deuterium incorporation will help reveal the mechanisms of polyol reactions. This knowledge can than be applied to the afore-mentioned problem of carbohydrate cleavage.

## **Silencing Conserved Plant Genes with Tobamoviral Vectors**

Timothy . Howes, under the direction of Dr. Monto H. Kumagai, University of Hawaii, Molecular Biosciences and Bioengineering

This work was conducted as part of the summer research program in Marine Science and Marine Bioproducts Engineering at the University of Hawaii at Manoa. Viral vectors can be used to introduce sequences that cause gene silencing in plants. In this work, a sequence from the salt-tolerant green alga *Dunaliella salina* was used to silence a putative DEAD box RNA helicase gene in *Nicotiana benthamiana* (wild tobacco). Plants were transfected with vectors derived from tobacco mosaic virus. Phenotypic changes due to silencing were observed, and changes in expression of the DEAD box helicase gene were quantified using real-time PCR. The results support the idea that the gene is involved in critical RNA processing functions. More generally, it was demonstrated that *D. salina* sequences can be used to induce gene silencing in *N. benthamiana* despite the phylogenetic distance between the two species, which suggests that similar



methods could be used to characterize a wide variety of conserved plant genes.

### **A Look at Music Advocacy for the Twenty-first Century**

Mary Beth E. Huttlin, under the direction of Dr. Judy Palac, Music Education

As schools continue to battle issues over departmental spending, music educators often find it necessary to advocate for the continuation of music programs in their schools and cite data supporting the “Mozart Effect.” The phenomenon termed the “Mozart Effect” describes possible correlations between the study of music and increased intelligence. However, when the actual evidence is reviewed, music educators must ask, what concrete conclusions can be drawn from detailed scientific analysis, how can this information be properly utilized in music advocacy and why are alternative nonmusical benefits necessary to rationalize music education in our schools? The connection between music education and academic achievement has been especially difficult to research due to the multitude of factors which influence a student and his or her academic success, but perhaps future research will provide concrete evidence indicating a symbiotic relationship between the study of music and the study of academics as suggested by standardized testing. However, while fascinating to study, it should not become the impetus for musical study because the study of music has far greater musical benefits. Music belongs in the curriculum by its own merits and no student should be deprived of the opportunity to explore its possibilities and to enjoy its numerous musical rewards.

### **Experimental Method to Quantify Sand Residual Sand in Produce**

Andrew F. Knowles, under the direction of Dr. Kirk Dolan, Biosystems Engineering and Food Science

A procedure was developed to determine the amount of sand in produce. The incineration, separation by density, and rinsing method (ISDR) developed in our laboratory is a simple, inexpensive, and a reliable technique for quantifying the amount of sand in a sample of organic material. A sample of fresh produce is weighed, and then dosed with a known mass of acid washed/ignited sand. The samples are reduced to ashes in ovens at 200°C and 400°C for five and 0.5 hours respectively. The majority of the ash is removed from the samples by rinsing with water, and the remaining ash is removed through separatory funnels using salt and sugar solutions. This method was validated using sliced and washed: apples, carrots, celery stalks, tomatoes, and bananas. The range of errors using the ISDR method for all the produce tested: 1 gram of sand added to 50 grams of produce yielded 0.0% to 11.6% error. 0.5 grams of sand added to 50 grams of produce yielded 11.9% to 20.3% error. 0.1 gram of sand added to 50 grams of produce yielded 11.4% to 26.8% error. To obtain results accurate to within 12%, the ratio of the mass of the produce sample to the dosage mass of sand must be at least 50:1. The ISDR method could be applied to most types of produce. Likewise, this method allows researchers and produce production factories to quantify the amount of residual sand in a sample of produce, a quality control factor.

### **Design of a Mechanical Loading System to Exercise Articular Cartilage in Vitro**

Zachary T. Kaltz, under the direction of Dr. Roger Haut, Mechanical Engineering

Participation in sports, recreation, and exercise is increasingly popular in American culture. In vitro studies of exercise with animals and humans are complex, making it difficult to isolate and control individual factors, such as the input mechanical loads on joint surfaces. While in vitro loading devices have been described in the literature, there are questions concerning their ability to accurately maintain low levels of input loads on cartilage explants. We have designed and built a custom in vitro cartilage exerciser that is highly adjustable and versatile. The entire system is biocompatible; it operates in a normal tissue culture environment within an incubator. In addition, cartilage explants can be mechanically loaded while in media in commercial well plates that interface with the device. The system is controlled by a computer, enabling

users to easily adjust the intensity and timing of output loads across multiple wells with less than 1% error.

### **Wireless Remote Controlled Artificial Fish using ICPF smart material as an actuator: An innovative engineering educational approach**

Drew . Kim, under the direction of Dr.Xiobo Tan, Electrical Engineering

Recent emergence of micro and nano technology has sparked a substantial number of researches into underwater locomotion of fish-like movement is being investigated. Future applications of micro and nano scale micro robot that can be controlled by wireless remote at low power consumption can be critical to usage in surgical, diagnosis, and in other biomedical fields. A new prototype wireless remote controlled artificial fish that moves like fish in underwater, using the smart material called Electroactive Polymer(EAP) as an actuator will be developed. The EAP actuators will ‘drive’ the fish tail in place of a conventional motor. The prototype artificial fish swimming speed and direction will be controlled with a wireless remote in underwater by adjusting the frequency and amplitude voltage. The prototype fish will have low power button sized batteries, circuits, microcontroller, and wireless receiver inside the fish and the body of fish will be made using Unigraphics designed mold and latex material. This project will certainly provide technical challenges for the undergraduate researchers, but also will be replicated during high school engineering program offered during summer as a team project to introduce Smart Materials, Micro & Nano technology, and Microelectromechanicalsystems (MEMS) area in engineering.

### **Analysis of the Cellular Function of the Universally Conserved GTPase YqeH in B. subtilis**

Mark J. Koenigsnecht, under the direction of Dr. Rob Britton, Microbiology and Molecular Genetics

GTPases function as molecular switches that regulate many important cellular processes. Bacteria contain several GTPases that play key roles in numerous essential processes including translation, protein secretion and cell division. I am studying the GTPase YqeH in *Bacillus subtilis*. YqeH is essential for growth and has homologs in gram positive bacteria and eukaryotes, including humans. Since YqeH is conserved throughout evolution, understanding the function of YqeH in *B. subtilis* may lead to the understanding of how its homologs function in other organisms. Preliminary data in our lab suggests that YqeH has a role in ribosome subunit biogenesis, but how YqeH participates in this process is not yet known. Our lab has found that depletion of the essential protein YqeH caused a growth defect for the cell. I am studying the cellular function of YqeH by analysis of genetic suppressors of this growth defect. A strain was constructed in order to place yqeH under the control of an inducible promoter. Chemical mutagenesis was then performed in order to isolate mutagenized bacteria that can grow without the essential YqeH. This mutation is currently being mapped by transposon insertion. Once I have successfully mapped my mutation, the genes in this region will be sequenced from my chromosomal suppressor DNA to look for mutations that could possibly allow for growth without YqeH. Complementation tests will then be done to test for the loss of the suppressor phenotype when put into a YqeH-deficient strain. It is hoped that by understanding the function of the mutated gene that allows for growth without YqeH, it will lead us to understand the function of YqeH itself.

### **The Surprising Ability of Malaria Mosquitoes to Survive and Develop in Moving Water**

Julia N. Letoutchaia, under the direction of Dr. James Miller, Entomology

*Anopheles Gambiae* is a malaria vector mosquito in Sub-Saharan Africa. It is commonly accepted that *A. Gambiae* only lays eggs on and develops in still water, such as puddles and ponds. However, in a choice test, gravid *A. Gambiae* females actually preferred to lay eggs on moving water that was artificially created by placing a magnetic stir bar into a beaker filled with water. Also, *A. Gambiae* eggs ecdyse in moving water, the larvae are able to pupate, and the pupae are able to eclose into adults out of moving water. The resulting

adults were of equal size and weight to mosquitoes that developed in still water. This outcome raises the possibility that mosquitoes are able to survive in rivers during the dry season. It is currently unknown where and how *A. Gambiae* lives through the dry season.

### **Thermal Folding Studies of the Cholera Secretion Protein EpsG**

Monica Markovski, under the direction of Dr. William Wedemeyer, Department of Biochemistry and Physics

Cholera is a ubiquitous pathogen with terrible consequences for third-world countries. We are studying the type II pseudopilin EpsG from *Vibrio cholerae*, which is necessary for the secretion of cholera toxin and, thus, the virulence of cholera. Twenty residues are absolutely conserved among all type II secretion systems in Gram-negative bacteria. We are mutating these residues systematically and examining their effects on the folding, oligomerization and protein-protein interactions of EpsG. Several mutants unfold just above room temperature, allowing us to interrupt type II secretion with a simple temperature step. Other mutants appear to adopt a conformation that is folded differently than wild-type EpsG, possibly corresponding to the pseudopilin conformation.

### **Effect of Age on Antioxidant Activity in Muscle and Identification of Iron Regulatory Proteins in Liver of Cattle**

Allison M. Meyer, under the direction of Dr. Gretchen M. Hill, Animal Science

The presence of unbound Iron (Fe) in tissues increases the opportunity for oxidative damage to occur. The protein myoglobin is the major heme pigment in muscle and its color intensity is correlated with the Fe content of the tissue. In cattle, the concentration of myoglobin increases with age as evidenced by the dark red color of cull cow carcasses. Iron regulatory proteins (IRP) modulate cellular Fe homeostasis in rats, although their presence in cattle is unknown. Therefore, our research investigated if the high Fe load in older animals is associated with elevated antioxidant enzyme activity in muscle and if IRP are present in cattle. Liver tissue and five muscle tissues were collected from the carcasses of two cull Holstein cows (6 yr age) and two market steers (16 mo age). Muscle samples were analyzed for the antioxidant enzymes Catalase (CAT), CuZn-Superoxide Dismutase (SOD), and Glutathione Peroxidase (GPX). The presence of IRP in liver was confirmed, not previously reported in cattle. Cull cows had greater hepatic Fe concentrations than steers, indicating increased Fe load in the cows. Antioxidant enzyme activity was greater in the muscle tissue of older cows compared with market steers, and IRP were detectable in these animals.

### **Characterization of the Multicusp Filament-Driven Ion Source in the Small Isochronous Ring Project**

Victoria A. Moeller, under the direction of Dr. Felix Marti, Head, Accelerator Research Development

The purpose of this research is to qualitatively understand the effect of changes in ion source conditions on beam parameters in the small isochronous ring (SIR). A compact filament-driven multicusp ion source was borrowed from Lawrence Berkeley National Laboratory and is currently in use in the SIR project as part of a study of the longitudinal space charge effects in the isochronous regime. The functioning of an ion source is characterized by correlating ion beam parameters, such as the beam current and emittance, with conditions in the ion source, such as filament power, arc power and gas pressure. Ions are produced in the source when current from the filament power supply is passed through a thoriated molybdenum filament, causing the filament to warm up and emit electrons. The arc power supply maintains a voltage difference between the filament and the walls of the source, so the electrons are accelerated to the walls after escaping from the filament. As they travel, the electrons collide with hydrogen molecules in the chamber and form plasma. Some of the ions in the plasma move toward the plasma electrode where the electric field between the source and the puller extracts those ions and the beam is formed. The source produces H<sup>+</sup>, H<sub>2</sub><sup>+</sup>, and H<sub>3</sub><sup>+</sup> ions. A

bending magnet is used to select the desired species. All of the investigations into space charge effects in the ring to date have used H<sub>2</sub><sup>+</sup> beam, so the characterization of the ion source has focused on H<sub>2</sub><sup>+</sup> beam.

### **Culture, Self-Concept and Self-Esteem in Depressed Japanese and American Women**

Chenai J. Muzamhindo, under the direction of Dr. Denise Saint-Arnault, Nursing

According to the National Mental Health Association (2002), 7 million women in the United States suffer from clinical depression. No matter where in the world one looks, women are twice as likely as men to be affected by depression. In order to accurately assess depression, various scales and measures have been utilized including the Beck Depression Inventory. The relationship between self-esteem and depression is well documented in Americans. However, recent research has questioned whether American values of autonomy and self-control are embedded in the self-esteem construct, limiting its cross-cultural utility in predicting depression or other mood problems. Newer self-esteem assessment tools have suggested that self-confidence and self-liking are important cross cultural dimensions of self-esteem. This study hypothesized that while a firm belief in one's abilities and capacities is how self-confidence and self-liking manifest themselves in American women. The researchers expected to find that the assurance that others felt that one was a capable individual was key to the Japanese woman's level of self-confidence and self-liking. Analysis for this study has found self-liking to be strongly correlated with depression for Americans ( $r=.68$ ), but only moderately correlated with depression for Japanese ( $r=.48$ ). This suggests that self-liking is less related to depression in the Japanese, but that it is still an important dimension to consider. This research has examined negative self-descriptors of 26 depressed Japanese and 9 depressed American women to determine whether there is cultural variability in the specific self-esteem related concerns for the two groups.

### **The GM Scholarship Program - 1955-1975**

Brittany G. Naber, under the direction of Dr. David Bailey, History

After WWII, the nature of American higher education changed, as a huge influx of new college-going young adults challenged the idea that college was only for the elite. The GM Scholarship Program, started in 1955, was one of many corporate-sponsored initiatives aiming to meet higher education's increasing need for new funding sources. The program, which provided scholarships to more than six thousand students, evolved over its 17-year span, until it ultimately evolved out of existence in 1975. What can the life of this scholarship program tell us about the dramatic changes in American higher education between 1950 and 1975?

### **Redesigning the Career Services and Placement Website**

John W. Phillips III, under the direction of Dr. Jeff Grabill, Writing Rhetoric and American Cultures

Career Services and Placement (CSP) at Michigan State University needs a new web presence due to changes within the organization and evolving user needs. The largest and most critical inadequacy of the site is that it portrays an overly narrow view of what CSP offers the University community. Our project is to give them research-based ways to solve these problems. To achieve this end, we conducted usability research on the current CSP site. [Usability.gov](http://Usability.gov) defines usability as "the measure of the quality of a user's experience when interacting with a product or system." Our usability evaluations enabled us to determine exactly where problems existed in the CSP website, our "product." Our team designed tasks to reveal issues contained within the "identity" projected by the CSP site and the "ease of wayfinding," that is, the ease with which the site could be navigated by the average user. Our presentation will focus on our results, which portray the advantages and disadvantages of the current site. The audience will be given a more in-depth explanation of our usability evaluation that will encompass our methods, our findings, and their implications for the subsequent direction of our project. The audience will learn the importance of such usability evaluations when building or reconstructing a website, as well as receiving an overview of the processes behind

conducting a successful evaluation.

### **MSU's Project FISH (Friends Involved in Sportfishing Heritage) Program and Its Impacts on Different Stakeholders**

Kristen A. Pratt, under the direction of Dr. Shari Dann, Fisheries and Wildlife

Project FISH is a program for adults and children in Michigan to learn about fishing and water quality issues in a hands-on manner. Adults interested in mentoring children can participate in Project FISH workshops. There participants are trained to facilitate programs for youth, covering topics such as ethical fishing practices, fishing skills, environmental awareness, aquatic ecosystems, and how to best present these ideas in a way that youth will understand and enjoy. Participants complete surveys both before and after the workshop in which they participate. In the surveys, they rate their own knowledge of fishing and aquatic ecology as well as the amount of experience they have had fishing, teaching, and working with youth. To analyze responses to these surveys, I divided the participants into two main groups based upon their experiences; one group consisted of people with extensive backgrounds in fishing-related areas but little experience working with youth, and the other group consisted of people with extensive experience teaching but with limited background in fishing. I compared participants' personal knowledge ratings in the pre- and post-surveys in order to observe the amount of knowledge gained by each person as a result of his or her participation in the workshop. Looking at where the biggest gains in knowledge occurred in each of the two groups, it can be seen that the Project FISH workshops have different benefits for different groups of stakeholders.

### **Examining the Role and Function of Various Domains of Tic40 during Protein Import into Chloroplasts**

Sowkya Rangarajan, under the direction of Dr. Kenneth Keegstra and Dr. John Froehlich, Plant Biology

Tic40, a protein co-chaperone in the inner envelope membrane of chloroplasts has two integral membranes: a tetratricopeptide repeat domain (TPR) and a Hop/hip domain. These two domains are thought to interact with components of the chloroplastic protein translocon machinery during the process of import of precursor proteins into the stroma of the chloroplast. In order to examine the functions of the various domains of Tic40, clones of truncated versions of the gene and Histag versions of Tic40 were generated. These constructs will be used to generate sufficient amounts of Tic40 that can be subsequently used in protein-protein interaction studies to examine the associations of the domains with other molecules - including heat shock protein 93 (Hsp93) and Tic110. The constructs will also be subsequently used in plant transformation experiments to observe the effects of modified versions of the Tic40 protein during the translocation process in plants.

### **A Wolf at the Door: The Re-emergence of European Anti-Immigration Parties**

Alicia Ratterree, under the direction of Dr. Leslie Page Moch, History

To the casual observer, the recent trend of anti-immigration movements in Europe may appear to be caused by events of the past several years, like the terrorist attacks on September 11, 2001 and March 11, 2003, and the subsequent quest to uncover terrorists around the world. While these events may have contributed to the upsurge in support for right-wing parties and anti-immigration policies, the origins of this support dates farther back. For the purposes of this study, I will look at the history of anti-immigration political parties in Europe. In addition, I will use American newspapers to look at media trends regarding European immigration and anti-immigration sentiment. The questions I attempt to answer include: Are American newspapers looking more at conservative parties in Europe as a result of the influence of the conservative Bush administration? What about the impact of terrorist attacks since 2001? Are immigration issues in Europe reported fairly by American newspapers, or do trends point to sensationalism? My study includes the use of

both primary and secondary sources of anti-immigration attitudes and policies.

### **Smoking Cessation & Theory of Planned Behavior**

Lucie J. Richards, under the direction of Dr. Janet Lillie, Communication

Smoking cigarettes is a behavior that many Americans partake in and is a behavior that often results in serious health consequences such as cancer, cardiovascular disease, and respiratory disease. However, these harmful consequences can be prevented by smoking cessation. The purpose of this research is to develop a health communication campaign to increase smokers' intentions to quit. The Theory of Planned Behavior is useful in designing a campaign to promote smoking cessation, particularly in longtime smokers. By looking at variables surrounding smoking cessation such as attitude toward behavior, subjective norm, and behavioral control, we can better understand how to aid a smoker's intention to quit.

### **Evolution of the APOBEC3 Genes: Innate Immunity to Retroviruses**

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

The APOBEC3 family of cytosine deaminases has been shown to provide a powerful host defense mechanism against retroviral infection. During viral packaging, the APOBEC3 protein is included in the viral particle, where it causes widespread cytidine deamination in the nascent reverse transcript of the viral genome. Virion infectivity factor (Vif) is a protein produced by some retroviruses which counters the antiviral activity of the APOBEC3 proteins. The APOBEC3 proteins are a particularly promising subject of study in *Canis familiaris* because dogs are not known to be affected by a retrovirus. This may indicate that dogs have evolved a mechanism by which retroviral infection can be evaded, perhaps involving an APOBEC3 protein which is particularly effective in cytidine deamination or resistant to the action of Vif. The goal of this study is to find and characterize the canine APOBEC3 genes. Owing to a large gap in the assembled canine genome sequence at the predicted location of the APOBEC3 gene cluster, the first objective in this study has been to search the unassembled sequence data for any APOBEC3-like sequences. We have identified sequences which appear to be homologous to segments of the human APOBEC3C, APOBEC3G, and APOBEC3H genes. We are using two library screening approaches in an attempt to obtain the complete sequences of these genes. For the purposes of phylogenetic and functional domain comparisons, we are also attempting to sequence APOBEC3 genes of the species *Felis catus* and *Macaca nemestrina*. Concurrently, an effort has been made to use sequence data of the APOBEC proteins in human, mouse, rat, and dog to create a phylogenetic tree showing the evolutionary relationships between these proteins across species.

### **Chronic PPAR $\alpha$ Activation Increases Vascular Tetrahydrobiopterin Levels in Salt-Sensitive Hypertensive Rats**

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

Hypertension increases the risk for heart disease and stroke. Our laboratory has reported that a factor for vascular dysfunction in salt-sensitive hypertension is a deficiency of tetrahydrobiopterin (BH4), a cofactor for the production of a vascular protective molecule, nitric oxide. Peroxisome proliferator-activated receptors (PPAR) are a family of ligand-dependent transcription factors. PPAR $\alpha$  agonists are used clinically to improve vascular function, but the mechanisms underlying their beneficial effect remain unclear. This study tested the hypothesis that vascular protection by PPAR $\alpha$  activation occurs through reversing the vascular BH4 deficiency in hypertensive rats. Chronic PPAR $\alpha$  activation was achieved by administering PPAR $\alpha$  agonist fenofibrate to adult male Sprague-Dawley rats for 4 weeks in the following 4 groups: sham, hypertensive, fenofibrate-treated sham and fenofibrate-treated hypertensive. High-performance liquid chromatography with fluorescence detection was used to quantify BH4 levels in isolated aortas. Our preliminary results showed that

vascular BH4 levels decreased in hypertensive rats as compared to Sham rats. Treatment with fenofibrate increased vascular biopterin levels in hypertensive rats. These findings suggest that chronic PPAR $\alpha$  activation in vivo increases vascular BH4 levels in salt-sensitive hypertensive rats, which may represent an important mechanism for the clinical benefits of PPAR $\alpha$  agonists.

### **Evangelical Christianity and American Foreign Policy: Policy, Power, and Resistance**

John R. Rood, under the direction of Michael G. Schechter, International Relations

As recently as thirty years ago, the vast majority of sociologists regarded religion as a closed subject. As science became able to answer more of humanity's questions, fundamentalist religion seemed less likely to be the answer. Today, the re-election of George W. Bush signals a triumph for religion; a strong evangelical Christian who based both policy and rhetoric around his religious beliefs was reconfirmed by the American public. His reelection would have been unlikely without support by the Christian right. The Christian right has had nearly unprecedented success at raising support at both the grassroots and the policymaker/elite level. Today it is one of the most important political groups in Washington. This work seeks to trace the impact of Evangelical Christianity on the foreign policy of the United States. While historical perspectives will be discussed, the focus is on the current status of the movement. Examining cases such as humanitarian intervention in Sudan, this work seeks to determine how powerful the Christian right is in the determination of United States foreign policy. What limitations does this group face in its efforts? What strengths does it have to levy in the battle for elite attention? In which issue areas are the Christian right likely to be effective? Answers to these questions will paint a picture as to the real impact of the Christian right on foreign policy as well as revealing possibilities for the future of the movement.

### **Investigating the Ecological Validity of Emotion Induction Using Pictorial Stimuli in the Laboratory: A Psychophysiological Assessment**

Arthur R. Sandt, under the direction of Christine L Larson, Psychology

Inducing emotion in the laboratory has been and remains a challenge for emotion researchers. One of the most commonly employed procedures to induce emotion is the use of emotionally evocative pictures, due to the ability to precisely match various pictures in intensity and to easily control the timing of presentation. Previous research has been able to show that strong physiological responses to aversive stimuli can be acquired using picture stimuli. Previous designs, however, have lacked the ecological validity, in part because they have employed randomly-presented unrelated pictures. In an attempt to induce emotion in a way more representative of how people become emotionally engaged in the real world, this study aims to support the hypothesis that using related pairs of pictures will result in more marked physiological responses. Startle blink magnitude will be analyzed in response to the pictures, to measure the effectiveness of using related pairings. The related pairings of pictures are designed to have a relation to each other, and also show a progression of events involving the subject of the image. What results is an interesting interaction between the valence of the second stimuli (when the startle probe is presented), the relatedness of the stimuli, and the valence of the prior stimuli presented in a pairing.

### **Society's Control of Gender: A Look at MSU's Gender Notions**

Jennifer M. Schmidt, under the direction of Dr. Danielle Nicole DeVoss, Writing, Rhetoric and American Culture

The first question asked when a baby is born is "girl or boy?" Last year, I presented, along with my colleague Kyle Wyrick, a study analyzing gender constructions in contemporary U.S. culture. We addressed how people typically make judgments based on the norms of society and assign one of two genders to each and every person. This year, I will present our findings from a survey of the MSU community that communicates

the extent to which society limits or allows gender expression, how individuals developed their gender notions, and how these notions affect their everyday lives. I will also report on interviews conducted to provide a more detailed, focused analysis and presentation of the study.

### **Inhibitory Effects of Pravastatin on 3T3-L1 Preadipocyte Interleukin-6 (IL-6) Secretion**

Nicholas O. Schroeder, under the direction of Dr. Kate J. Claycombe, Food Science and Human Nutrition

An increasing number of studies have shown that inflammation plays a key role in the development of cardiovascular disease (CVD). Recent studies have shown that HMG-CoA reductase inhibitors (or statin drugs such as pravastatin) reduce CVD risk by reducing C-reactive protein (CRP). Studies also have shown that adipose tissue accounts for up to 35% of circulating interleukin-6 (IL-6), a major activator of CRP. Furthermore, we previously have shown that preadipocytes rather than adipocytes secrete significantly higher levels of IL-6. Thus, we hypothesized that pravastatin reduces CRP, in part, by reducing IL-6 levels from the preadipocytes. Accordingly, using a murine preadipocyte cell line, 3T3-L1 cells, we tested whether pravastatin inhibits preadipocyte IL-6 production in a dose dependent manner. To address our hypothesis, we pretreated 3T3-L1 preadipocytes with 0, 5, 10, 20, and 50 uM pravastatin for 4 hrs prior to co-treatment of lipopolysaccharide (LPS) and 0, 5, 10, 20, and 50 uM pravastatin for 12 hrs. Results showed that pravastatin significantly reduces IL-6 secretion by 3T3-L1 cells in a dose dependent manner with maximal inhibition at 20uM. These data demonstrate that pravastatin may contribute toward reducing CVD risk by reducing preadipocyte IL-6 secretion thereby reducing CRP levels. Future studies will address in vivo effects of statin drugs on adipose tissue expression of IL-6 levels.

### **Pulse Shapes and Patterns: Mapping Coherent Control Problems**

Janelle C. Shane, under the direction of Dr. Marcos Dantus, Chemistry

An important goal of present femtochemistry investigations is the control of multiphoton processes with phase-shaped laser pulses, with applications including chemical identification and cancer detection. A major challenge encountered during these investigations is the difficulty of choosing a pulse shape that will produce the desired effects in a sample. Because of the extremely large number of shapes that can be produced by a typical pulse shaper, this search space needs to be intelligently reduced if optimization is to be a tractable problem. We present a method for reducing this search space via Binary Phase Shaping (BPS), and a unique method for visualizing trends and symmetries in this reduced search space. Applications for current and future control problems, as well as for the design of efficient genetic algorithms, are discussed.

### **Redesigning The Career Services & Placement Website**

Tyler C. Smeltekop, under the direction of Dr. Jeff Grabill, Writing, Rhetoric & American Cultures

Career Services and Placement (CSP) at Michigan State University needs a new web presence due to changes within the organization and evolving user needs. The largest and most critical inadequacy of the site is that it portrays an overly narrow view of what CSP offers the University community. Our project is to give them research-based ways to solve these problems. To achieve this end, we conducted usability research on the current CSP site. [Usability.gov](http://Usability.gov) defines usability as “the measure of the quality of a user’s experience when interacting with a product or system.” Our usability evaluations enabled us to determine exactly where problems existed in the CSP website, our “product.” Our team designed tasks to reveal issues contained within the “identity” projected by the CSP site and the “ease of wayfinding,” that is, the ease with which the site could be navigated by the average user. Our presentation will focus on our results, which portray the advantages and disadvantages of the current site. The audience will be given a more in-depth explanation of our usability evaluation that will encompass our methods, our findings, and their implications for the subsequent direction of our project. The audience will learn the importance of such usability evaluations



when building or reconstructing a website, as well as receiving an overview of the processes behind conducting a successful evaluation.

### **Establishing Communication in Rural Markets in Michigan**

Paul Summers, under the direction of Dr. Paul Hartman, Telecommunication, Information Studies and Media

The development of fiber optical networks has been largely produced for large and dominating telephone companies. Through research and development a need for broadband and communication needs far exceeds the capacity of standard copper wire, which most if not all telephone companies use for service. In an effort to offer tomorrow's technology today we have been able through the use of government programs, plans to build and install fiber optics to residential homes. This idea of using fiber optics to the home allows for companies to focus on one media, but still allow for multiple communication tools to be utilized. Through the use of fiber, a residence can receive telephone, data, and video service at a fraction of the cost but with the reliability of a digital service. This application will be installed in rural areas of Michigan in hopes to have their community in better standard than most cities in the United States. Since it's their first time at receiving phone service, the research and development of the fiber to the home system will be the future of telecommunication in Michigan and the United States.

### **We Really Do Read for the Stories!**

Aimee Sutherland, under the direction of Lister Matheson, English

Over the years, a number of leading science fiction writers have published stories in Playboy magazine. And why not? Playboy has the freedom and autonomy to publish stories that other magazines cannot; because of its somewhat unique market role it is able to print science fiction that pushes boundaries (in multiple senses of the word). In contrast to standard science fiction magazines such as Analog or Asimov's, the stories in Playboy are not specifically directed towards an audience with a strong scientific background. Their established readership also allows them to attract some of the most popular writers in the field. By reading and coding the science fiction stories printed in Playboy, we intend to demonstrate that this magazine publishes a wide diversity of theme and genre contents, a low incidence of hard science fiction stories, and a high frequency of stories that are the first of their kind.

### **Surface plasmon resonance detection of kinetics of mRNA editing in Trypanosoma brucei**

Aimee B. Sutherland, under the direction of Donna Koslowsky, Microbiology & Molecular Genetics

The mitochondrial mRNA of the kinetoplastid *Trypanosoma brucei* undergoes an extensive number of uracil insertions and deletions before translation occurs; as much as half the base pairs in a matured transcript may be the result of editing. The editing process is directed by guide RNAs: short untranslated transcripts complementary to small regions of the fully matured mRNA. To better understand the process of trypanosome mitochondrial mRNA editing it is important to know how the gRNA recognizes and binds with the mRNA, and how the structure of the reactants affects their interaction. In particular, the initial binding step seems to be crucial in determining the rate and stability of the interaction. To study this process, BiaCore, a surface plasmon resonance biosensor, was used to detect the values of kinetic constants for formation of the complex between *T. brucei* mRNA ND7 550 and its corresponding gRNA. Results show an affinity constant of 0.565(0.228 nM, with a  $k_a$  of  $0.958E5(2.26E4 M^{-1}s^{-1}$  and a  $k_d$  of  $4.99E-5(8.451E-6 s^{-1}$ . Because the dissociation is so slow, particularly compared with the association, the gND7-mND7 550 complex appears to have a very stable interaction.

### **Microarray Analysis of *Bacillus Subtilis* Cells Defective in Translation**

Crystal M. Tobin, under the direction of Dr. Robert Britton, Microbiology and Molecular Genetics

Translation is a fundamental process essential for the growth of all cells. In bacteria, ribosomes are the target of many antibiotics, demonstrating that the process of protein synthesis is an ideal target for antimicrobial agents. This study centers on elucidating gene expression patterns characteristic of cells that are deficient in translation via microarray analysis. We are determining how *Bacillus subtilis* cells alter their transcriptional program during inhibition of translation initiation and translation elongation. We have identified genes that are overexpressed in all cases where translation is inhibited, such as *yrzI* and *yrzK*, which encode for small peptides. We have also identified genes that are overexpressed only when specific steps in translation are inhibited. For example, when initiation is defective we find several genes overexpressed, including the essential GTPase *obg*. Ultimately, we would like to build a database of expression profiles of genes and antibiotics involved in translation. This database will be used as an aid to identifying the functions of genes involved in translation and the modes of action of new antibiotics.

### **Heritability and Genetic Relationships Among Arabian Type Traits**

Emily J. Townsend, under the direction of Dr. Dennis Banks, Animal Science

Arabian horses were evaluated for eighteen type traits with a linear system that scored horses from 0 to 50. Eight traits had desired phenotypes represented by high scores (50), nine by intermediate scores (25), and one had a desired phenotype on the low end of the scale (0). The data set consists of 727 horses, 197 with complete linear scores. Horses without linear scores are genetically linked through pedigree relationships. Heritability and genetic correlations were obtained from a multitrait animal model. Phenotypic correlations ranged from a high positive (0.64,  $P < 0.0001$ ) in foreleg front-view of knee and foreleg front-view of foot to high negative (-0.145,  $P = 0.04$ ) in back/loin and body depth. Genetic correlations (corr  $\pm$ SE) ranged from -0.38 $\pm$ 0.19 to 0.64 $\pm$ 0.12, the strongest negative for hoof-pastern angle and shoulder slope and the strongest positive for body depth and neck attachment. The trait with the largest estimate of heritability among the linearly scored traits was head (0.55  $\pm$  0.05) while neck attachment (0.10 $\pm$ 0.03) was the least heritable. The traits of head, quality, and body depth appear to have the greatest ability to respond to selection as evidenced by heritability estimates of 0.56, 0.34 and 0.31, respectively. Thirteen genetic correlations were greater than 0.50. Selection among these traits should yield a strong correlated response in other traits. Twenty-nine genetic correlations between 0.25 and 0.50 were discovered in the data.

### **Identification of *Burkholderia cepacia* Complex Members and Virulence Genes Necessary for Infection and Disease Causation in Humans, Animals, and Plants**

Nikola Vuljaj, under the direction of Dr. Martha Mulks, Microbiology and Molecular Genetics

*Burkholderia cepacia* (*B. cepacia*) was first described as a causative agent of bacterial onion rot, causing sour skin disease. However, some *Burkholderia* strains were used agriculturally to kill nematodes and protect certain crops. More recently *B. cepacia* has been recognized as a human opportunistic pathogen, causing a severe progressive respiratory failure with bacteremia in Cystic Fibrosis (CF) patients. *B. cepacia* can be classified into nine genotypically distinct but phenotypically similar species (genomovars) forming the *Burkholderia cepacia* complex (Bcc). All Bcc members share a high degree of 16S rRNA (rDNA) and *recA* sequence similarity. The hypothesis underlying this study is that there are strains in Bcc that will infect only a subset of the natural hosts, e.g. humans; humans and plants; humans and nematodes; or humans, plants, and nematodes, and that there must be distinct genes in these various strains associated with infection of each natural host. A collection of Bcc strains isolated from CF patients who suffered from respiratory tract infection in the 1980s was characterized. At that time of collection, these patients were diagnosed to have respiratory tract infection with *Pseudomonas cepacia*, since the genus *Burkholderia* did not yet exist taxonomically. Biochemical tests and a Bcc-specific PCR test using 16S rDNA-specific primers were used to

determine if the cultures in this collection were indeed members of Bcc. To assign Bcc strains to genomovars, restriction fragment length polymorphism (RFLP) of PCR-amplified *recA* was used, which has been shown to be efficient in discriminating among all of the genomovars. In subsequent studies we plan to evaluate the ability of these human isolates to infect plants and nematodes.

### **Purification and Properties of the *Klebsiella aerogenes* UreE Metal-Binding Domain, a Functional Metallochaperone of Urease**

Sarah K. Ward, under the direction of Dr. Robert P. Hausinger, Microbiology & Molecular Genetics

Urease is a nickel-containing enzyme that catalyzes the hydrolysis of urea. It is critical to the virulence of several human and animal pathogens of the urinary and gastrointestinal tracts, and also plays an important role in agriculture, as microbes that produce urease participate in the recycling of nitrogenous wastes in the rumens of domestic livestock and are important to the environmental transformations of urea-based fertilizers. *Klebsiella aerogenes*, a non-pathogenic soil microbe, has seven urease-related genes. Three are structural genes (*ureA*, *ureB*, and *ureC*) and four are accessory genes needed for Ni-dependent urease activation (*ureD*, *ureE*, *ureF*, and *ureG*). UreE is a dimeric protein and is proposed to function as a metallochaperone by delivering Ni to the UreDFG-urease complex. Homologs of *ureE* are found in almost all urease-producing microbes. UreE contains a His-rich C-terminus metal binding domain and an N-terminus peptide-binding domain. The role of UreE in urease activation was studied by making recombinant deletions of parts of the *ureE* gene. Deletion of the peptide-binding domain lowered but did not eliminate urease activity. Deletion of the metal-binding domain had a significant effect only at low concentrations of nickel in the growth medium. Deletion of the His-rich region of the metal-binding domain had no effect. In addition, the metal-binding domain was purified and characterized as a tetramer capable of binding two moles of Ni per mole of tetramer.

### **Gender Differences in Content and Form in Drawings by Children and Adults**

Candice J. Wu, under the direction of Dr. William Charland, Art and Art History

Today, children are raised to conform to the models of gender that traditionally correspond to their sex. Gender, unlike sex, is a socially constructed idea, created by the society in which we live in. Constructed gender roles have an influence on the subject matter and form in children's and adults' drawings. Extremely fascinating differences in interpretation formal preferences in art have been discovered through the study of drawings.

### **Reading Between Sacred Lines: Status of Regla de Ifá Leadership in Santiago de Cuba**

Shanti A. Zaid, under the direction of Dr. Jualynne E. Dodson, Sociology

This study seeks to explore leadership status within Regla de Ifá, as practiced in Santiago de Cuba, Cuba. Regla de Ifá is the premier divinatory system of the Yoruba-based Regla de Ocha religious tradition, more popularly known in the United States as "Santería." I measured leadership status by focusing on three factors: growth, autonomy, and cross-tradition utilization of babalao, or Ifá leaders, in Santiago. Though Regla de Ifá has been practiced in Cuba since at least the mid-nineteenth century, Cuban researchers suggest that performance of structured Ifá began in Santiago de Cuba only within the last thirty years, with knowledge and ritual instruments brought from western Cuba. Since then, the tradition experienced limited but visible expansion in the city, due largely to the commitment, selectivity, and materials involved in becoming a babalao. Western Cuba, especially Havana and Matanzas, currently holds a stronger concentration of Ifá leaders, and babalao in Santiago are dependant on the occidental cleric community for religious training, initiations, and written materials. However, I simultaneously discovered that some babalao in Santiago could autonomously initiate future babalao and perform ceremonies central to the practice.

Further, insight gained through Regla de Ifá was respected as authoritative and utilized across other religious traditions practiced in the area, including Regla de Palo and Espiritismo.

# ***POSTER PRESENTATION ABSTRACTS***

## **Executive Function and Visual Spatial Dysfunction in Adolescents and Adults with ADHD, Using the Rey**

Amee M. Amin, under the direction of Dr. Joel Nigg and Dr. Lauren Harris, Psychology

Attention-Deficit/Hyperactive Disorder (ADHD) affects all ages, yet studies in this area are far more extensive in children than in adults. A key question has been how ADHD will persist in children as they develop into adults. Theories of the etiology of ADHD suggest that executive functions and regions of the right hemisphere important for visual spatial functions are dysfunctional in children with ADHD. However, developmental changes caused by maturation in adolescence and adulthood remains unclear with regard to these neuropsychological issues. Do problematic symptoms seen in children with ADHD lessen with maturation? Is executive function or visual spatial dysfunction associated with a particular subtype in adolescents and adults? This study attempts to clarify these issues using The Rey-Osterrieth Complex Figure, a neuropsychological assessment that taps executive and visual spatial abilities in the same task. Furthermore, using multiple scoring methods that tap into both neuropsychological mechanisms will allow for greater interpretation of developmental affects with respect to ADHD.

## **Simulations of Effusion Rates from Generic ISOL Target Geometries**

Shankar Arul, under the direction of Dr. Paul Mantica, Physics

The objective of this study was to simulate the effusion of isotopes from proposed isotope separation on-line (ISOL) target geometries using the computer program SIMION. ISOL is one of two rare isotope production methods that will be used at the Rare Isotope Accelerator (RIA). Many short-lived radioactive species are produced in the ISOL target, and must be extracted rapidly to produce a useful radioactive beam. With SIMION, various ISOL target geometries were modeled to determine effusion times. By analyzing variations of the proposed geometry, we have determined the most efficient geometry that would provide the lowest effusion times to optimize extraction of short-lived species. The configuration that was found to be the most efficient was the one with the effusion space placed on the outer edge inside the target.

## **Identification and Analysis of an *Actinobacillus pleuropneumoniae* Serotype 1 Operon Homologous to the NQR Operon**

Kristy A. Bachus, under the direction of Dr. Martha Mulks, Microbiology and Molecular Genetics

*Actinobacillus pleuropneumoniae* (APP) is a bacterial pathogen that causes respiratory disease in swine. APP produces a 48 kDa outer membrane protein encoded by *nqrA* that is immunogenic in infected pigs. In *Vibrio cholerae*, *nqrA* is the first gene in a 6 gene operon, *nqrA-F*, encoding an NADH-ubiquinone reductase (NQR) that derives energy from a sodium electrochemical gradient. The purpose of this project is to determine if the entire NQR operon exists and is functional in APP serotype 1 and to evaluate its expression under conditions present in a host during infection. The entire 6 Kb APP NQR operon from the beginning of the putative promoter region through the end of the stop region was cloned and sequenced. APP serotype 1 was shown to contain 6 open reading frames homologous to *nqrA-nqrF*. The NQR promoter region was cloned into an expression vector containing promoterless *luxAB* genes for measurement of expression based on luciferase production. Expression of the NQR promoter in response to pH and salt conditions was analyzed. Western blots with monoclonal antibodies against *nqrA* were performed to measure *nqrA* protein under the same pH and salt conditions. Future plans include use of Northern blots to detect the RNA transcripts for NQR under varying growth conditions.

### **Probing p53 Autoinhibition using X-ray Crystallography**

Deobrah R. Barney, under the direction of Dr. Jennifer Ekstrom, Biochemistry

The p53 protein is a tumor suppressor that regulates cellular division. We are testing a hypothesis, based on mutagenesis and yeast two-hybrid data from the Kuo lab, that the linker region of the p53 polypeptide interacts with the tetramerization domain, causing autoinhibition. We first tried to test for interaction of two synthetic p53 peptides representing the linker region and the tetramerization domain using size-exclusion chromatography, but this failed due to peptide impurities. We have since been expressing a recombinant GST-tagged p53 construct that contains both the linker region and the tetramerization domain (residues 300-356). We transformed a pGEX vector containing our sequence into Rosetta, an E. coli host strain. After purifying the p53-GST protein on a glutathione-sepharose column, we used Factor Xa enzymatic cleavage to separate the GST tag from the p53, and isolated the p53 from the Factor Xa and GST with two additional purification steps. The p53 was further purified using ion-exchange chromatography. We are now beginning to screen for p53 crystals using a variety of crystal screens. We intend to determine the structure of this p53 construct to determine whether the linker region interacts with the tetramerization domain to form an autoinhibited state.

### **Development of a Coding Scheme to Assess Source Credibility**

Tim E. Bograkov, under the direction of Dr. Sandi Smith, Communication

Source credibility is a critical component in social influence and persuasion, having gained attention since the time of the ancient Greeks. Currently, though, a scheme to assess source credibility is lacking. We aim to fill that void by conceptualizing the components of source credibility as expertise, trustworthiness, attractiveness, and power. Each of these four dimensions has sub-categories that will be reflected in our coding scheme. In addition, we will establish unitizing reliability via Geutzkow's U and coding reliability via Cohen's Kappa.

### **Kinetics of Thermally-induced Shrinkage of Beef Muscle During Cooking**

Gail M. Bornhorst, under the direction of Dr. Bradley Marks, Biosystems Engineering

Meat products change shape and lose mass during commercial thermal processing, which impacts product quality, yield, and economic value. Therefore, there is a great need to model these changes in order to optimize the commercial processes. Previous studies have tried to quantify the transformations due to heat-induced shrinkage in different varieties of meat, but have not taken into account the water lost during heating. In this study, we sought to control this variable by heating whole-muscle beef samples in both water and mineral oil. For example, the sample length decreased from 18.07% to 30.78% when heating time increased from 1 to 4 minutes in at 60o C in water, while the width and thickness stayed constant. The mass loss also increased with temperature and time. These results will become the foundation for a kinetic model for shrinkage of beef muscle while being heated, which will aid the food processing industry in improving process design and operation.

### **Use of Homologous Nucleophiles Improves Recognition of Cyanylation-Induced Cleavage Products during Disulfide Mass Mapping of Cystinyl Proteins**

Stephen Bowman, under the direction of Dr. Watson, Biochemistry

A determination of the disulfide structure of cystinyl proteins is important for understanding their function. Our chemical methodology for disulfide mass mapping overcomes many of the shortcomings of the conventional proteolytic approach. The method is based on cyanylation (CN) of the nascent cysteines produced during reduction of a disulfide bond, followed by CN-induced cleavage of the polypeptide

backbone at the modified cysteines. Data interpretation relies on recognizing mass spectral peaks that represent CN-induced cleavage fragments that must be mapped to the sequence of the protein to identify which two cysteines are involved in a particular disulfide bond. Two thirds of the cleavage products undergo a mass shift due to incorporation of the nucleophile that promotes the cleavage reaction. The parallel use of two homologous nucleophiles, e.g., methyl amine and ethyl amine, produces a mixture of two variants of a given cleavage product differing by 14 daltons due to the  $-CH_2-$  group that distinguishes them. We report on optimizing the parallel use of binary mixtures of ammonia and methylamine as nucleophiles for the cleavage reaction during disulfide mapping of ribonuclease-A. We will present mass spectra to show how certain cleavage products are represented by pairs of peaks separated by 14 m/z units, thereby increasing the confidence in distinguishing them from chemical noise and spurious background.

### **Mapping the 5' End of Trypanosoma brucei's Mitochondrial Maxicircle Precursor Transcript**

Remy L. Brim, under the direction of Dr. Donna Koslowsky, Microbiology and Molecular Genetics

*Trypanosoma brucei* is the parasitic protozoan causing African Sleeping Sickness in humans and Nagana in cattle. The life cycle of *T. brucei* is complex in that it lives in two very different hosts (the human and the tsetse fly) and it is the mitochondrion of this organism that is thought to be responsible for this ability. The mitochondrial genome consists of two components, one of which is the ~23kb maxicircles. This maxicircle component contains a variable region between the NADH dehydrogenase subunit 5 gene and the 12s rRNA genes. This variable region of the maxicircle is thought to contain the promoter sequences important for transcription initiation. To define the promoter sequences, we are attempting to map the transcription start site of the polycistronic transcript. This start site is suspected to lie 1200nt or more upstream of the 12s rRNA gene. The technique we chose involves the differential display of RNA ligase mediated amplification of cDNA ends. In this technique, isolated total RNA is treated in four different ways: untreated, phosphatase treated, kinase treated, and phosphatase followed by kinase treatment. The treated RNA is put into a ligation reaction with a synthesized tag RNA. cDNA is made by reverse transcription and the ligated products are amplified using a precursor specific and a tag primer. Our most recent experiments indicate that the start site lies between 1400-1700nt upstream of the ND5 gene.

### **Binding of S'Adenosyl Methionine to DNA Repair Enzyme Spore Photoproduct Lyase**

Waleed Brinjikji, under the direction of Dr. Joan Broderick, Chemistry

The spore photoproduct lyase (SPL) protein is a member of the radical SAM superfamily. The radical SAM superfamily utilizes an iron-sulfur cluster in homolytic cleavage of S'adenosyl methionine to form an adenosyl radical. This radical goes on to abstract a hydrogen to begin radical catalysis. Spore photoproduct is a type of DNA damage that occurs in spore-forming bacteria. The damage that occurs is a result of exposure of DNA to ultraviolet light which causes two consecutive thymine nucleotides to dimerize via methyl bridge. The radical catalysis is thought to begin when the adenosyl radical abstracts a hydrogen from the spore photoproduct. Electron double nuclear resonance spectroscopy has shown that SAM binds to the iron-sulfur cluster of protein pyruvate formate lyase activating enzyme another member of the radical SAM superfamily. The purpose of this research project is to find the dissociation constant of SAM to the spore photoproduct lyase. This is done by first overexpressing the protein, SPL, and then purifying the protein via metal affinity chromatography. After purification, equilibrium dialysis is utilized to find the binding constant of SAM to SPL. This is done by first, labeling SAM with tritium. Then, the radioactive SAM is added to a solution of SPL and placed in an equilibrium dialysis tube along with buffer. Preliminary results indicate a dissociation constant of 300 $\mu$ M.

## **Celebrity Spotting**

Nancy B. Carlisle, under the direction of Dr. Alessandra Passarotti, Psychology

Although there is an extensive background of research on facial recognition in humans, much of the research on face recognition has presented faces against solid colored backgrounds. These tasks hold little ecological validity because in everyday life, humans must recognize familiar faces against extremely complex backgrounds, such as finding a familiar face in a crowd. To address this inconsistency, we devised a task in which subjects must decide whether a target face is famous (familiar) or non-famous (unfamiliar), under conditions in which the background information increases in complexity. White backgrounds were used as a baseline, scene and face collage backgrounds were used as experimental conditions, and masks containing the visual structural components of the scene and face backgrounds, but devoid of the semantic information of the scene and face backgrounds were used as controls.

## **Exogenous Dietary Cellulase Does Not Increase Fiber Digestibility in Mature Horses**

Rachel L. Carpenter, under the direction of Dr. Brian Nielsen, Animal Science

Adding cellulase to the equine diet has been proposed to allow greater nutrient utilization from fiber. The hypothesis of this study was that dietary cellulase administration would increase fiber digestibility as compared to when fed a control diet. Six mature geldings were used in a switchback design. They were fed a diet of timothy grass hay in addition to oats containing cellulase or a control supplement for ten days followed by a 3-day total fecal collection. Percent DM, NDF, ADF, nitrogen content, and GE of feces were all measured and evaluated. Horses fed the control supplement digested a greater percentage ADF ( $31.8 \pm 1.1\%$ ) than the cellulase group ( $27.0 \pm 1.1\%$ ,  $P = 0.04$ ). There was a trend for horses fed the control supplement to digest a greater percentage of NDF ( $34 \pm 1.1\%$ ) than horses fed the cellulase supplement ( $30 \pm 1.1\%$ ,  $P = 0.06$ ). There were no differences between the two groups for fecal DM ( $P = 0.33$ ), fecal N ( $P = 0.48$ ), fecal GE ( $P = 0.20$ ), fecal NDF ( $P = 0.35$ ), or fecal ADF ( $P = 0.71$ ). Overall, the addition of cellulase to a hay-based diet of mature horses did not improve fiber digestion as hypothesized. The horses fed the control supplement actually appeared to digest fiber better than horses fed the cellulase supplement. Hence, our hypothesis was rejected. This agrees with other work that has suggested exogenous cellulase interferes with the binding of endogenous hindgut microbial enzymes to fiber, thus decreasing overall fiber digestion.

## **At-sea Surveys of Marbled Murrelets- Methodological Considerations**

Jennifer L. Carroll, under the direction of ,

Marbled murrelets (*Brachyramphus marmoratus*) are solitary nesters, and nest in the tops of old-growth trees. As a result, surveys are necessarily conducted on populations at sea. We evaluated the accuracy of alternative line transect methods, and described the spatial distribution and density of marbled murrelets in Stephen's Passage, Southeast Alaska. We used these results to develop an optimal survey design. We found that the perpendicular distance from the object to the transect centerline could be more accurately calculated by estimating radial distance and angle, than by estimating the perpendicular distance directly. Repeated boat surveys along 23 transects (range 5.4 – 12 km) were conducted in the study area using GPS to record all bird locations spatially. The information gathered from the survey produced density estimates of 41.3 murrelets/sq. km (95% CI = 25.7 to 50.27) for June and 15.55 murrelets/sq. km (95% CI = 12.2 to 19.8) for July. Half of all murrelets occurred within 2.0 km of the shore, and peak density occurred 1.7 km from shore. Bird density varies greatly with distance from shore, therefore, the optimal survey design would orient transects perpendicular to shore and calculate density from line transects using radial distance estimates and measured angles.



## **The Power and Impact of Feminist Art**

Allison K. Chamberlain, under the direction of Dr. Janet Lillie, Communication

The American feminist movement of the 1970s affected several facets of the American culture. One area that was radically challenged was the art world. Early feminist art brought about fundamental changes in the values and experiences of women. The goal of this early feminist art was to change the essential characteristics of art itself, to eliminate the suppression of women, and to assimilate a gender balance into art and culture. During the 1980s there was an extreme backlash against feminism in general. However, the impact of feminism and feminist art during the 1970s was not diminished. Today, it is clear that this feminist art and art history helped to validate new types of art forms and new means of expression for all artists. This research studies the effects that the 1970s American feminist movement had on art and art history, as well as its continuing impact on feminist artists and the art world today.

## **Crystallization of Human Asparaginyl tRNA Synthetase for Negative Drug-Design**

Greg T. Costakes, under the direction of Dr. Jennifer Ekstrom, Biochemistry & Molecular Biology

Asparaginyl tRNA synthetase (AsnRS) charges the asparaginyl tRNA with its cognate amino acid and is therefore critical for protein synthesis. *Brugia malayi* AsnRS is currently being pursued as a drug target for filarial infections, and several promising inhibitors have been identified. However, these inhibitors also inhibit the human enzyme, which would likely cause side effects. I have been working on expressing, purifying and crystallizing human AsnRS. The structure of human AsnRS will be compared with the structure of AsnRS from *Brugia malayi*, and will be useful in designing selective inhibitors (negative drug design). I have optimized the expression of a truncated AsnRS construct, and have purified the protein using affinity and ion exchange columns. I have also set up crystal screens with AsnRS and the inhibitor Asparaginyl Sulfamoyl Adenylate. To date, AsnRS protein crystals have been produced and are currently being optimized to achieve high quality crystals that will yield the best results for X-ray data collection.

## **South Pacific Serenity**

Colleen M. Crawford, under the direction of Dr. Roberta Kilty, Interior Design

This limited personal space of relaxation is a proposed design for an individual client. Due to the client's busy lifestyle, she requires ample time for rest and rehabilitation throughout the year, at any give time, for any amount of time. The client finds the outdoors most tranquil, therefore, she responds best to structures that are open with lots of natural light and a smooth, curvilinear, organic quality. This design will emulate those wants and needs by showing its strong ties to the environment through its use of materials, color, texture, shape, and form. To maximize the natural lighting and breath-taking view of this New Zealand cliff location, the design will incorporate many tall windows along the curved front overlooking the Pacific Ocean with a dramatic emphasis on the entry outside to the balcony. This will make the spectacular view an obvious focal point, drawing one into its naturally therapeutic beauty. Since the limited space is to create a sense of balance, each individual element will flow in harmonious rhythm to achieve an overall peacefulness. While appreciating the openness of the endless outdoors, the client needs to feel safe and secure, and the rounded structure with specific furniture placement will do just that. Due to the myriad activities that the client enjoys for relaxation, the design must be flexible and utilize its small space well. A serene space of her own should be a reflection of her personality and provide for her desires.

## **Perceptions of the Overweight and Psychological Well-being: Variations by Gender and Weight Status**

Leslie A. Crimin, under the direction of Dr. Isis Settles, Psychology

Past research on stigmatization has found that being overweight is one of the most debilitating and negative stigmas in the United States. Unlike other stigmatized groups, the overweight are often blamed, by others and themselves, for their weight status. This negative stigma is particularly salient to women's lives, as females in the United States are pressured to conform to the thin-ideal. This study aimed to examine the relationships between weight status, gender, and perceptions of heavy weight, as well as the relationship between weight status and psychological well-being. Two hundred-seventy-two participants at a large Midwestern university, 13% of which self-identified as overweight, reported perceptions of the overweight on scaled questions and psychological well-being on multiple scales. Participants, independent of weight status, held similar negative views of the overweight. Females reported heavy weight as significantly more visible and changeable than males. Finally, overweight participants had lower levels of self-esteem, life satisfaction and positive affect than normal weight participants. Because the majority of adults in the United States are now labeled overweight, the stigmatization connected with heavy weight may be harmful to many aspects of social life, particularly to lives of women. Research should continue in this area in order to discover the origins of the negative perceptions the overweight, in effort to prevent harmful effects such as lowered well-being and self concept.

## **Modeling of Human DNA Mismatch Repair Recognition Enzyme**

Hugh J. Crossmun, under the direction of Dr. Michael Feig, Biochemistry

The MutS protein possessed by E-coli and Thermos Aquaticus scans DNA in order to find defects. MutS is a homo dimer that recognizes incorrect pairing of thymine and insertion/deletion defects. A model of the MutS protein has been obtained using x-ray crystallography. Humans possess a similar system that is a hetero dimer. The proteins that make up this hetero dimer are known as Msh2, Msh3, and Msh6. The sequences of these proteins are known, but there currently are no models of them. In the homo dimer, Msh2 is paired with Msh3 or Msh2 is paired with Msh6. Using bioinformatics, Msh2, Msh3, and Msh 6 can be modeled using MutS as a template because they have similar sequences. By aligning the target sequence (Msh2, Msh3, or Msh6) with MutS it is possible to obtain a homology model, however, due to the complex nature of the human proteins there will be gaps that need to be filled using loop modeling. Theoretically, Msh6 specializes in finding DNA mismatches, Msh3 specializes in finding extra base pairs and Msh2 acts as a clamp, holding DNA from the back. By making homology models of Msh2, Msh3 and Msh6 it may be possible to answer these as well as other questions.

## **Horse Chores**

Ebony R. Davis, under the direction of Jeremy Herliczek, Journalism

Sometimes many students work odd jobs in order to pay for their schooling. But Vet- Med student Julie Hunt has found not only a job that she loves but also contributes to her everyday learning. This photostory examines the daily routine of chores that she does on a horse breeding farm in return for room and board. In an effort to learn more about her work, I spent numerous days photographing the farm and the horses that she tended. From those 300 plus photographs, only the best were selected. And after an interview with my subject, the final layout was designed to display a photojournalism story about surviving as a college student.

## **Effect of VP16 Phosphorylation-Site Mutations on Immediate-Early Gene Expression During Infection by Herpes Simplex Virus**

James R. Doroghazi, under the direction of Dr. Steven J. Triezenberg, Biochemistry

During lytic infection by herpes simplex virus type 1, expression of IE genes is activated by the VP16 transactivator protein. This protein has previously been shown to be phosphorylated *in vivo* and *in vitro*. VP16 expressed from a transfected gene was phosphorylated at Ser375 and a Ser375Ala mutation disrupted the interaction of VP16 with its DNA binding partner Oct-1. In contrast, VP16 expressed at late times in infection was not phosphorylated at Ser375, but was phosphorylated at Ser411. To examine the role of these serine residues during infection by HSV-1, virus strains SJO2 and SO11 were constructed with Ser375Ala or Ser411Ala substitutions, respectively. SJO2 grew at a reduced rate compared to a wildtype virus, but was not as debilitated as RP5, a mutant strain lacking the VP16 transcriptional activation domain. Moreover, cross-linking/immunoprecipitation assays showed a decrease in the presence of both VP16 and Oct-1 at the IE gene promoters during SJO2 infection. IE gene expression (as measured by real time RT-PCR) was also dramatically decreased in SJO2 infection. In contrast, SO11 showed a modest decrease in IE gene expression, but no significant defect in virus yield. These studies reveal that Ser375 is vital to the role of VP16 in IE gene expression, whereas Ser411, although phosphorylated, does not seem necessary for any VP16 activity during lytic infection.

## **Increased Nitric Oxide Synthase Expression in the Kidney of Renal Wrap Hypertensive Rats**

Jennifer M. Edwards, under the direction of Dr. JR Haywood and Dr. Carrie Northcott, Pharmacology and Toxicology

Decreased nitric oxide in the kidney plays an important role in renal dysfunction that occurs and contributes to hypertension. However, the time course of the reduced nitric oxide in the development of hypertension has yet to be examined. We hypothesized that nitric oxide synthase (NOS) was down-regulated as early as 7 days and continued to 28 days of renal wrap hypertensive treatment. Cortical and medullary proteins were isolated from the kidneys of 7 and 28 day wrap and sham rats for western blot analyses of eNOS, nNOS and iNOS protein expression [Mean Arterial Pressure; 7 day: Sham =  $96 \pm 6$  mmHg, Wrap =  $112 \pm 7$  mmHg; 28 day: Sham =  $96 \pm 5$ , Wrap =  $144 \pm 6$ ]. eNOS expression was significantly higher in the medulla of 7 day wrap compared to sham rats ( $2347 \pm 238$  vs.  $1577 \pm 205$  arbitrary densitometry units); no differences in iNOS or nNOS expression were detected. In contrast in 28 day wrap rats, cortical eNOS and medullary nNOS proteins were elevated compared to sham (eNOS:  $3955 \pm 369$  vs.  $2819 \pm 422$ ; nNOS:  $1892 \pm 365$  vs.  $1392 \pm 365$  arbitrary densitometry units); no differences in iNOS expression were detected. These data demonstrate changes with respect to NOS occur in the early stages of hypertension development and continue as the hypertension is maintained and may be a compensatory mechanism in response to the increase in blood pressure.

## **Children's Literature in the Secondary Classroom**

Kate L. Fedewa, under the direction of Marilyn Wilson, English Department

This research project analyzes the use of children's literature in secondary classrooms, particularly in terms of how children's literature reflects and affects a developing understanding of the universal aspects of literature such as: 1) understanding other cultures through children's literature, 2) understanding and appreciating literature as a whole through children's literature, and 3) understanding ourselves through children's literature. Our experiences with the Kiddie Lit. Club have given us insight into these aspects of children's literature regarding our own development and have provided inspiration for further study on their use in the secondary classroom.

## **Workplace Experiences of Entry-Level Female PR Practitioners in the U.S. Auto Industry**

Laleah H. Fernandez, under the direction of Dr. Brenda Wrigley, Advertising

Research indicates 70% of Public Relations (PR) practitioners are women (Grunig, Toth, & Hon, 2001), and 80% of PR majors enrolled in U.S. universities are female (Wrigley, 2004). This study examines entry-level women in PR. The researchers explain the extent to which entry-level female practitioners are aware of feminization, gender wage disparities and sexual harassment in the field of PR. In determining the overall awareness level of the entry-level female PR practitioners, we can determine whether this population is prepared to face the challenges of a female dominated career in the context of today's workplace culture. This study is of an exploratory nature, since little related research to date has examined entry-level practitioners. Results indicated that entry-level female practitioners are aware of the high concentration of women in the field, and the discrepancy that occurs at management level. Participants reported low numbers of women in management. Participants did not recognize the effects of feminization, such as marginalization of the field and an overall wage decrease for all employees. Participants also reported gender wage disparities, particularly at management levels. Participants also acknowledged the existence of sexual harassment in public relations. For items concerning gender wage disparities and sexual harassment, many participants indicated an overall awareness, but they reported that these challenges did not exist in their workplace.

## **Development of Silicon-Based DNA Biosensor for Salmonella Detection**

Tara L. Franey, under the direction of Evangelyn Alocilja, Biosystems Engineering

For rapid detection of Salmonella, a silicon-based DNA biosensor was fabricated. Planar and porous silicon were evaluated for use as a biosensor platform. Silicon (p-type) was anodized electrochemically using hydrofluoric acid to produce porous Si. Both planar and porous Si chips were then functionalized into a biosensor by immobilizing a DNA probe specific to Salmonella Enteritidis. Sensitivity (lower detection limit) of the biosensors was determined using DNA extracted from an overnight pure culture of Salmonella Enteritidis (with and without PCR amplification). Specificity (cross reactivity) of the biosensor was tested using DNA of related species, Escherichia coli, at same concentrations as employed for sensitivity testing with Salmonella. DNA hybridization was determined by cyclic voltammetry in a three-electrode electrochemical cell using  $K_4Fe(CN)_6$ . Sensitivity of the planar and porous Si biosensors using PCR-amplified Salmonella DNA was 1 nanogram/ml and 1 microgram/ml, respectively. Cross reactivity was not observed with E. coli DNA. No significant difference in the output signal was observed when testing DNA from Salmonella pure culture with and without PCR amplification. Silicon-based biosensor was fabricated to successfully detect Salmonella DNA with the porous Si performing significantly better than the planar Si as a biosensor platform (in terms of sensitivity). This biosensor has potential applications in food, medical, biodefense, and environmental testing.

## **Black is Beautiful: Civil Rights to Black Power**

Terrell D. Frazier, under the direction of Dr. Katherine O. See, Social Relations

My topic of interest focuses on the Civil Rights Movement and the rise of black consciousness. My research is primarily focused on the growth of Black Power in civil rights organizations such as CORE and SNCC between the time periods of 1965-1975. This topic is one that needs to be examined because of the inclination in civil rights scholarship to use a dichotomizing framework when examining the movement. Civil Rights scholar Jeanne F. Theoharis comments on this separation of equal parts of the movement when she asserts that there is a tendency to “bifurcate the movement between South and North, nonviolence and Black Power militancy, de facto and de jure segregation, and the movement before 1965 and after” (Danielson, 432) This dichotomization seems to be most prevalent discourse between pacifism vs. Black Power and this is why I am choosing to focus on the connection between these two forms of contentious politics instead of framing them as opposing forces. The first question that I will ask in my research paper is

how exactly did the competing frame of black power ideology grow out of the dominant collective action frame of the civil rights movement? To do this I will first examine the strategic use of the collective action frame in social movement theory. A collective action frame is an action oriented set of beliefs and meanings that inspire and legitimate the activities and campaigns of a social movement. Secondly I am asking is, "How did the socioeconomic conditions of the time period lead to the rise in Black Power within the Civil Rights Movement. Through my research I hope to add to the knowledge in this growing area of civil rights scholarship.

### **The Dilemma of Local Control in Urban Education: Comparing State Takeover in Chicago and Detroit School Districts**

Jasmine D. Gary, under the direction of Dr. Louise Jezierski, Social Relations

Today DPS are facing a large budget deficit, a large number of school closings and laying-off of school staff in the near future. The top-down reform of Engler's school board takeover did nothing to address systematic issues that are found within urban school districts, like Detroit and Chicago. However, Chicago's school board reform has been used as the example of this type of reform. The purpose of this research is to see whether a top-down reform such as state takeovers in urban education systems can be successful in improving the quality of education, without addressing systematic issues within a community. The research will examine the Detroit school board reform and the Chicago school board reform through theoretical models, which will show the similarities and differences within these two reforms that may have attributed to the differences of success. In order to measure success of the reforms, the research will review data that would measure the quality of education before and after the reforms in both urban areas. An analysis of the data will then be performed to examine the relationship between the school board reform and the improvement of the quality of education. Based on the findings, we hope to find whether top-down reforms such as state takeovers are beneficial to education systems in urban areas, and if additional policies need to be adopted.

### **Isolation of Clonal Breast Cancer Cell Lines that Inducibly Express Mixed Lineage Kinase 3 Variants.**

Michelle A. Gilmer, under the direction of Dr. Kathleen Gallo, Physiology/Biochemistry

Mixed-lineage kinase 3 (MLK3) is a mitogen-activated protein kinase (MAPK) kinase kinase that activates MAPK pathways, including the c-Jun NH(2)-terminal kinase (JNK), ERK and p38 pathways. To learn more about MLK3 regulation and its signaling pathways through its SH3 domain, a MCF7 breast cancer cell line, a clonal cell line inducibly expressing a variant of MLK3 will be established. This variant, Flag epitope-tagged MLK3 K144A/ P469A, lacks kinase activity and lacks an autoinhibitory interaction involving the SH3 domain. In this way MLK3s SH3 domain should be free to interact with other proteins in the cell. This variant can be used to isolate signaling complexes of MLK3 and to identify their components using mass spectrometry. A pool of cells has been previously generated in the lab to stably, inducibly express the MLK3 variant, but expression has decreased in response to an inducer treatment after a long-term passage. Thus the goal of this research project is to generate individual clones that highly express MLK3 K144A/P469A protein in the presence of a small molecule inducer.

### **For Focal Point, this is Jessica Godell. (Student Reporting for MSU)**

Jessica J. Godell, under the direction of Dr. Kim Piper-Aiken, journalism

Producing quality news is a primary goal of broadcast journalism students. As a broadcast journalism student at MSU, one is not only responsible for creatively and effectively coming up with stories and writing scripts, but also responsible for shooting all the video for each story and editing as well. I have chosen to showcase a short variety of work that I have completed for Focal Point, MSU's television news magazine. Focal Point

gives students the opportunity to work as reporters in the field and puts curriculum beyond the traditional classroom. As a reporter and anchor on Focal Point, I have put together a number of pieces for the show. A package is a piece of work including both video and reporter presence. Typically a reporter has a video stand-up in a package, personally illustrating a part of the story. A package also includes the reporter's presence on a voice-track previously recorded and edited to the video. A VO/SOT is different in the fact that the anchor reads the script (typically written by the reporter) alongside correlating video. As an anchor on Focal Point, I've had the opportunity to effectively tell stories from the studio. Today's presentation includes a combination of the three.

### **Development of a Coding Scheme to Assess Source Credibility**

Nicholas A. Godlesky, under the direction of Dr. Sandi Smith, Communication

Source credibility is a critical component in social influence and persuasion, having gained attention since the time of the ancient Greeks. Currently, though, a scheme to assess source credibility is lacking. We aim to fill that void by conceptualizing the components of source credibility as expertise, trustworthiness, attractiveness, and power. Each of these four dimensions has sub-categories that will be reflected in our coding scheme. In addition, we will establish unitizing reliability via Geutzkow's U and coding reliability via Coehn's Kappa.

### **Economic Abuse and Depression**

Megan R. Greeson, under the direction of Dr. Cris Sullivan, Psychology

Domestic abuse is an important social problem in today's world. Domestic abuse is a dynamic of power and control that involves batterers using various forms of abuse to control women and their actions. One of the most under-researched and over-looked forms of domestic abuse is economic abuse. Economic abuse involves tactics utilized by one person to control another through economic means. This type of abuse has important effects, one of the most commonly recognized being increased economic dependence on the batterer, which is a critical barrier to leaving the relationship. This study is part of a larger study that was designed to validate an unprecedented measure of economic abuse. The purpose of the research was to pilot this measure; I studied the relationship between economic abuse and depression in domestic abuse survivors. Female survivors were administered surveys of economic, psychological and physical abuse and depressive symptomology. While depression has been linked to domestic abuse, it has never been studied in relation to economic abuse specifically. Results are not yet available.

### **Designing a Magnetic Lens for Femtosecond Electron Microscopy**

Royce P. Grewer, under the direction of Dr. Chong-yu Ruan, Physics and Astronomy

In electron microscopy a narrow beam of electrons is shot at the specimen at ultra-high speed and its imaging power is defined by the beam column focusing. The problem is that the electrons tend to spread out due to Coulomb repulsion of like charges, and thus as time progresses the beam becomes spread out and unfocused, causing the image to become unfocused. This problem is even more pronounced in femtosecond electron microscopy, where the electrons are packed closer and thus the repelling forces are even larger. One solution is to create a "lens" of sorts that bends errant electrons back on course towards the target specimen using a magnetic field. The object of this simulation is to design such a lens, within the spatial constraints of the vacuum container, which will use coil geometry to produce the desired magnetic field through its center for focusing of electrons. The design consists of a coil of wire surrounded by soft (paramagnetic) iron that helps intensify the local magnetic field, making it more efficient at bending electrons toward the focus point.

## **Phosphodiesterase Inhibitor Stimulation of Calu-3 Cell Monolayers and Its Effects on CFTR Activation**

Jamey L. Hardesty, under the direction of Dr. Douglas Luckie, Physiology

The Cystic fibrosis transmembrane conductance regulator (CFTR) is a protein that functions as a chloride anion channel. More recent studies have also shown CFTR to be linked to bicarbonate flux and extracellular pH (pHo). Mutations in the gene for CFTR are the cause of the disease cystic fibrosis. We investigated the pHo of Calu-3 cells expressing CFTR in application with phosphodiesterase inhibitors (PDEis). We measured the pHo after stimulation by PDEis using the microphysiometer. Sildenafil citrate and papaverine were the two PDEis tested in this experiment. We also used forskolin to stimulate CFTR as well as glybenclamide, which deactivates CFTR. In effect, by increasing the activity level of CFTR by using PDEis, they could possibly be used as a form of therapy. Past studies have acknowledged that certain phosphodiesterase inhibitors can activate CFTR-dependent chloride transport in non-polarized cells and CF mice. We found that forskolin and glybenclamide activated and deactivated, respectively, as expected compared to previous studies. Papaverine showed some stimulation of CFTR and sildenafil citrate had little to no activation of CFTR. We also used the iodide efflux assay to test for the presence of CFTR in the Calu-3 cells.

## **Career Studio--Designing Your Life's Work**

Mary A. Helmic, under the direction of Dr. Jeff Grabill, Writing, Rhetoric & American Culture

Choosing a career is one of the most important decisions we ever make. Many of us need assistance in identifying who we are, what we have to offer, what we want to do with our lives, and strategizing how to get there. Institutionalized career advice may or may not be helpful. Are there other approaches which could be beneficial? My research encompassed working at MSU's Career Development Center; attending the Big Ten+ Career Conference; completing a 3-credit pre-professional internship at MSU's Career Services & Placement; interviewing Lansing area career professionals; studying print and online materials; completing an MSU Career Strategies class; and informally advising several adults. These experiences led to formulating an innovative approach titled "Career Studio—Designing Your Life's Work." The Career Studio concept offers a home studio environment in which a Licensed Professional Counselor provides individualized guidance for persons exploring career options and life path development. This format allows for movement and choice within a resource-rich environment, taking into consideration individual learning styles and personality preferences. Career Studio is adaptable to a variety of settings and age groups, making it feasible for elementary, middle, high school, and college settings, as well as private and community programs.

## **Cell Culture Methods for Zebrafish Caudal-Fin Cells**

Lindsey A. Hendershot, under the direction of Dr. Jose Cibelli, Physiology/Animal Science

The Zebrafish (*Danio rerio*) is an excellent model used extensively to study the development and disease of higher organisms. These animals lend themselves well to comparative genetic studies due to their small size, ease of breeding, and relatively short period of maturation. Despite the great potential for study, no consistent culture conditions for embryonic or somatic cells exist for the Zebrafish. The purpose of this study is to determine the most effective culture condition for adult caudal-fin cells, specifically addressing our recent difficulties with cell attachment and poor growth. While an effective culture media has been determined, this study focuses on air oxygen concentration and the effect of a membrane matrix on cell growth. The methods determined by this study will be used by our lab to culture primary cells for Nuclear Transfer and cloning experiments with Zebrafish.

### **Thermal Resistance of Salmonella in Whole Muscle Versus Ground Pork**

Amy M. Hendricks, under the direction of Dr. Bradley P. Marks, Biosystems Engineering

Research has documented differences in thermal inactivation rates of Salmonella between ground and whole muscle meat during cooking. However, the correlation between degree of grinding and inactivation rate is unclear because only whole muscle and finely ground meat have been evaluated. The objective of this study was to determine the relationship between thermal resistance of Salmonella and degree of grinding. Irradiated pork loins were inoculated with a marinade containing Salmonella (108 CFU/mL). Samples (~5g) were packed into sterile brass tubes (12.7mm diam.), sealed, and cooked in a water bath at 60°C. The internal temperature of the meat was monitored with a thermocouple. Samples were plated on Petrifilm™ aerobic count plates to enumerate Salmonella. The whole muscle and ground samples had the same composition, thermal history, and inoculation levels; therefore, differences in thermal resistance of Salmonella were due exclusively to the degree of grinding. Salmonella showed higher heat resistance in whole muscle samples. Pathogens that may be present in meat products need to be inactivated in commercial processes. Current USDA regulations for meat processing are based on studies performed with ground meat. If Salmonella are more heat resistant in whole muscle products, application of these regulations could result in insufficient bacterial inactivation, thus leading to foodborne illness.

### **The Demands of Television News**

Alison E. Himelhoch, under the direction of Dr. Kim Piper-Aiken, Journalism

The media continues to get a bad rap for misportraying current issues or under/over representing certain things. A journalist's job is to give an unbiased, accurate account of what is going on in the world. I am learning to be this kind of journalist and fight the stereotypes that go along with the profession. However, television news is a lot more complex than print. We have to shoot video and write our stories around the video that we have. For the story I am presenting here, I researched myths about nutrition labels. The final product explains what goes into fat-free and low fat products and what we should be including in our diets instead of these foods. To produce this story I shot video of various products in the grocery store and also of people eating. At the end of my story, I included a clip of myself anchoring Focal Point, MSU's Television News Magazine. Although, this may seem effortless on camera it is not as easy as it looks.

### **The Role of Pentatricopeptide Repeat Proteins in Mitochondrial Biogenesis of Trypanosoma brucei**

Andrea M. Hingst, under the direction of Dr. Donna Koslowsky, Microbiology

*Trypanosoma brucei*, a parasitic protozoa, is responsible for initiating African Sleeping Sickness in humans and Nagana in cattle. This organism has two distinct lifecycle stages, bloodstream and procyclic, occurring in a mammalian host and insect vector respectively. During the complex lifecycle, mitochondrial gene expression is regulated, which is the focus of our laboratory's study. A large family of pentatricopeptide repeat proteins (PPR proteins), originally identified in plants, are suspected to regulate RNA metabolism in the mitochondria and chloroplasts of cells. *T. brucei* is predicted to have 22 of these proteins with a characteristic 35-amino acid degenerate repeat, the largest number in any nonplant organism examined thus far. Via RNA interference (RNAi), Northern blot analysis, and Real Time PCR, our lab is exploring the precise roles of these proteins, beginning with TbPPR1 and TbPPR2. These two proteins are paralouges and show considerable alignment both inside and outside the PPR domains (33.7% identical and 45.1% similar), which may infer that the two interact with the same proteins. Preliminary results indicate that TbPPR1 targeted by RNAi results in a slow growth phenotype and a decrease in steady state levels of some mitochondria transcripts. Further experimentation and data analysis hope to deduce more information concerning the role of PPR proteins in mitochondrial biogenesis in trypanosomes.



### **Individual Differences in the Pursuit of Happiness**

Michael P. Hoerger, under the direction of Dr. Thomas Carr, Psychology

You won't be happy forever if you win the lottery. And you won't suffer unending sorrow over a romantic breakup. Yet, several studies have shown that people overestimate the duration and intensity of their emotional reactions to future events. This finding is important because overestimating our emotional reactions may lead us to make a number of foolish decisions in everyday life. For example, we might shell out hundreds of dollars on a new DVD player, designer clothing, or a luxury automobile, predicated on the assumption that these things will provide us with somewhat lasting happiness; though, research suggests these things might become quite commonplace and boring after only a few days. Thus, being skilled at predicting our emotional reactions seems vital to the pursuit of genuine, lasting happiness. This is the first study to investigate individual differences in the ability to accurately make such predictions. Specifically, this study examines the role of personality traits, coping style, and working memory capacity in the accuracy of predictions about emotional reactions to events, such as football games or the Presidential election. This study explores how to more accurately predict emotional reactions, with the ultimate aim of fostering better decision making and the pursuit of happiness.

### **Relationship Variables and Ideal Romantic Partner Preferences**

Kendal Holtrop, under the direction of Dr. Gary Stollak, Psychology

There has been a vast amount of opinion, theory, and research into the broad construct of love concerning its definition, its assessment, and its development and influence in parent-child and marital relationships. However, there has been relatively little empirical research conducted on the topic of romantic partner selection. The current study sought to investigate what characteristics of an individual influenced the type of love style they desired in an ideal long-term romantic partner during late adolescence and early adulthood. Specifically, it was predicted that dimensions of self-esteem, perceived mate value, attachment style, and relationship experience would influence the description of one's ideal mate. Online surveys were administered to approximately 300 college undergraduates recruited through the Psychology Department subject pool. Preliminary data analyses are consistent with previous findings and suggest statistically significant correlations between some of the variables. For instance, the anxious and avoidant dimensions of attachment style were significantly correlated with reported preferences for the Eros, Ludus, Mania, and Agape love styles. The results of this line of research could be applicable to areas of premarital counseling, personality development, and interpersonal relationships, in general.

### **UTP Increases Extracellular Acidification Rate of NIH/3T3 Cells via Interaction with P2Y2 Receptors**

James S. Howard, under the direction of Dr. Douglas Luckie, Physiology

According to previous research, when treated with UTP some cell lines will initiate a P2Y2 receptor response leading to the activation of Ca<sup>2+</sup> dependent Cl<sup>-</sup> channels (CaCC) that are capable of transporting HCO<sub>3</sub><sup>-</sup> as well (Clarke et al., 2000; Rubera et al., 2000). Using the logic that this could provide a potential therapy for Cystic Fibrosis patients, who lack the normal CFTR path these anions travel for secretion, we tested the effect of UTP on NIH/3T3 cells both (+)CFTR and (-)CFTR (delta F508). Using microphysiometry to monitor the change in extracellular acidification rate (ECAR) and efflux techniques to investigate Cl<sup>-</sup> conductance, we found that UTP caused the ECAR to increase instead of the predicted decrease, with no significant difference between (+) vs. (-) CFTR. Upon further investigation of the literature regarding this topic, we discovered the protein believed to be responsible for UTP/P2Y2 activated extracellular acidification is Ca<sup>2+</sup> dependent Na<sup>+</sup>/H<sup>+</sup> exchanger: NHE1. Since NIH/3T3 cells are fibroblast and not epithelial cells, the consequences for CF research are unclear.

### **Bulldog Joe Character Study**

Ara J. Howrani, under the direction of Lisa Whiting Dobson, Telecommunications

A 5 minute documentary-style video on a true character from Detroit. He has been known as Bulldog Joe for years, but now the city of Detroit has officially named him Mr. Detroit. He considers himself a "meeter, greeter, chaperone, and a true gentleman." The way he presents his ideas is pretty comical, talking about his "PhD", "the 3 G's to life", amongst other topics.

### **Is Trans Fat a Significant Component of Commercial Petfoods?**

Emma B. Hummel, under the direction of Dr. Tom Herdt, Large Animal Clinical Sciences

Trans fat has recently become a concern in human nutrition as research has revealed a link between trans fat consumption and LDL cholesterol ("bad" cholesterol) levels, which contribute to a greater risk of coronary heart disease. By the start of next year, the FDA will require food manufacturers to include trans fat content on nutrition labels. Little is known, however, about either the effects or the prevalence of trans fat in animal diets. The objective of this study was to compare trans fat levels across a variety of commercial pet foods. Total dietary fat was extracted from 12 canine diets and 7 feline diets, and the percent trans fat was analyzed. Diets specially designed for weight loss or for growth were compared in trans fatty acid content to diets indicated for general maintenance. As veterinarians continually seek to improve nutrition for pets, trans fat is an important dietary component to be taken into account.

### **PDEI's and Cystic Fibrosis**

Adam Jablonowski, under the direction of Dr. Douglas Luckie, Physiology

The Cystic Fibrosis Transmembrane Regulator channel has been shown to be linked to bicarbonate flux and to have possible effect on cellular pH. We investigated the pH<sub>o</sub> of Calu-3 cells and the effects on phosphodiesterase's in an application with phosphodiesterase inhibitors. We measured the pH<sub>o</sub> when CFTR is stimulated by PDEi's by using the microphysiometer. We used Sildenafil citrate, and papaverine as our two PDEi's. We also used forskolin to stimulate CFTR as well as glybincamide, which deactivates CFTR. In effect, by lowering the activity level of mutant CFTR molecules that spontaneously localize to the cell surface by using PDEi's, we could use it as a form of therapy. Past studies have acknowledged that certain phosphodiesterase inhibitors [PDEi's] can activate CFTR-dependent Chloride transport in non-polarized cells and CF mice. We found that forskolin and glybincamide activated and deactivated as expected and seen in previous studies. Papavarine had some stimulation of CFTR and Sildenafil Citrate had little to no activation of CFTR. We also used the iodide efflux assay to test for the presence of CFTR in the Calu-3 cells.

### **Cloning and Expression of the SET Domain of the EZH2 Protein**

Rachel C. Jacobson, under the direction of Dr. Jennifer L. Ekstrom, Biochemistry

The SET domain and the adjacent cysteine-rich region are responsible for the catalytic activity of the protein EZH2, a known human histone methyltransferase which is associated with breast cancer and prostate cancer. These regions of EZH2, like SET domains and their associated cysteine-rich regions found in other proteins, are involved in chromatin regulation. My research project involves cloning and expressing two EZH2 constructs: the SET domain itself (SET) and a second construct including both the cysteine-rich region and the SET domain (cysSET). Isolating the catalytic region of the EZH2 protein will aid research into the protein's role in histone methylation and perhaps allow us to design inhibitors that could aid in the treatment of certain cancers. The EZH2 sequences for the SET and cysSET regions were amplified using PCR and digested with restriction enzymes BamH1 and Nde1. The DNA for the SET and cysSET regions have been individually inserted into two vectors (a pRSF Duet vector encoding an N-terminal 6-His tag and a modified

pRSF Duet vector encoding a GST-tag) via ligation. Both the 6-His and GST-tagged SET constructs have successfully been expressed in *Escherichia coli*. Sequencing of EZH2tr cysSET-GST showed two base pair mutations which will be corrected using site-directed mutagenesis. The cysSET and SET regions isolated from EZH2 will be crystallized with the intent of studying the unique structure of the SET domain to more fully understand the catalytic activity of the EZH2 protein and its role as a cancer-causing histone methyltransferase.

### **Pygoscelis papus, Gentoo Penguin, and Pygoscelis antartica Chinstrap Penguin Hatching Success on the Antarctic Peninsula**

RajReni Kaul, under the direction of Dr. John Schwartz, Fisheries and Wildlife

*Pygoscelis paua* and *Pygoscelis antartica* known commonly as the Gentoo and Chinstrap penguin respectively compete for the same breeding, nesting, and foraging grounds throughout the peninsula. Not only do they share habitats, but also procreative behavior. Both species lay two eggs 2-3 days apart, and will replace the clutch if the eggs are lost before the chicks hatch (Trivelpiece, W and Trivelpiece S.,1990). In this observational study, I recorded the number of hatched chicks in randomly sampled nests and factors that may affect the rate, such as, temperature, latitude and the surrounding nesting conditions. From this data, and the assumption that each nest started with two eggs, the hatching rate was found, and general trends could be seen. Each species favored different nest surroundings. Chinstrap penguins with the highest hatching rate were closest to the water, most of the time on rocky areas. The Gentoo penguins with the highest hatching rate either nested inland, or in cliffs. Those on the beach had a low success rate, most likely due to high mortality rate from predators.

### **Using Gene Recombination to Investigate Pathogenic Type II Secretion Systems**

Andrea C. Kendzioriski, under the direction of Dr. Dennis Arvidson, Microbiology and Molecular Genetics

Many bacterial pathogens employ type II secretion systems to secrete toxin proteins. EpsG is the major pseudopilin protein involved in the type II secretion of the cholera toxin, homologous to type IV pilins. Part of the general secretion pathway (GSP) of the bacterial pathogen *Vibrio cholerae*, EpsG likely assembles to form a similar pilus-like structure. The exact structure and function of EpsG have yet to be elucidated. In attempting to better understand the type II pseudopilus, we plan to construct a series of site-directed mutations at different locations within the G gene to test their effects on protein assembly and toxin secretion. Prior to this, we first constructed a plasmid containing the full-length functional G gene and possessing other desirable qualities, such as antibiotic resistance and useful restriction enzyme sites. Datsenko and Wanner (1) have developed a simple and highly efficient method for gene recombination, in which PCR primers provide the homology to the targeted genes. In two steps, we have successfully constructed a suitable clone. First, the plasmid pMMB857 was constructed by recombination of pAR3 (2) with the PCR product of a kanamycin (Km) fragment from pKD4 (1). Second, the plasmid, yet unnamed, was constructed by restriction digest and ligation of functional EpsG amplified by PCR from *V. cholerae* chromosomal DNA, and pMMB857.

### **Site-directed Mutagenesis of the Catalytic Domain of Mixed Lineage Kinase MLK3**

Steffany M. Kerkstra, under the direction of Dr. Kathleen Gallo, Physiology

The mitogen-activated protein kinase (MAPK) kinase kinase Mixed-lineage kinase 3 (MLK3) activates the c-Jun NH2-terminal kinase (JNK) and other MAPK pathways. Previous data has shown that MLK3 is involved in the regulation of several cell processes including apoptosis and cell growth. Activation of MLK3 in cells leads to MLK3 phosphorylation. To better understand the mechanism regulating MLK3 activation, site-

directed mutagenesis was used to generate kinase defective versions of MLK3.

### **Plurality and Maximality in Children's Comprehension of Definite Noun Phrases**

Jacqueline M. Kinney, under the direction of Dr. Alan Munn, Linguistics and Languages

Research has shown that young children's use of the definite article is not consistent with adults'. Children have a tendency to use the definite article when adults would rather use the indefinite. For example, when asked to describe a situation in which there are three balls, and a boy who kicks one of them, children would tend to say "The boy kicked the ball", whereas adults would say "The boy kicked a ball". For adults, the set picked out by the definite article must be unique and maximal, otherwise an indefinite must be used. At the same time, children have been reported to understand the plural morpheme /-s/ correctly. However, this research has not necessarily controlled for the possibility that other linguistic cues might account for this comprehension pattern. In this project, we report an experiment designed to test both aspects of young children's comprehension of definite noun phrases. Our task is designed to test (i) whether children can use the plural morpheme alone (as opposed to other linguistic cues) to distinguish between singular and plural definite noun phrases, and (ii) to test whether children have a maximal interpretation of the definite in a task different from those reported in the literature.

### **Why Do We See Colors?: Trying to Understand Color Vision**

Sayee Kiran, under the direction of Dr. Ali Zand, Chemistry

When visiting an art gallery, it is easy to appreciate the spectrum of colors used in each artist's palate. The ability to see different colors is easily taken for granted; we do not fully understand the mechanisms by which our eye adjusts to the variance of shades in our environment. In the retina, there are specialized cells called rod and cone cells that aid us in differentiating colors and brightness. Since the number of cone cells is less than rod cells, they have not been thoroughly investigated in the past. Inside cone cells, the protein opsin binds to one molecule of retinal; isomerization of this bound retinal leads to color vision. There are many theories suggested that try to explain how one molecule, retinal, enables us to see different colors. One of these theories suggests that the variation in the degree in which the retinal structure twists inside opsin is responsible for color vision. Another theory claims that the distance separating the positive and negative charges varies in different cone-opsins thus causing us to see different colors. To test the validity of these theories, we are engineering a protein, by site directed mutagenesis, to mimic the behavior of opsins. The results of our investigation from these studies will be presented.

### **Brain Cytoarchitecture in a Large Grazing Marsupial, Rufous Wallaby *Thylogale billardieri***

Cindy D. Knaff, under the direction of Dr. John I. Johnson, College of Human Medicine

Evidence of brain evolution can be seen through comparative neurology. Marsupial brain analysis provides evidence for the paths and outcomes of the larger mammalian neuroanatomy and physiology. Wallabies, large grazing marsupials, provide opportunities to study evolutionary convergences with brains of independently evolved brains of large grazing placental mammals, from a separate branch of the mammalian radiation. To accomplish this we have analyzed the internal structure of the brains of Rufous Wallabies *Thylogale billardieri*, in direct comparison with their counterpart structures in Domestic Sheep *Ovis aries*, large grazing placentals. In stained sections from both species, we found relatively well-developed brain regions subserving olfaction, audition and vision, and a large extent of cerebral isocortex. These parallel hyperdevelopments are obviously related to environmental adaptations rather than to phylogenetic relationships. Through further quantitative analysis of neuroanatomical structure and function of the Rufous Wallaby brain, we can understand more about the validity of conjectures, and the functional adaptation, of mammalian brains.

### **Electrostatics and the Folding of Type III Secretion Pili**

Michaela Kopka, under the direction of Dr. William J. Wedemeyer, Physics/Biochemistry

Bubonic plague (*Yersinia pestis*) is an ancient nemesis of mankind and a primary pathogen for biowarfare and bioterrorism. The virulence of *Yersinia* depends on its type III secretion needle, which delivers proteins that shut off the defenses of its victims; this needle is composed of a single protein, YscF. Computational predictions suggest that YscF and other type III secretion needle proteins may be intrinsically unstructured as monomers, i.e., acquire structure only as part of the needle. Using analytical ultracentrifugation, gel filtration, liquid-state NMR and CD, we have found supporting evidence for these predictions. Type III needle proteins are often highly charged, and we have since studied the effects of specific counterions and helix-favoring cosolvents on needle formation. Our results suggest that a Manning-type condensation is necessary to provoke oligomerization.

### **A New Analysis of the Bidelman & MacConnell Low-Metallicity Candidates**

Julie A. Krugler, under the direction of Dr. Timothy Beers, Physics and Astronomy

A new set of very high signal-to-noise ( $> 100/1$ ), medium-resolution ( $1 \text{ \AA}$ ) spectra have been obtained at Siding Springs Observatory for the sample of candidate low-metallicity stars originally selected by Bidelman & MacConnell, and reported on two decades ago by Norris, Bessell, & Pickles (1985). The sample has been supplemented with newly available proper motions from a variety of sources, as well as with JHK photometry from the 2MASS Point Source Catalog. Based on these data, we measure improved radial velocities, re-determine estimates of  $[\text{Fe}/\text{H}]$ , provide new estimates of  $[\text{C}/\text{Fe}]$ , and obtain full space motions for the majority of the stars in this catalog. Associations of these stars with various recognized stellar populations (the thin disk, thick disk, metal-weak thick disk, and halo) are discussed.

### **Global Gene Expression in *Neisseria gonorrhoeae* in Response to Antibiotic Stress**

Jonathan D. Lenz, under the direction of Dr. Cindy Arvidson, Microbiology and Molecular Genetics

The human pathogen *Neisseria gonorrhoeae* possesses a wide array of tools to avoid host defenses. Since *N. gonorrhoeae* is able to avoid the adaptive immune response and allow repeated infection, antibiotic compounds have been extremely useful in treating the disease gonorrhea. Unfortunately, *N. gonorrhoeae* is extremely versatile at developing resistance to even the most recently developed antibiotics and is currently on track to outpace all of the antimicrobials that we have to combat its spread. With this in mind, our lab is currently exploring the changes in gene expression that occur when *N. gonorrhoeae* is subjected to the stress of antibiotic exposure. In order to determine the patterns of possible gene expression changes, several different classes of antibiotics are being studied. Antibiotics may be present during other disease therapies in concentrations low enough to avoid complete killing of *N. gonorrhoeae*, but high enough to influence the ability of the bacterium to establish a productive infection, mediate its asymptomatic carriage or cause disease. By using DNA microarrays of the *N. gonorrhoeae* genome, we hope to discern if this bacterium can develop new or increased antibiotic resistance mediated by environmental exposure to sublethal concentrations of antibiotics. Further investigation of these pathways will also determine if bacterial responses are tailored to individual compounds or represent the activation of general stress response pathways.

### **Isolation of Gcn5-Containing Coactivator Complexes from Tomato and *Arabidopsis thaliana***

Nathan D. Lord, under the direction of Dr. Steven J. Triezenberg, Biochemistry and Molecular Biology

The eukaryotic protein Gcn5 is a transcriptional coactivator with the enzymatic function of a histone acetyltransferase (HAT). Gcn5 exists within large, multi-subunit coactivator complexes, notably the yeast

SAGA complex. Our laboratory has characterized the GCN5 gene and protein from the plant *Arabidopsis thaliana*. The *Arabidopsis* genome lacks obvious homologs of several SAGA subunits, and thus plant coactivator complexes are likely to be distinct from human or yeast complexes studied previously. The purpose of this study is to isolate and characterize Gcn5- containing transcriptional coactivator complexes from *Arabidopsis*, an organism useful for molecular genetics experiments, and *Lycopersicon esculentum* (tomato), a system amenable to biochemical study. A cDNA encoding the complete leGCN5 open reading frame was cloned. A tandem affinity purification (TAP) cassette, encoding a calmodulin binding peptide and IgG binding domain, was fused to the N- or C- termini of leGcn5 and atGcn5. The fusion genes were transformed into an *Arabidopsis* gcn5 mutant. Transformed lines are being used to test whether the TAP-tagged GCN5 can complement the gcn5 mutant phenotype. This work provides a foundation for biochemical efforts to identify components of tomato and *Arabidopsis* coactivator protein complex(es) containing Gcn5, and thereby to define one mechanistic aspect of transcriptional activation in plants.

### **Baseline Characterization of the Beta Counting System**

Benjamin R. Lott, under the direction of Dr. Paul Mantica, Chemistry

The beta counting system has been used at the NSCL for a variety of different experiments to examine short-lived fragment implants. The system consists of a 1-mm thick double-sided Si microstrip implantation detector backed by 6 1-mm single-sided Si microstrip detectors and 2 1-mm Si PIN detectors used to characterize energy and flight path of emitted beta particles. Currently we are working on baseline characterization studies of the individual Si detectors. The goal is to improve both the energy resolution and detection efficiency of the system to extend the reach of nuclides accessible to beta-decay studies at the NSCL.

### **Helical Structure of Type III Secretion Pili and Its Disruption**

Ishan Mahapatra, under the direction of Dr. William J. Wedemeyer, Biochemistry and Physics

Bubonic plague (*Yersinia pestis*) is an ancient nemesis of mankind and a primary pathogen for biowarfare and bioterrorism. The virulence of *Yersinia* depends on its type III secretion needle, which delivers proteins that shut off the defenses of its victims; this needle is composed of a single protein, YscF. Computational predictions suggest that YscF and other type III secretion needle proteins are mostly helical in structure. We have taken CD and solid-state NMR data to confirm these predictions. We have since made proline mutants to disrupt this helical structure; in general, the mutants do not form needles and, in some cases, interfere with needle formation from the wild-type protein, i.e., exhibit a dominant-negative effect.

### **Chess Perception**

Andrew T. Mattarella-Micke, under the direction of Dr. Zach Hambrick, Psychology

In a critical chess study, de Groot (1966) discovered that expert players did not differ from novices in the overt thought processes involving move choices. Instead he demonstrated that experts are capable of retaining significantly more pieces of a briefly presented board than their less skilled counterparts, as long as the boards were structured based on normal chess rules. This thoroughly replicated result provides the basis for a model of expertise linking chess performance with the recognition of familiar patterns. Yet, despite the valuable evidence which de Groot's classic board recall task provides, it is clear that pattern recognition is being measured only indirectly. By requiring that participants retain chess information for the short period of time between presentation and recall, working memory is implicated in the experimental performance. Therefore, it is the purpose of this study to validate a direct measure of the pattern recognition processes involved in chess performance, independent of the influence of working memory. Towards this end, chess players of varied skill levels were recruited from local chess organizations. The participants were required to

quickly identify whether or not a predetermined piece is within a board. By demonstrating that participants of higher skill are capable of faster piece identification for structured boards, the study replicates de Groot's original findings without the confound of working memory.

### **The Simon and Ehrlich Wager: a Historical Perspective**

David B. McClintick, under the direction of Ross Emmett, Political Economy

In 1980, Julian Simon made a wager with his longtime foe in population economics, Paul Ehrlich. They bet on the question of whether the prices of a bundle of five basic metal commodities (chrome, copper, nickel, tin, and tungsten) would rise or drop over a 10 year period. Simon won the bet handily because real prices fell, and defended his population economic theory successfully. The Simon-Ehrlich bet tested Malthusian population theory by using commodity prices as an indicator to determine the affects of population growth. Had Ehrlich been right, commodity prices would have risen along with the rapidly increasing world population. Simon's victory suggested that the expansion of resource supplies through further exploration and technological development outstripped population pressures. However, the 10-year time frame of the bet provided at best a very limited test of Malthusian population theory. The purpose of this project, therefore, is to extend the test by examining the history of commodity prices over a 100-year time frame. The paper will test the hypothesis that rapidly increasing world population over the 20th century led to price increases in common metal commodities, excluding inflation and major external events. Using a database assembled as part of this project, the paper will examine both the question of whether other 10-year periods in the 20th century confirm Simon's hypothesis, and also whether prices fell over the entire 100-year history.

### **hRev7 is Involved in Mutagenic Translesion Synthesis of UV-induced DNA damage**

Andrew M. McCoy, under the direction of Dr. J. Justin McCormick, Biochemistry and Molecular Biology and Molecular Genetics

In eukaryotic cells, the major DNA replicase polymerase delta is unable to continue incorporating nucleotides when it encounters a fork-blocking lesion induced by carcinogens such as UV radiation. Alternatively, specialized DNA polymerases are able to insert nucleotides opposite DNA damage. This process is called translesion synthesis (TLS) and is often error-prone. In yeast cells, polymerase (pol) zeta plays a major role in error-prone translesion synthesis. Pol zeta is composed of scRev3, the catalytic subunit and scRev7, the non-catalytic subunit. Yeast cells that lack a functional scRev3 or scRev7 exhibit significantly fewer UV-induced mutations indicating that pol zeta is involved in the induction of mutations by UV radiation in yeast cells. A human homolog of scRev3 was cloned in 1998 and subsequent studies demonstrated that cells expressing antisense against hRev3 produce a significantly decreased UV-induced mutation frequency, indicating that hRev3 performs a similar function in human cells as does scRev3 in yeast cells. A putative human homolog to the yeast scRev7 protein was identified in 2000. Whether hRev7 is involved in TLS in human cells has remained unknown until now. Cells transfected with siRNA targeted against hRev7 demonstrate slightly lower survival after UV radiation compared to control cells. In addition, cells with decreased hRev7 produce 4-fold fewer mutations after UV radiation when compared to parental cells and vector control cells indicating that hRev7 is involved in TLS of UV-induced DNA damage in human cells. This is the first evidence for a role for hRev7 in TLS in human cells.

### **Use of a Conductometric Biosensor for Detection of Foodborne Pathogens**

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

One of the most frequently occurring hazards in the U.S. food supply is foodborne pathogens such as E. coli O157:H7 and Salmonella Typhimurium. Because of the highly contagious nature of these pathogens, it is important to have a reliable, sensitive, and relatively rapid detection method for these bacteria. The objective

of this study is to evaluate the sensitivity of the conductometric biosensor for *E. coli* O157:H7 and *Salmonella* Typhimurium detection in artificially inoculated produce samples. Different variations of concentrations of antibodies and polyaniline were used to find the prime combination for increasing sensitivity. Testing was also conducted to see if using monoclonal or polyclonal antibodies would have an effect. There was no statistically significant difference between the results of the polyclonal and the monoclonal antibodies. For both tested antigens the best results were found using concentrations of: 0.5mg/ml of antibody on the capture membrane, 0.25 mg/ml of antibody on the conjugate membrane, and 100 mg/ml of polyaniline. A sensitivity of  $10^2$  CFU/ml was found for detecting pathogens on lettuce and strawberries while a sensitivity of  $10^3$  CFU/ml was found for detection on sprouts.

### **Validation of Group Administered Tasks of Working Memory Capacity**

Shannon J. McKenney, under the direction of Dr. D. Zachary Hambrick, Cognitive Psychology

According to Baddeley and Hitch, in 1974, working memory capacity (WMC) is the ability to hold information in an active state during ongoing processing. In recent years, WMC has been conceptualized as an important – even central – component of complex cognition. This construct is generally assessed with dual-task paradigms such as Daneman and Carpenter's 1980 reading span, a "complex span" task. Historically, complex span tasks have almost always been individually administered. This makes large-scale studies extremely – even prohibitively – time consuming and expensive. Thus, most studies have been very small. For example, consider Daneman and Carpenter's 1980 study, only 20 participants were involved in this study. There are at least two significant concerns associated with use of small samples: power and precision. Therefore, I propose to develop and validate group-administered complex span tasks. My intent is to make large-scale studies of WMC more efficient and economical so that the results of such studies exhibit more power and precision.

### **The Role of Sprouty-2 in the Transformation of Human Cancer Cell Lines in the Presence or the Absence of Ras-activating Mutations**

Bryan D. Mets, under the direction of Dr. J. Justin McCormick, Biochemistry and Molecular Biology and Molecular Genetics

Sprouty-2 (Spry2) has emerged as a signal specific regulator of receptor tyrosine kinase (RTK) signaling. In particular, Spry2 has an antagonistic function in FGF, PDGF and VEGF signaling, and an agonistic function in EGF-induced signaling. The PH3MT human fibroblasts, which have been transformed into malignant cells by overexpression of the H-RasV12 oncogene, have up-regulated expression of Spry2, compared to their normal precursor cells. When Spry2 was down-regulated in PH3MT cells, the cells lost their ability to form tumors, suggesting that Spry2 has oncogenic properties in the context of H-Ras transformation. Moreover, the expression of Spry2 was up regulated in the patient tumor-derived cell lines HT1080 and VIP:FT, which express a constitutively active Ras isoform, or wild type Ras isoforms respectively. To determine whether Spry2 plays a role in the transformation of these latter two cell lines, and also, to determine whether the role of Spry2 in cancer is dependent on Ras activation, both cell lines were stably infected with Spry2-specific shRNA constructs. From each of the cell lines, two sets of negative controls were generated by infecting one group of the cells with an empty vector, and another group with a vector expressing a nonspecific shRNA transcript. From the HT1080 cells expressing spry2-specific shRNA constructs, one clone showing an apparent down-regulation of Spry2 has been isolated. In the VIP:FT cell line, several clones have been isolated that show down-regulation of Spry2. In both cell lines, the clones with down-regulated Spry2 levels will be injected into athymic mice and tested for tumor growth. In addition, the cells with down-regulated levels of Spry2, and the control cell lines, will be analyzed to determine the modality of Spry2 function in RTK signaling in this context.



### **Cloning, Expression and Characterization of the Polycomb group PRC2/3 complex**

Samuel A. Molina, under the direction of Dr. Jennifer L. Ekstrom, Biochemistry and Molecular Biology

The Polycomb Group PRC2/3 protein complex (EZH2/EED/SUZ12) is responsible for the negative transcriptional regulation of various developmental genes and is involved in the control of cell proliferation. PRC2/3 methylates lysines on histones H3 and H1 through the SET domain of EZH2; these histone modifications have been shown to down regulate the transcriptional activity of nearby genes. Upregulation of EZH2 is also linked to metastatic cancers, making this complex of interest to various aspects of research and development. The human EZH2, EED and SUZ12 proteins have been cloned into E. coli expression plasmids containing GST or 6-His purification tags. We have been expressing these proteins in E. coli and purifying them using affinity and/or ion-exchange chromatography. Single protein expression data has been collected for each of the PcG members, and we are now attempting to co-express these protein complexes and study their interactions. We plan to use X-ray crystallography to determine the structure of EZH2, EED and SUZ12 individually, and in complex, to understand how this complex functions.

### **Examining the Effects of Training on Working Memory Processes in the Tower of Hanoi Game**

Daniel . Moore, under the direction of Dr. Alessandra Passarot, Psychology

The subject of working memory has often been studied by cognitive psychologists as have expertise and the Tower of Hanoi game. What has yet to be fully explored is how working memory processes differ in a novice performance compared to an expert performance in the Tower of Hanoi game. In this experiment novice subjects will be tested as they play a computerized version of the Tower of Hanoi (TOH). The subjects will be shown two pictures of the TOH puzzle. The top picture will correspond to where they are in solving the puzzle while the bottom picture will be the next correct move or an incorrect move. Subjects will be asked to choose whether or not they believe the move is correct. They will then be trained in the specific steps that lead to the quickest solution, using another computerized version of the TOH, and then be retested as experienced subjects. The novice test and experienced test will be compared in general accuracy and reaction time using a paired t-test and we expect the accuracy of these two tests to be statistically, significantly different. We hope to show that the discrepancy between accuracy at the two tests can be attributed to a difference in working memory load at the time of testing. Using mismatch trials, specific rule violations made during the two tests will also be analyzed, with hopes of showing a clear difference between errors at each testing time.

### **Fabrication of an ITO-Pani biosensor for Detection of BVDV**

Matthew J. Nelson, under the direction of Dr. Evangelyn C. Alcocilja., Biosystems and Agricultural Engineering

Bovine viral diarrhea virus (BVDV) is a prominent infectious agent of cattle that can cause a variety of detrimental symptoms and potentially death. The prevalence of BVDV and other similar agents has created a demand for rapid screening of these agents and the development of biosensors has the potential to fill this need. An ITO-Pani biosensor was fabricated to detect BVDV in a pure culture. The biosensor consisted of polyaniline, a conductive polymer, on a tin indium oxide glass platform and antibodies specific to BVDV. Two immobilization methods and three antibody concentrations were used in the study to optimize the biosensor architecture. The detection limit of the biosensor was determined by evaluating the difference between the signal before and after antigen binding. The detailed procedure and performance of the biosensor will be highlighted in the poster presentation.

### **CtBP as a Candidate Phospho-CTD Interacting Protein**

Sze-Ling Ng, under the direction of Dr. Min-Hao Kuo, Biochemistry

Protein-protein interactions are critical for many biological processes because they facilitate the cross-talk between different cellular pathways maintaining homeostasis within cells. These interactions are fundamental in our understanding of the regulation of gene expression and numerous other cellular functions. 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. To provide a means of detection for modification-regulated interactions, we have modified the yeast two-hybrid system. Our tethered catalysis/yeast two-hybrid system is a novel technique for detection of modification-activated and -inhibited interactions. In this experiment, we focus on one such modification, phosphorylation of the carboxyl terminal domain (CTD) of RNA Pol II, which is critical for regulation of Pol II activity during the transcription cycle. Many devastating human diseases have been linked to misregulation of transcriptional elongation. We hypothesize that the use of our system for 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 possible links to certain human diseases. Our Y2H screen has yielded several possible phospho-CTD interacting proteins. We have chosen one of the candidates, CtBP (C-terminal binding protein), to study further. CtBP has been shown to bind to the C-terminal region of E1A oncoprotein and functions as a transcriptional co-repressor. We hope to further expand on the role of CtBP in transcriptional regulation by showing that it may be a specific phospho-CTD interacting protein.

### **The Cytochrome P450A4 Inhibitor Ketoconazole Does Not Reveal 5-HT-Stimulated Superoxide in Rat Aorta**

Kevin K. Ogden, under the direction of Dr. Stephanie Watts, Pharmacology and Toxicology

Serotonin (5-HT) is a vasoconstrictor and mitogen, and substances with similar effects produce superoxide in arteries. We have been unable to demonstrate 5-HT-induced increases in superoxide. Recently, 5-HT has been shown to be metabolized by cytochrome P450 to nitric oxide (NO). We hypothesized that 5-HT-induced increases in superoxide are quenched by metabolism of 5-HT to NO and that inhibition of cytochrome P450 would reveal 5-HT-stimulated increases in superoxide. In isolated tissue baths, rat thoracic aorta contraction to 5-HT was potentiated by the cytochrome P450A4 inhibitor ketoconazole (KTZ: 10  $\mu$ M; aorta:  $-\log EC_{50}$  control =  $5.29 \pm 0.09$ , KTZ =  $6.39 \pm 0.08$ ;  $p < 0.05$ ); KTZ did not affect phenylephrine-induced contraction. Lucigenin-based chemiluminescent experiments were used to measure superoxide. 5-HT (1 nM – 1  $\mu$ M) did not significantly increase aortic superoxide concentrations over basal levels. The nitric oxide synthase inhibitor L-NAME did not enhance 5-HT (1  $\mu$ M)-stimulated superoxide. Finally, addition of KTZ (1  $\mu$ M) did not enhance 5-HT (1  $\mu$ M)-stimulated superoxide (KTZ:  $0.037 \pm 0.007$  nmol/min/mg; KTZ + 5-HT:  $0.041 \pm 0.003$ ). Thus, these experiments suggest that while KTZ potentiated contraction to 5-HT, this result was independent of any effects KTZ might have on elevating superoxide concentrations. The ability of 5-HT to increase superoxide in arteries remains a question.

### **Why Are Some People More Knowledgeable Than Others? A Longitudinal Study of Individual Differences in Knowledge Acquisition.**

Jeffrey E. Pink, under the direction of Dr. Zach Hambrick, Psychology

How are some people able to acquire more knowledge than others? The current study investigates what may contribute to acquisition of current events knowledge. Certain cognitive ability and non-ability factors may lead to individual differences in knowledge. Previous research (Hambrick, Meinz, and Oswald, 2005) has indicated the presence of distinct pathways relating cognitive ability and non-ability factors and their influence on differences in knowledge acquisition. This study expands these findings by utilizing a

longitudinal design in which the subjects participated in two sessions. With this design, I was able to further understand the factors which contribute to knowledge acquisition over approximately a 2.5 month span in a naturalistic learning environment. The results of the study will further increase understanding of the factors that lead to individual differences in knowledge acquisition.

### **Censorship**

Stephanie A. Pittman, under the direction of Dr. Cheryl Pell, Journalism

This editorial spread was an exercise in combining visual imagery with a written statement to say more to the reader than is possible separately. The issue addressed is: how far will book censorship go before it is too far? The layout is arranged to emphasize the black and white photo as a glimpse into the bleak future of book censorship, while the dominant headline boldly displays the seriousness of the issue. The photograph of near-vacant library shelves represents an extreme consequence of book censorship: the emptying of libraries and knowledge. Typographic treatment of the headline gives emphasis to the word “Censorship,” treating this part of the written statement as an integral part of the visual statement. The treatment of the red drop cap is the same as the headline to bring the reader’s eye to the beginning of the article, while tying the package together.

### **Paula Scher**

Stephanie A. Pittman, under the direction of Dr. Cheryl Pell, Journalism

This poster was part of an exercise in researching influential graphic artists. The assignment was to research an artist and then create a poster promoting a hypothetical lecture, imitating the style of that artist. Scher, a principle designer at the New York branch of Pentagram, uses illustrative typography to create images within her work. This poster follows the same style of designing type to create a visual image. The interweaving of the words and letterforms provide a visually appealing piece that also provides basic information. This approach to design emphasizes the beauty of well-constructed type, in addition to its functionality.

### **Does Ovarian Estrogen Exposure During Puberty Defeminize Reproductive Behavior in Female Syrian Hamsters?**

Andrew D. Poole, under the direction of Dr. Cheryl Sisk, Neuroscience

The idea of puberty being a sensitive period for sexual development is new in the field of neuroscience. It was previously thought that peri- and postnatal development were when most sexual development and differentiation occurred. However, recent studies have shown ovarian hormone exposure during puberty defeminizes the reproductive behavior of adult female hamsters, so puberty may hold quite a bit more importance than previously thought. However, it is not currently known which ovarian hormone is responsible for this defeminization. There is evidence to suggest that estradiol may be the hormone responsible because it defeminizes the behavior of both males and females when administered perinatally. This presentation will explain the experimental research we have done up to this point and then go on to explain the current experiment where we are testing the hypothesis that the presence of ovarian estrogen during puberty defeminizes adult sexual behavior in female hamsters. With this experimental data, we will then have one more critical piece of evidence in the search for the true importance of puberty as a sensitive period for sexual development

## **A Molecular Pathologic Review of Mohr-Tranebjaerg Syndrome (DFN1) from Gene Mutation to Audiometric Data**

Charles B. Pudrith, under the direction of Dr. Jill Elfenbein, Audiology Speech Science

Mohr-Tranebjaerg syndrome (MTS) is a rare neurodegenerative disorder brought on by a mutation of the deafness-dystonia peptide gene (DDP1) which leads to a sensorineural hearing loss at about age 3 to 5 and adult progressive dystonia. This affects a patient's ability to use Sign Language, furthering communicative difficulties already present from the hearing loss. Other neurological abnormalities from MTS include, but are not limited to, cortical blindness, spasticity, dementia, and mental retardation. The absence of the DDP1 protein destabilizes a 70kDa complex made up of Translocase of Inner Mitochondrial Membrane (TIMM) genes, altering levels of Calcium and NADH. Histopathologic studies indicate that although there was almost complete preservation of the Organ of Corti, stria vascularis, and vestibular hair cells, there was nearly a complete loss of Scarpa's Ganglion Cells. The objective of this paper is to explain the link between the genetic mutation brought on by MTS, the molecular pathogenesis of the disease, including its effects on the mitochondrial transportation, and the hypothesized means that lead to a sensorineural hearing loss with a comprehensive explanation that can be understood by an Audiologist without a background in molecular pathogenesis.

## **Type II Cepheids in the Globular Cluster M5**

Katherine C. Rabadoux, under the direction of Dr. Horace Smith, Astrophysics

Type II Cepheids are pulsating giant stars found in old stellar populations. They are used as "standard candles" for determining the distances to the stellar systems in which they are found. I have analyzed observations that were obtained at the campus observatory of two type II Cepheids in the globular star cluster M5. I have combined the MSU blue and visual observations of these stars with those obtained at Central Michigan University and Macalester College to derive complete light curves showing how these stars change brightness over the pulsation cycle.

## **UTP Increases Extracellular Acidification Rate of NIH/3T3 Cells via Interaction with P2Y2 Receptors**

MaryBeth L. Riblett, under the direction of Dr. Douglas Luckie, Physiology

According to previous research, when treated with UTP some cell lines will initiate a P2Y2 receptor response leading to the activation of Ca<sup>2+</sup> dependent Cl<sup>-</sup> channels (CaCC) that are capable of transporting HCO<sub>3</sub><sup>-</sup> as well (Clarke et al., 2000; Rubera et al., 2000). Using the logic that this could provide a potential therapy for Cystic Fibrosis patients, who lack the normal CFTR path these anions travel for secretion, we tested the effect of UTP on NIH/3T3 cells both (+)CFTR and (-)CFTR (delta F508). Using microphysiometry to monitor the change in extracellular acidification rate (ECAR) and efflux techniques to investigate Cl<sup>-</sup> conductance, we found that UTP caused the ECAR to increase instead of the predicted decrease, with no significant difference between (+) vs. (-) CFTR. Upon further investigation of the literature regarding this topic, we discovered the protein believed to be responsible for UTP/P2Y2 activated extracellular acidification is Ca<sup>2+</sup> dependent Na<sup>+</sup>/H<sup>+</sup> exchanger: NHE1. Since NIH/3T3 cells are fibroblast and not epithelial cells, the consequences for CF research are unclear.

## **EpsG Crystallization**

Adam Richard, under the direction of Dr. Dennis Arvidson, Microbiology and Molecular Genetics

EpsG is a protein that is thought to be essential in the building of pilli by some bacteria, such as vibrio cholerae, in order to infect other cells. The purpose of our study is to crystallize the pure form of the wild-type protein, which will hopefully lead to an understanding of the exact structure of the protein through the

use of X-ray crystallography. If the structure is known, then treatments can be developed to “block” the protein from combining with itself to form the infecting pilli, which greatly reduces the virulence of the bacteria that use such methods of infection.

### **The Effects of Residential Shoreline Development on Lake Zooplankton Assemblages**

John T. Roasa, under the direction of Dr. Mary Bremigan, Fisheries and Wildlife

Lake ecosystems not only are affected by air pollution, land use change, and fish stocking, but have the potential to be strongly altered by residential lakeshore development. Zooplankton can be analyzed in order to quantify the effects that residential development has on a lake. The taxonomic composition, abundance, and size structure of zooplankton assemblages can be an indicator of the relative health of a lake as zooplankton constitutes a critical link between primary producers and fish assemblages in lake food webs. We hypothesized that as lakeshore development increased: zooplankton abundance and size structure would decrease, and species composition of zooplankton would become dominated by tolerant taxa. Zooplankton samples were collected from fifteen lakes in the Huron river watershed of SE Michigan using vertical net hauls from the same time period. All lakes were similar in size, depth, and trophic status, but varied with respect to residential development along the shoreline. Each zooplankton sample was split according to density and individuals were identified, counted, and measured using a digitizing tablet viewed through a dissecting microscope drawing tube and the Sigma Scan program. We are conducting principle component analysis and other relevant statistical tests to test our hypotheses. Ultimately, our analysis will help identify the extent to which residential development of lake shorelines alters aquatic ecosystem structure and function.

### **Size Class Identification of Algal Groups within Muskegon Waterhed, Mi**

Allison R. Rober, under the direction of Dr. Jan Stevenson, Dr. Kalina Manoylov

The Muskegon watershed feeds into Lake Michigan as well as serves a great deal of communities that lie within it. Algal biodiversity is important for the maintenance of the ecological integrity of the watershed. The objectives of this study were first; to identify the algal genera and /or families in different algal classes, second to determine the algal size abundance within the Muskegon watershed, and third to determine the algal composition on two substrates (wood and rock). Size distribution of the algal genera was used to indicate dominance. Three hundred units of algae were counted using a Palmer cell at 400x. Each unit was classified by its' size class and genus. Both substrates were dominated by diatoms (Bacillanyphyta), followed by blue green-algae (Cyanophyta), and green algae (Chlorophyta), mixed within each size class. Preliminary observations suggest that the dominant algal genus was Achnanthidium (size class 1) on both substrates. Most abundant size class 2 (4.5 um 7.5 um wide, and average bio volume of 459.3µm<sup>3</sup>) was taxonomically diverse and incorporated nineteen diatom genera.

### **The Proline- and Glycine-rich Domain of Galectin-3. Epitope for the Mac-2 Monoclonal Antibody and Its Functional Significance in pre-mRNA Splicing.**

Katherine M. Ruby, under the direction of Dr. John Wang, Biochemistry and Molecular Biology

Galectin-3 (Gal3) is one member of a family of carbohydrate-binding proteins. The polypeptide of Gal3 can be delineated into two domains: an NH<sub>2</sub>-terminal domain (ND) containing repeats of a 9-residue motif, PGA YPGXXX; and a COOH-terminal carbohydrate recognition domain (CRD). Previous depletion and reconstitution experiments established that Gal3 is a factor required for the splicing of pre-mRNA. Addition of the ND to a splicing competent nuclear extract yielded a dominant negative effect, resulting in inhibition of splicing. This suggested that the full-length Gal3 polypeptide uses, at least in part, the ND to interact with the splicing machinery. We now provide two lines of evidence that implicate the PGA YPGXXX motif in this

interaction. First, a synthetic peptide containing three perfect repeats of the sequence PGAYPGQAP (27mer), corresponding to residues 41-67 of the murine Gal3 sequence, also inhibited the splicing reaction as was observed with the ND. In contrast, addition of peptides corresponding to a single iteration (9mer) or two repeats (18mer) failed to yield the same effect. Second, the epitope of monoclonal antibody anti-Mac2 maps to residues 47-65 which contains the PGAY repeats; this antibody has no effect on the splicing reaction. In contrast, NCL-Gal3, whose epitope maps to the NH<sub>2</sub>-terminal 14 amino acids, inhibited the splicing reaction. We interpret these results to indicate that the portion of Gal3 bearing the PGAY repeats is sequestered through interaction with the splicing machinery and therefore is inaccessible to the anti-Mac2 antibody.

### **Quantitative Analysis of the Neuroprotective Agent Apocynin in a Murine Model of Parkinson's Disease using HPLC-ED**

Zafar A. Sayed, under the direction of Dr. Keith J. Lookingland, Pharmacology and Toxicology

Apocynin (a chemical derivative of the dogbane plant) can effectively block inflammation-induced oxidative stress and, through this action, may provide neuroprotection by reducing substantia nigral dopaminergic neuron damage in Parkinson's Disease (PD) patients. The purpose of this study was to develop a reliable quantitative analytical technique to determine effective neuroprotective doses of apocynin in tissue samples obtained from neurotoxin-treated mice. Initial studies, using high performance liquid chromatography coupled with electrochemical detection (HPLC-ED), determined the optimal parameters for mobile phase composition and flow rate, as well as electrode potential voltage for optimal detection of apocynin. To determine the percent recovery of apocynin, plasma samples were spiked with the non-endogenous internal standard epinine, extracted with alumina, and a coefficient of extraction was determined. Apocynin distribution in plasma and brain will then be determined 10, 20 and 30 minutes following a single intraperitoneal injection of apocynin (100 mg/kg body weight). Vehicle-treated controls will be killed 10 minutes after injection. Plasma and sections of the brain containing substantia nigral dopaminergic neurons will be prepared and analyzed for traces of the compound. Data from these and future experiments will permit the determination of effective neuroprotective doses of apocynin in neurotoxin-treated mice in a model of PD.

### **Children's Literature in the Secondary Classroom**

Kristen D. Schalm, under the direction of Dr. Marilyn Wilson, English

This research project analyzes the use of children's literature in secondary classrooms, particularly in terms of how children's literature reflects and affects a developing understanding of the universal aspects of literature such as: 1) understanding other cultures through children's literature, 2) understanding and appreciating literature as a whole through children's literature, and 3) understanding ourselves through children's literature. Our experiences with the Kiddie Lit. Club have given us insight into these aspects of children's literature regarding our own development and have provided inspiration for further study on their use in the secondary classroom.

### **Plurality and Maximality in Children's Comprehension of Definite Noun Phrases**

Andrew R. Sewick, under the direction of Dr. Alan Munn, Linguistics and Languages

Research has shown that young children's use of the definite article is not consistent with adults'. Children have a tendency to use the definite article when adults would rather use the indefinite. For example, when asked to describe a situation in which there are three balls, and a boy who kicks one of them, children would tend to say "The boy kicked the ball", whereas adults would say "The boy kicked a ball". For adults, the set picked out by the definite article must be unique and maximal, otherwise an indefinite must be used. At the

same time, children have been reported to understand the plural morpheme /-s/ correctly. However, this research has not necessarily controlled for the possibility that other linguistic cues might account for this comprehension pattern. In this project, we report an experiment designed to test both aspects of young children's comprehension of definite noun phrases. Our task is designed to test (i) whether children can use the plural morpheme alone (as opposed to other linguistic cues) to distinguish between singular and plural definite noun phrases, and (ii) to test whether children have a maximal interpretation of the definite in a task different from those reported in the literature.

**Death & Discrimination: The Effect of Mortality Salience on Reactions to Discrimination Claimants**  
Anand Sharma, under the direction of Dr. Cheryl Kaiser, Psychology

Terror Management Theory (TMT) proposes that reminding individuals of the inevitability of their death leads them to more strongly uphold their cultural worldviews. Numerous studies have shown that after having their mortality made salient, an individual tends to demonstrate an increased favorable reaction to those who support their cultural worldview and an increased negative reaction to those who oppose it. The focus of this current study is to explore the effects of mortality salience on an individual's subsequent reactions to a person who claims to be the victim of discrimination. The study involves the manipulation of the salience of mortality for the individual (mortality salient vs. non-salient), the race of the fictional target (White vs. African American), and the attribution for failure by the target (discrimination vs. rudeness).

**A Zinc Binding Site Defines the Entrance of a Proton Uptake Pathway in Cytochrome c Oxidase**  
Jamie N. Slater, under the direction of Dr. Shelagh Ferguson-Miller, Biochemistry

Cytochrome c oxidase (CcO) catalyzes the final step of the electron transport chain. This enzyme functions to pump protons across the mitochondrial inner membrane or bacterial periplasmic membrane, creating a proton gradient. Each O<sub>2</sub> reduced by CcO produces two molecules of water and pumps four protons across the membrane. The proton gradient drives synthesis of ATP, the energy currency of the cell. The so-called "K" path of CcO is important for supplying protons to be used in the oxygen chemistry. Glutamate 101, on subunit II of the enzyme, is proposed to be the entrance to this path, and to bind metals which inhibit CcO activity at micromolar levels. An x-ray crystal structure of *Rhodobacter sphaeroides* CcO shows that Cd<sup>2+</sup>, an analog of Zn<sup>2+</sup>, is bound at this site. Mutating glutamate 101 to an alanine creates a highly inhibited enzyme that continues to tightly bind Zn<sup>2+</sup>, which further inhibits this activity. The binding of metal in the absence of glutamate suggests that an additional amino acid on subunit II (H96) is also a Zn<sup>2+</sup> ligand. If a double mutant of E101/H96 removes Zn<sup>2+</sup> inhibition, this will support the conclusion that Zn<sup>2+</sup> inhibits the "K" path and that E101/H96 are indeed the entrance.

**The Role of the State in Second Wave Feminism: A Comparison of the United States and France**  
Carolyn E. Smith, under the direction of Dr. Katie See, Social Relations

The basis for my research is to examine feminism in the US, a decentralized state and in France, a centralized state within the second wave of feminists movements. Within both countries, I will examine the theoretical structures behind this particular feminist collective action frame and I will also look at key events within the movement during the second wave, particularly focusing on the years 1963-1975. These key events include, but are not limited to, organization formation such as the NOW or the MLF, actual protests and legislation. By looking at the events and the theories, a broader picture that includes the social, public realm and the more personal, private realm will be seen and the role of the state made clear.

### **Phosphodiesterase Inhibitor Stimulation of Calu-3 Cell Monolayers, and Its Effects on CFTR Activation**

Katie E. Sowle, under the direction of Dr. Douglas Luckie, Lyman Briggs School and Physiology

The Cystic fibrosis transmembrane conductance regulator (CFTR) is a protein that functions as a chloride anion channel. More recent studies have also shown CFTR to be linked to bicarbonate flux and extracellular pH (pHo). Mutations in the gene for CFTR are the cause of the disease cystic fibrosis. We investigated the pHo of Calu-3 cells expressing CFTR in application with phosphodiesterase inhibitors (PDEis). We measured the pHo after stimulation by PDEis using the microphysiometer. Sildenafil citrate and papaverine were the two PDEis tested in this experiment. We also used forskolin to stimulate CFTR as well as glybenclamide, which deactivates CFTR. In effect, by increasing the activity level of CFTR by using PDEis, they could possibly be used as a form of therapy. Past studies have acknowledged that certain phosphodiesterase inhibitors can activate CFTR-dependent chloride transport in non-polarized cells and CF mice. We found that forskolin and glybenclamide activated and deactivated, respectively, as expected compared to previous studies. Papaverine showed some stimulation of CFTR and sildenafil citrate had little to no activation of CFTR. We also used the iodide efflux assay to test for the presence of CFTR in the Calu-3 cells.

### **Childhood Obesity: Initiatives to Promoting Better Nutrition and Physical Activity in Michigan's Schools**

Jennifer Spilotro, under the direction of Dr. Dale Romsos, Food Science and Human Nutrition

In response to the obesity epidemic facing America's youth, Action for Healthy Kids (AFHK) has mobilized state teams to support its groundbreaking nationwide initiative to promoting better nutrition and physical activity in schools. Each state team has been charged with tailoring specific solutions sensitive to the needs of their local school districts. This past summer I led the task force formed to implement changes in Michigan's Food and Beverage Policy. This field experience allowed me to constantly communicate with a diverse base of volunteers comprised of leaders in health, education, local government, and businesses including Dietitians from around the state. I prepared documents to creatively introduce the nutrition policy to teachers and parents in Michigan. I led coalition meetings, created agendas, and was the lead contact for coalition members in between meetings. In September 2004, my work was published in the Tips and Tools to Help Implement Michigan's Healthy Food and Beverage Policy and I was recognized at a statewide coalition meeting.

### **The Mutagenic Effects of Polymerase Kappa Overexpression in Human Cells**

Allison E. Stone, under the direction of Veronica M. Maher, Biochemistry and Molecular Biology and Microbiology

Cellular DNA is constantly exposed to damaging agents that cause DNA lesions. Many of these lesions are repaired by mechanisms that remove them directly. Some DNA lesions, however, are not removed prior to the onset of DNA replication. These fork-blocking lesions require specialized DNA polymerases which are able to replicate past damaged bases, a process known as translesion synthesis. Translesion synthesis can be either error-free, when the correct nucleotide is inserted across from the lesion, or error-prone, when an incorrect nucleotide is inserted. Error-prone translesion synthesis leads to DNA mutations, which may ultimately result in cancer or other diseases. Polymerase  $\epsilon$  is one such specialized polymerase involved in translesion synthesis. In vitro experiments indicate that polymerase  $\epsilon$  can bypass DNA adducts caused by benzo[a]pyrene, a major carcinogen found in cigarette smoke, in an error-free manner. To determine the effects of overexpression of polymerase  $\epsilon$  on mutagenesis, a plasmid containing the human polymerase  $\epsilon$



gene has been successfully constructed and transfected into human fibroblasts. Currently, western blot analysis is being performed to identify cell lines with the desired overexpression of polymerase  $\epsilon$ . These cell lines will then be exposed to benzo[a]pyrene diol epoxide, a metabolically active form of benzo[a]pyrene. The frequency of mutations induced in these cell lines will be compared to that induced in their normal parental cell line.

### **Football Footprint:How MSU tailgating impacts the environment**

Joanne Tyes Briseno, under the direction of, Dr. Dave Poulson, Journalism

Each football season thousands of Spartan fans come to MSU to tailgate. Some come from miles away to barbecue on campus and watch the game with friends. With all the fun associated with tailgating, who would have thought that it could have such negative impacts? This project reveals some of the ways MSU tailgating is affecting our campus environment. From vehicle emissions and energy concerns to excess trash and landscape damages, this project is sure to reveal a new side of MSU football.

### **Regulation of Mixed Lineage Kinase 3(MLK3) by Peptidyl Prolyl cis/trans Isomerase (Pin1)**

Kartik Viswanathan, under the direction of Dr. Kathleen Gallo, Physiology

Mixed Lineage Kinase 3 (MLK3) is a serine/threonine protein kinase that activates multiple mitogen-activated protein kinase pathways. MAPK pathways are important in many cellular processes, including proliferation, development, morphogenesis and apoptosis. In a variety of cancer cells, including breast cancer cells, MLK3 tends to be expressed at high levels. Peptidyl prolyl isomerase or Pin1, which specifically binds only to phosphorylated Serine-Proline bonds or phosphorylated Threonine-Proline bonds, also tends to be expressed at high levels in these cancer cell lines, and has been shown to be required for tumor survival. MLK3 is phosphorylated at many serine-proline sites and threonine-proline sites, and is therefore a potential target for isomerization by Pin1. The COOH terminal region of MLK3 interacts with Pin1. Mutations of serine-proline and threonine-proline sites within this region reveal that multiple phosphorylation sites contribute to the interaction between MLK3 and Pin1. In addition, hyper-phosphorylation of MLK3, induced by G2/M phase cell cycle arrest, leads to increased association with Pin1. This may indicate that MLK3 is regulated by Pin1 and points to a potential role for MLK3 during the cell cycle. Current studies are directed towards understanding the mechanism by which Pin1 regulates MLK3 in cells.

### **The Influence of Facial Features on Occupational Selection**

Anvi K. Vora, under the direction of Dr. Christine Larson, Psychology

While a multitude of studies have focused on aspects of the face and its effect on romantic interpersonal situations, few have addressed the topic of facial features in other interpersonal situations, such as the selection of an occupation. It has been evident in previous research that facial features can be associated with personality traits such as dominance or trustworthiness. Therefore, our research interest is to determine whether trait identification based solely on facial features is correlated with an individual's selection of occupation. Faces of politicians and journalists will be compared to faces of "unknown" people. These faces were averaged among their respective categories using a mathematical technique devised by Dr. Oliva. Subjects were asked to rate these faces on a scale of trustworthiness. Our hypothesis was that the mean trustworthiness scores of the politician and journalist will be greater than those of the typical people. To control the emotion on the faces, an additional program was written by Dr. Oliva to project emotions onto the average face. A pilot was required to ensure the validity of this procedure. Overall, pilot results appeared to reveal that the facial projection technique did not reliably control emotion. Therefore, only pilot data will be presented here.

## **Accamentary**

Lucy . Xing, under the direction of Robert Albers, Communication

Accamentary is a documentary about the Accafellas, a cappella group from MSU. Accamentary captured the spirit of the eight-member ensemble from rehearsal to the stage. The Accafellas spoke of their goals, interest, and how music changed their lives. Last November, Accamentary won silver at the Detroit chapter of the D-CAI (Media Communication Association International) Golden Cassette Awards. The 10-minute documentary was shot on a Sony DSR 300 camera and edited on a non-linear machine.

## **Influence of Mismatches and Amplicon GC-Content on the Success Rate of Cross-Species PCR Primers**

Zachary A. Zalewski, under the direction of Dr. Patrick Venta, Microbiology and Molecular Genetics

The sequencing of several mammalian genomes has brought forth a multitude of improvements in genetic research. The use of cross-species primers developed from these sequences will make it possible to study all mammalian genomes. We have used cross-species primers to develop genetic markers in the dog, and the recent release of the canine genome sequence makes it possible to determine the influence of mismatches under a set of standard conditions. Forty primer sets, with half unsuccessful, were compared with the canine genome sequence. We found that of the 20 successful sets, 7 had 0 mismatches, 6 had 1, 6 had 2, and 1 had 3. For the unsuccessful sets, 2 had 0 mismatches, 2 had 1, 4 had 2, and 12 had 3 to 8. We hypothesized that the 8 unsuccessful primers with 0 to 2 mismatches did not work because the amplicons were relatively GC-rich (49.2% vs. 39.4% for successful sets). To test the hypothesis betaine, a known enhancer for GC-rich templates, allowed the GC-rich genes with 0 and 1 mismatches to work. Overall, the success rate of cross-species primers is 60%, and with the number of mismatches determined here, a theoretical basis for predicting success rate can be formed. Notably, the addition of betaine can allow for a 3-5% increase in cross-species primer success rates.

## **Speech Production Abilities of a 9-year-old Cochlear Implant User with Partial Insertion Due to Mondini Malformation**

Amber L. Zmick, under the direction of Dr. Jill Elfenbein, Audiology & Speech Science

One way to provide auditory information to individuals with severe to profound, sensorineural hearing loss is through the use of a cochlear implant. The device converts incoming sound to an electrical signal that is delivered to a series of electrodes on a wire (i.e., the electrode array) that has been inserted into the bony, snailshaped, sensory organ for hearing called the cochlea. The process provides information that is valuable not only for hearing a spoken message, but also for the development of intelligible speech production. The electrode array must be inserted into the cochlea. Sometimes, a malformed cochlea prevents complete insertion of the electrode array and, therefore, a child with a cochlear malformation may not derive full benefit from the device. The subject for the study was born with a Mondini malformation of his cochlea. When he was 2 years old, he received a Nucleus 24 cochlear implant. This study compared the speech skill acquisition of this child with the speech skill acquisition of four sets of age peers: cochlear implant users described by Chin (2003) and Blamey et al. (2001), hearing aid users described by Osberger et al. (1986), and normally hearing children described by Smit (1993). The poster will focus on both the order of speech sound acquisition and the size of speech sound inventories as age increases. These data will provide evidence of the benefit available with only partial insertion of the electrode array.

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