



# Roanoke College Showcase of Research & Creativity



Family Weekend  
September 28, 2012

Smoyer Gallery (posters) & Fintel Library (oral presentations)



**Oral Presentations**  
**Fintel Library, Main Floor**  
**5:45 PM—8:00 PM**

5:45 PM | John Stang

Living in the Shadow of History: The story of Catharine, Kansas and its legacy as a Volga-German settlement, 1876-2012

6:00 PM | Charla Henley

The Economic Role of the Mexican Sweatshops: Exploitation or Saving Grace?

6:15 PM | Sarah Perkins

El mundo desapercibido de las mujeres no reconocidas: Un estudio de la construcción de género e identidad nacional a través de la ciencia ficción escrita por las mujeres hispánicas/The Unnoticed World of Unsung Women: A Study of the Construction of Gender and National Identity through Science Fiction Written by Hispanic Women

6:30 PM | Renae Dower

An Analysis of Leonardo and Raphael's Drawings

6:45 PM | Jonathan Thumas

Nature in the Shugendo Amalgam: An Example of Contemporary Japanese Folk Religion

7:00 PM | Joshua Ferrier

U.S. Freshwater Resource Management Policy and Its National Security Implications

7:15 PM | Tiffany Ingram

Unveiling the Life of a Banker

7:30 PM | Stephanie Vogel

The Extraction and Identification of oil within Lycopodium spores

7:45 PM | Tyler Barnes

vitellogenin1 in Embryonic Zebrafish as a Bioindicator to Detect Estrogenic Compounds within the Roanoke River

**Poster Presentations**  
**Smoyer Gallery, Olin Hall**  
**6:00 PM—8:00 PM**

Mr. Noah Aguayo | Investigations of PurP enzyme activity of purP genes from *Methanocaldococcus jannaschii* and *Thermococcus kodakarensis*

Mr. Daniel Ballou | Cobalt and Chromium Substituted Goethite ( $\alpha$ -FeOOH)

Ms. Maura Belanger | Characterization of purF genes (*Sulfolobus solfataricus*)

Mr. Andrew Bernstein | Zinc Toxicity in Plants

Ms. Jennifer Blaney | Developing a Measure of Climate for Learning: An Ongoing Process Informing Change

Ms. Kendra Boyd | Characterization of hAT Transposons in the *Coprinopsis cinerea* Genome

Ms. Ashley Briggs | Estrogen Replacement Therapy Prevents Cardiac and Vascular Failure in the 'Listless' Zebrafish (*Danio rerio*) Developmental Model

Mr. Matthew Bryant | 5,10-Methenyltetrahydrofolate Synthetase

Ms. Bridget Carey | Digging Into The Past: Archaeology at Camp Powhatan

Ms Madhura Chitnavis | Characterizing Ty3-gypsy elements in the Basidiomycete Fungus, *Coprinopsis cinerea*

Ms. Kelsey Collett, Ms. Molly Southard, Mr. Andrew Nesbit, Ms. Paige Arrington, Ms. Holly Conner, & Dr. David Nichols | Brain Activity While Viewing Attractive and Unattractive Faces

Mr. Edward Curtis | Sulfuric Acid and Water Models and Atmospheric Nucleation

Mr. Daniel Garber | Effects of Auxin and Ethylene on Cellulose Deficient Lines of *A. thaliana*

Ms. Victoria Godwin | Molecular Mechanisms of Src and EGFR Inhibition in Pancreatic Cancer

Ms. Leah Hall, Ms. Lauren Roth, & Dr. Elizabeth Holbrook | The Roanoke Valley Community Healthy Living Index

Mr. Alexander Hawes | Synthesis of Novel Ethers from 1,2,3,4-tetrakis(Pentafluorophenyl)cyclopentadiene, 1,2,3-tris (Pentafluorophenyl)cyclopentadiene, and Various Alcohols

Ms. Shana Hensley | Cardiovascular response to graded exercise in the Atlantic blue crab, *Callinectes sapidus*

Mr. Matt Joseph | Synthesis of Melt Processable Poly(acrolonitrile-co-methylacrylate) Copolymers

Ms. Lillian Judge, Ms. Caroline Mueller, Ms. Leah Hall, Dr. Elizabeth Holbrook | Evaluation of a School Running Program for Youth with Sensory Impairment

Mr. Kyle King | Effects of Shading on Belowground Biomass in two Biofuel Species (Switchgrass and Giant Miscanthus)

Mr. Kyle King | Synthesizing Biodiesel from Used Vegetable Oil

Mr. Patrick Kohlhaas | Palladium Catalyzed Synthesis of Hydroxyproline Derivatives

Mr. James Lee | Monte Carlo Simulations of Perfluoroalkane-Alkane and Ether-Alkane Mixtures near a Gold Surface

Mr. Cody Meadows | Palladium-Catalyzed Synthesis of Hydroxyproline Derivatives

Ms Jan Minton & Talia Logan | A Community Art Project - The Roanoke Valley Reef

Ms. Caroline Mueller, Mrs. Cynthia Edmunds, Dr. Elizabeth Holbrook | The Efficacy of Fitness for Life Classes on the Fitness Profiles of Roanoke College Students

Ms. Michelle Pasier | Characterization of an IMP Cyclohydrolase in *Haloferax volcanii*

Mr. Jonathan Perkins | Ethers and Fluoro-ethers from Pentafluorophenyl-Substituted Cyclopentadienes

Mr. Ben Shapiro | Immune System in the American Lobster - Response to a Double Bacterial Challenge

Mr Tyler Stoneham | An Investigation of Hormonal Control of a Novel Plant-Resistance Trait: Defense by Ducking in Goldenrods

Mr. Connor Toomey | Colombia: A Sociopolitical Study of Past and Present Conditions through *One Hundred Years of Solitude* by Gabriel Garcia García Márquez

Ms. Chava Urecki | The Development of the Preference for Complexity Scale

Ms. Kathleen Wager | Investigation of 5,10- Methylnltetrahydrofolate Synthetase (MTHFS) in Standard and Auto-Induction and Protein Stability and Storage

Ms Rebecca Ward | The Role of Ethylene in Stem and Root Elongation of Cellulose-Deficient Mutants of *Arabidopsis thaliana*

Mr. Nicholas White | Ether Derivatives of 1,2,3,4-tetrakis(pentafluorophenyl)cyclopentadiene

Ms. Casey Wojtera | Implementation of a Yeast Expression System

Dr. Stella Xu, Ms. Kathleen Ouyang, Mr. Thomas Emerson, & Ms. Mathilda Nassar | The Silk Road

Ms Yuki Yamazaki | Assessing Cognitive Processes of Self-Actualization

Ms. Laura Zdziarski & Dr. Elizabeth Holbrook | The Relationship between Perceived Fitness Status and Physical Activity Level

## All oral presentations will be in Fintel Library, Main Floor

5:45 PM Fintel Library | Mr. John Stang  
(jastang@mail.roanoke.edu)

### Living in the Shadow of History: The story of Catharine, Kansas and its legacy as a Volga-German settlement, 1876- 2012

Faculty Sponsor: Dr. John Selby (selby@roanoke.edu)

Department: History

In the winter of 1875 and spring of 1876, a large number of Volga-German immigrants came to settle in the Midwestern United States after certain privileges were revoked by Russian Tsar Alexander II in 1864. This group consisted of immigrants who emigrated from Germany to Russia from 1764-1767 and farmed land promised by the tsar along the Volga River for about a century and retained much of their German heritage. A similar trend developed when these immigrants came to the United States; the Volga-German immigrants formed small farming communities in the Midwest with sustainable institutions, such as churches and schools, that kept these towns together into the twentieth and twenty-first centuries. This paper examines the history of one particular Volga-German settlement, Catharine, Kansas. More specifically, the paper examines (using primary sources, personal interviews, and secondary sources) the evolution of Catharine: how the institutions were built, when and why the town started to decline in population, and what has kept Catharine together into the present day.

6:00 PM Fintel Library | Ms. Charla Henley  
(cehenley@mail.roanoke.edu)

### The Economic Role of the Mexican Sweatshops: Exploitation or Saving Grace?

Faculty Sponsor: Dr. Jose Bañuelos-Montes  
(banuelosmontes@roanoke.edu)

Department: Spanish and Economics

What is the economic impact of Maquiladoras, or sweatshops, in the communities of Northern Mexico? Do they help improve the local's lifestyles or simply exploit them? What's the gender ratio that make up the labor force? In the cities of Juarez and Tijuana, maquiladoras are export assembly plants that transform imported materials and assemble products for export back to the US duty free. These manufacturing plants that spread rapidly during the 1980s were believed to improve economies and living conditions in many local communities. For thousands of families, it's been their only source of income to meet the simple standard of living because either they don't have an educational degree and/or they live below the poverty line. On the other hand, the maquiladora industry has been the target of criticisms for many decades because they employ workers at low wages, for long hours, under poor conditions—exploiting those in need of a job to support their families. This study analyzes historical and modern literature, economic data, and other forms of media in order to shed a different light on the significance of the Maquiladora industry in Northern Mexico.

6:15 PM Fintel Library | Ms. Sarah Perkins  
(seperkins@mail.roanoke.edu)

### El mundo desapercibido de las mujeres no reconocidas: Un estudio de la construcción de género e identidad

nacional a través de la ciencia ficción escrita por las mujeres hispanicas/The Unnoticed World of Unsung Women: A Study of the Construction of Gender and National Identity through Science Fiction Written by Hispanic Women  
Faculty Sponsor: Dr. Lynn Talbot (talbot@roanoke.edu)  
Department: Modern Languages

Although Hispanic science fiction has been dominated by men and not received much attention because of American dominance of the genre, negative stereotypes of science fiction, and a lack of translations to other languages, four female authors emerged in the 1980's and 90's as prominent figures within the genre: Cuban Daína Chaviano, Argentinian Angélica Gorodischer, Spanish Rosa Montero, and Spanish Elia Barceló. This project explores the development of the female identity in Hispanic science fiction and how it impacts the national identities constructed by the authors in their novels. The novels Fables of an Extraterrestrial Grandmother by Daína Chaviano, Kalpa Imperial by Angélica Gorodischer, Trembler by Rosa Montero, and Natural Consequences by Elia Barceló form a Hispanic, feminist narrative that influences the preconceptions and modern ideologies surrounding gender, advocate for gender equality as well as equality within personal relationships, and construct new female identities. The novels emphasize the importance of both sexes, as well as assert the desire for women to become influential and successful within their societies without reducing the values of men or domestic roles.

6:30 PM Fintel Library | Ms. Renae Dower  
(rpdower@mail.roanoke.edu)

### An Analysis of Leonardo and Raphael's Drawings

Faculty Sponsor: Dr. Jane Long (long@roanoke.edu)

Department: Department of Fine Arts

Drawings have been a standard beginning part of the painting process since at least the 14th century as they gave artists an opportunity to form their compositions by drawing from life, models and nature. Simultaneously, it allowed them to conserve expensive mediums and pigments while sorting through the composition-forming stages. Both Leonardo and Raphael, near-contemporaries who both created great works of art near the turn of the sixteenth century, created drawings for just this purpose. They made drawings of figures in various positions and arrangements that were interesting to the viewer's eye while simultaneously placing them in realistic natural settings. Despite the conventional nature of this drawing process, Leonardo and Raphael created drawings that were much more than just a preparation for their more finished works. They both used it as a way of personal expression and individual representation. This paper will explain the uniqueness of each artist, how those qualities are portrayed in their drawings, and how the drawings led to their paintings and the qualities therein.

6:45 PM Fintel Library | Mr. Jonathan Thumas  
(jethumas@mail.roanoke.edu)

### Nature in the Shugendo Amalgam: An Example of Contemporary Japanese Folk Religion

Faculty Sponsor: Dr. Marwood Larson-Harris  
(mdharris@roanoke.edu)

Department: Religion and Philosophy

Shugendo is an ascetical religion practiced in mountainous regions throughout Japan. In combining Buddhist, Taoist, and indigenous Shinto elements, Shugendo displays tendencies towards religious

assimilation. Due to this unique mixing, Shugendo is an example of Japanese folk religion. Recent scholarship has provided evidence of nature conservancy being an ideal in modern Shugendo. Since folk religion in Japan characteristically venerates nature, it is possible that such a mandate has arisen through this avenue and can be traced through folk religion. I present a history of Shugendo and folk mountain religion and examine their shared assimilative tendencies through the paradigm of honji suijaku theory, thus creating an understanding of Shugendo as Japanese folk religion. To theorize on environmentalism within Shugendo, I integrate examples taken from fieldwork and interviews conducted at Shugendo sites. Additionally, this ideal is traced through Japanese folk religious beliefs which regard nature in cosmology as well as in worship and conceptions of the divine. Some contemporary theory challenges my own, but we find that historical tendencies in Japan which hold nature in high regard could have indeed led to this sort of conservancy, especially through a many century long rule against damaging the environment at historical Shugendo training areas.

**7:00 PM Fintel Library | Mr. Joshua Ferrier  
(jgferrier@mail.roanoke.edu) Ms. Evelyn Clark, Mr.  
Charles Leonard, & Mr. Tucker Priskey  
U.S. Freshwater Resource Management Policy and Its National Security Implications**

Faculty Sponsor: Professor Roy Kirby  
(rhkirby@roanoke.edu)

A constant and reliable source of fresh water is critical to the survival needs of all. In this presentation we ask and attempt to answer several questions. What are the current policies governing freshwater reserves in the United States? What problems relating to freshwater resources exist in the United States and worldwide? How does policy concerning freshwater reserves assist in the goal of maintaining the national security of the United States? Finally, what other policy alternatives might be enacted in order to ensure our national security and a bright future?

**7:15 PM Fintel Library | Ms. Tiffany Ingram  
(tdingram@mail.roanoke.edu)  
Unveiling the Life of a Banker**

Faculty Sponsor: Dr. Alice Kassens  
(kassens@roanoke.edu)

Department: Business Administration & Economics  
This presentation reviews my internship with Bank of Botetourt during May of 2012. The purpose of my internship was to get a better understanding of the banking environment. I spent three weeks covering eight different departments within the bank. After my experience, I determined that I would like to work in the banking sector. The internship was a valuable example of experiential learning.

**7:30 PM Fintel Library | Ms. Stephanie Vogel  
(sivogel@mail.roanoke.edu)  
The Extraction and Identification of oil within Lycopodium spores**

Faculty Sponsor: Dr. DorothyBelle Poli  
(Poli@roanoke.edu)

Department: Biology

In evolutionary history, fire seemed to be a large component especially with high levels of atmospheric oxygen present. With plants

larger than they appear today, large explosions may have occurred. One example is with Lycopodium, that contains flammable spores. Their flammability is well documented from fireworks to coating pills and babies bottoms. With their many uses no one studied why or how they explode. By lighting the plants on fire, we found that there is a relationship between germination, development and spore protection to plant development. This conclusion is significant in piecing the evolutionary puzzle together in how these plants survived, thrived or were extinct. With the knowledge from the previous experiment we are further investigating the spore's oil components through NMR and GC-MS to see if components of the oil are responsible for the spores' flammability characteristics and if the oil is, do the components vary over the various life stages. This will provide increased insight into how Lycopodium would have evolved and the effects it could have had on surrounding plants and their evolutionary progress.

**7:45 PM Fintel Library | Ms. Tyler Barnes  
(twbarnes@mail.roanoke.edu)**

**vitellogenin1 in Embryonic Zebrafish as a Bioindicator to Detect Estrogenic Compounds within the Roanoke River**

Faculty Sponsor: Dr. Chris Lassiter  
(lassiter@roanoke.edu)

Department: Biology

Intersex fish are becoming a commonality in aquatic ecosystems, which may be due to exposure from agricultural, industrial, or sewage effluent containing estrogenic compounds. Estrogenic compounds act as endocrine disruptors, causing hormonal imbalances within exposed organisms. Here, we use zebrafish embryos as a bioindicator of estrogenic levels within the Roanoke River. Sample sites along the river include areas upstream and downstream of the Roanoke Regional Water Pollution Control Plant. The activity of the estrogen-sensitive gene, vitellogenin1 (vtg1), was quantitatively assessed using qPCR. vtg1 Ct values averaged 25.69 upstream, 27.59 downstream, and 26.56 control. Until efla Ct data is collected, we are not certain to what extent vtg1 activity is induced after exposure to Roanoke River water. Further research is necessary to determine if the Roanoke River contains a biologically active amount of estrogenic compounds.

**All poster presentations will be in Smoyer Gallery in Olin Hall. Posters are listed alphabetically by author name.**

**Mr. Noah Aguayo (nraguayo@mail.roanoke.edu)  
Investigations of PurP enzyme activity of purP genes from  
*Methanocaldococcus jannaschii* and *Thermococcus kodakarensis***

Faculty Sponsor: Dr. Catherine Sarisky  
(sarisky@roanoke.edu)

Department: Chemistry

Purine biosynthetic pathways in Archaea are interesting pathways to investigate because of the unique conditions under which these organisms can thrive. We have investigated predicted PurP enzymes from the purP genes of the organisms *Methanocaldococcus jannaschii* (MJ0136) and *Thermococcus kodakarensis* (TK0203). This research focuses on the conversion of 5-aminoimidazole-4-carboxamide-1- $\beta$ -D-ribofuranosyl 5'-monophosphate (ZMP) to 5-

formaminoimidazole-4-carboxamide-1- $\beta$ -D-ribofuranosyl 5'-monophosphate (FAICAR). PurP enzymes, in the presence of ATP and formate, will convert the aryl amine group on ZMP to an amide, giving the product FAICAR. We want to investigate the complementation and activity of the predicted PurP enzymes from the genes TKO203 and MJO136. In this investigation we were unable to produce soluble protein. For the future we want to adjust the techniques and conditions used to produce soluble protein.

### **Cobalt and Chromium Substituted Goethite ( $\alpha$ -FeOOH)**

**Mr. Daniel Ballou (dwballou@mail.roanoke.edu)**

Faculty Sponsor: Dr. Rama Balasubramanian  
(balasubramanian@roanoke.edu)

The project studies the synthesis of Goethite ( $\alpha$ -FeOOH), which is a type of iron oxide. This is used as a catalyst in which to form carbon nanotubes. Cobalt and Chromium are substituted in for part of the Goethite which will change the particle size and, therefore, the magnetic properties of the iron oxide. In this way the catalyst's properties will vary how carbon nanotubes are grown. The results so far have shown that the Goethite particle size and magnetism are changed by the substitution of the Co/Cr. The substitutions were done at a pH of 7 with 3%, 5%, and 7% Co/Cr. After several more synthesis and checking the IR peak data, carbon nanotubes will be grown from these iron oxides.

### **Ms. Maura Belanger (mcbelanger@mail.roanoke.edu)**

#### **Characterization of purF genes *Sulfolobus solfataricus***

Faculty Sponsor: Dr. Cathy Sarisky (sarisky@roanoke.edu)

Department: Chemistry

Archaea are one of the three domains of life and are more closely related to eukaryotes than prokaryotes are. Purine biosynthesis is one of the few pathways that seems to be the most different from both bacteria and eukaryotes. Purines are important in cells as both DNA bases (adenine and guanine) as well as energy (ATP, GTP). The first step in purine biosynthesis converts PP1-ribose-P (PPRP) and glutamine into  $\beta$ -P-ribosylamine (PRA) and glutamate. The enzyme that catalyzes this reaction is called phosphoribosylpyrophosphate amidotransferase (GPATase or PurF). In *Sulfolobus solfataricus*, a well characterized archaeon, the gene that codes for this protein is SSO0632 while the next gene, SSO0633, has an unknown function. To properly clone and characterize these genes certain steps must be taken. These steps include: primer design, PCR, enzyme digests, bacterial transformation, and sequencing. All of these steps were completed and showed the proper results to indicate both SSO0632 and SSO0633 were successfully cloned. One percent agarose gels showed the success of PCR. Transformation was shown to be effective through growth of antibacterial resistant colonies on solid media plates. Sequencing results showed that the entire gene had been cloned and inserted into the plasmid.

### **Mr. Andrew Bernstein (ajbernstein@mail.roanoke.edu)**

#### **Zinc Toxicity in Plants**

Faculty Sponsor: Dr. Leonard Pysh (pysh@roanoke.edu)

Department: Biology

Zinc, a group II b transition metal and essential micronutrient in plants, is necessary for growth and development. Among its wide variety of identified functions, zinc is notable for being a key compo-

nent in chlorophyll and as a constituent of thousands of different enzymes (Broadley et al. 2007). As with all micronutrients, zinc is toxic in excess. Zinc toxicity, resulting from concentrated growing medium zinc deposits, is often characterized by yellowing leaves accompanied by stunted root and shoot growth (Broadley et al 2007). The mechanisms by which plants mitigate micronutrient toxicity are not well understood (Shafea and Saffari 2011). Genetic resistance, the compartmentalization of zinc away from sensitive areas, and interactions with other plant nutrients have all shown promise as strategies plants use to tolerate high zinc concentrations (Hall 2002).

### **Ms. Jennifer Blaney (jmblaney@mail.roanoke.edu)**

#### **Developing a Measure of Climate for Learning: An Ongoing Process Informing Change**

Faculty Sponsor: Dr. Julie Lyon (lyon@roanoke.edu)

Department: Business Administration & Economics

This project develops a measure of climate for learning at Roanoke College and other small liberal arts colleges. The climate for learning measure determines the perceived supports, rewards, and expectations of learning from the student perspective. This paper will detail the process of developing a measure of climate for learning and how the process can be used to inform change. This measure and the process of developing this measure can be used to target areas of strength and weakness within departments and on campus as a whole.

### **Ms. Kendra Boyd (kboyd@mail.roanoke.edu)**

#### **Characterization of hAT Transposons in the *Coprinopsis cinerea* Genome**

Faculty Sponsor: Dr. Ramesh Marilee Ramesh

(ramesh@roanoke.edu)

Department: Biology

The *Coprinopsis cinerea* genome contains a variety of repetitive elements. One subcategory of repetitive elements is DNA transposons that operate using a cut-and-paste mechanism. My research focuses on characterizing the hAT family of DNA transposons. There are a total of 9 hAT elements that have been identified. To study the functionality of this family of transposons, I have selected the best candidate, hAT 1 for analysis based on transposon structure and expression. Analyses on areas including TIRs, methylation, and dimerization domains have provided insight about the activity of hAT 1. I have performed PCR reactions altering conditions such as primer combinations, DNA concentrations, annealing temperatures and magnesium concentrations to find the optimal conditions to amplify hAT 1.

### **Ms. Ashley Briggs (aabriggs@mail.roanoke.edu)**

#### **Estrogen Replacement Therapy Prevents Cardiac and Vascular Failure in the 'Listless' Zebrafish (*Danio rerio*) Developmental Model**

Faculty Sponsor: Dr. Christopher Lassiter

(lassiter@roanoke.edu)

Department: Biology

The presence of a robust estrogen (E<sub>2</sub>) response system throughout heart and blood vessel tissues of vertebrates, including humans, has led to the speculation that this ubiquitous hormone may play a prominent role in the health and maintenance of the adult cardio-

vascular system (CVS). We have established an embryonic zebrafish model called 'listless', which results from the inhibition of E2 synthesis by treatment with aromatase inhibitors (AIs). In addition to lacking numerous sensory-motor functions, 'listless' fish developed edema as indicated by the filling of the cardiac sac with fluid and also died from cessation of heart function, as well as the collapse of blood circulation; these symptoms are reminiscent of human congestive heart failure. Our observations led to the hypothesis that treatment of the 'listless' fish with E2 replacement therapy (E2 + AI) would decrease cardiac edema and protect fish from cardiovascular system failure. Indeed, data from the current study demonstrates that E2 + AI treatment: 1) reduced the severity of cardiac sac abnormalities; 2) protected heart function with increased survival; 3) prevented reduction in heart size; and 4) prevented blood vessel bed deterioration or delay in development. In addition, with removal of fluid surrounding the cardiac sac by puncture, heart function and survival were significantly increased. These results strongly indicate the important role played by E2 in the developing CVS of the zebrafish, and offers a potential new model for the study of its role in CVS development, maintenance and disease conditions such as congestive heart failure.

**Mr. Matthew Bryant (mrbryant@mail.roanoke.edu)**

### **5,10-Methenyltetrahydrofolate Synthetase**

Faculty Sponsor: Dr. Tim Johann (johann@roanoke.edu)

Department: Chemistry

5,10-Methenyltetrahydrofolate synthetase (MTHFS) is an enzyme that catalyzes the formation of 5,10-methenyltetrahydrofolate from 5-formyl tetrahydrofolate. It regulates the flow of the one carbon metabolic pathway and can be easily harvested from *E. coli* in the lab. MTHFS makes an excellent case of study because many organisms contain this enzyme. In this study, MTHFS from *Mycoplasma pneumoniae* were studied. Various mutants of this proteins structure were studied using circular dichroism. It was found that the Y123A mutant had differences in the folding of the protein. Also, the gene for human MTHFS was successfully inserted into the plasmid, pET15b, using a variety of techniques from both the fields of biology and chemistry, and will be subject to further research.

**Ms. Bridget Carey (bridgetacarey@aol.com)**

### **Digging Into The Past: Archaeology at Camp Powhatan**

Faculty Sponsor: Dr. Whitney Leeson

(wleeson@roanoke.edu)

Department: History

This project seeks to research artifacts found in archaeological digs at Camp Powhatan and around the Roanoke area. "Thing biographies" were created to give a history to each object. Using clues found on the objects themselves, a deeper understanding of how the land has been used over the years was formed. A website was published to educate the public on the history beneath their feet.

**Ms. Madhura Chitnavis (mvchitnavis@mail.roanoke.edu)**

### **Characterizing Ty3-gypsy elements in the Basidiomycete Fungus, *Coprinopsis cinerea***

Faculty Sponsor: Dr. Marilee Ramesh

(ramesh@roanoke.edu)

Department: Biology

Two types of LTR retrotransposons have been identified in *Coprinopsis cinerea*: Ty1-copia elements and Ty3-gypsy elements. The re-

trotransposons that were studied in this experiment were gypsy LTR retrotransposons (Fairbanks and Andersen, 1999). The research objective was to further characterize gypsy retrotransposons in *Coprinopsis cinerea* in terms of structure and eventually assess functionality. Out of the 44 full-length Ty3-gypsy elements that have been identified in *Coprinopsis cinerea*, the 31 longest elements were chosen and evaluated on functionality using various criteria (Stajich et al., 2010). The criteria for the elements were element length, LTR length, LTR similarity, and expression data (ESTs, SAGE tags, methylation). Using the *Coprinus cinereus* annotation website and IGV software (The Broad Institute), gypsy elements were analyzed for potential functionality and given a rating from 1-5 with 1 being possibly functional and 5 being unlikely to be functional. The elements with the highest ratings were then characterized internally via comparing *Coprinopsis* sequence data to other fungal genomes using BLAST software. The elements and the exons and proteins within them were subsequently graphed using the program, Sequencher. It was concluded that the Ty3-gypsy elements of the *Coprinopsis cinerea* genome were unlikely to be active due to the genome being heavily methylated and mutated internally.

**Kelsey Collett, Molly Southard, Andrew Nesbit, Paige Arrington, Holly Conner, & Dr. David Nichols**  
**Brain Activity While Viewing Attractive and Unattractive Faces**

Faculty Sponsor: Dr. David Nichols

(dnichols@roanoke.edu)

Department: Psychology (Neuroscience Concentration)

Facial attractiveness has long been understood to be an evolutionary trait that is beneficial in mate selection and other social interactions, with a societal preference for attractive faces. The current study explored how faces are processed neurologically. Using electroencephalography (EEG), subjects were presented with images of male faces to measure a visual mismatch negativity (vMMN), a type of event related potential (ERP) signal. A vMMN is elicited when a deviant, i.e. infrequent, stimulus is presented after the visual adaptation to a standard, i.e. frequently repeated, stimulus. A total of 40 faces were used, 20 attractive and 20 unattractive faces, which were empirically defined as such in a previous study. The present study included data from 8 female participants aged 20-22. The study compared processing in the occipital lobe to the frontal lobe (channel 1) and in the temporal lobe (channel 2). As expected, an vMMN was found for channel 1, indicating that the brain recognizes a difference between attractive and unattractive faces even when the task did not require them to pay attention to attractiveness. Findings are consistent with the unconscious categorizing of faces as attractive or unattractive that would be expected as an evolutionary benefit.

**Mr. Edward Curtis (ewcurtis@mail.roanoke.edu)**

### **Sulfuric Acid and Water Models and Atmospheric Nucleation**

Faculty Sponsor: Dr. Kelly Anderson

(kanderson@roanoke.edu)

Department: Chemistry

Sulfuric acid plays a large role in atmospheric chemistry. The acid plays a major role in the nucleation of atmospheric particles, although the mechanism is not fully understood. The purpose of this research is to examine empirical sulfuric acid and water models via

Monte Carlo simulations. It is hoped that these models can be used to screen a wide variety of cluster properties in order to isolate the most interesting properties for further examination with first principles simulations. The models evaluated were developed by Kathmann and Hale<sup>1</sup> and Ding et al.<sup>2</sup> These models utilized different features such as the deprotonation of an acid molecule, hydrogen bonding, and the magnitude of the partial charges within the molecules in the model (ionic v. neutral). Liquid phase densities and structures were evaluated for both the Kathmann and Ding models over a range of compositions (0 – 50 wt. % sulfuric acid) and the results were compared to experimental data. Additionally, simulations of a range of vapor phases were completed to examine the clustering. The initial data suggests that the force field plays a strong role in the extent of the cluster formation.

**Mr. Daniel Garber (dgarber@mail.roanoke.edu)**  
**Effects of Auxin and Ethylene on Cellulose Deficient Lines of *A. thaliana***

Faculty Sponsor: Dr. Leonard Pysh (pysh@roanoke.edu)  
Department: Biology

Cellulose is a vital component in plant physiology. It is found in the cell walls and critical in determining a cell's shape and how the cell functions. Some lines of plants however, have mutated genes that cause them to have decreased levels of cellulose, which thus affect the cell wall and how it functions. The goal of this experiment was to see how root growth would be affected by the applications of indole acetic acid (IAA), an auxin hormone, and 1-Aminocyclopropane-1-carboxylic acid (ACC), a molecule that induces ethylene production, in various cellulose-deficient lines of *Arabidopsis thaliana*. The results showed that both IAA and ACC caused the roots to grow shorter than those grown without any hormone applied. This was consistent with what was seen in the wild type or plant line with normal cellulose levels. From these results, we can conclude that IAA and ACC have similar effects on root growth of cellulose deficient plants and plants with normal levels of cellulose though the reasons why aren't yet clear.

**Ms. Victoria Godwin (vagodwin@mail.roanoke.edu)**  
**Molecular Mechanisms of Src and EGFR Inhibition in Pancreatic Cancer**

Faculty Sponsor: Dr. Nipun Merchant (nipun.merchant@vanderbilt.edu)  
Department: Vanderbilt Medical Center, Surgical Sciences

Pancreatic cancer remains as one of the deadliest cancers in the world, with a 5-year survival rate of about 5%. Evidence exists for interactions between pancreatic cancer cells and stromal fibroblasts that affect angiogenesis and the invasive phenotype of pancreatic cancer. Oncogenic collaboration between Src and EGFR in cell transformation is well established. The purpose of this study was to determine whether Src and EGFR inhibition can overcome STAT-3 resistance to treatment in pancreatic cancer. In vitro effects of the Src inhibitor dasatinib and EGFR inhibitor erlotinib treatment were determined on sensitive and resistant human cell lines, BxPC-3 and PANC-1 cells, respectively. Combined inhibition of Src and EGFR inhibits constitutively activated STAT-3 signaling and decreases nuclear expression of phosphorylated STAT-3 in vitro. Blocking STAT-3 activation decreases expression of VEGF as well as fibronectin which promote angiogenesis. Furthermore, significant decreases in CD31 ex-

pression and microvascular density are also seen. These results provide evidence that combined targeted biological therapy targeted against Src and EGFR in addition to cytotoxic chemotherapy can inhibit tumor-stromal interaction and angiogenesis in pancreatic cancer through a STAT-3 mediated mechanism.

**Ms. Leah Hall, Ms. Lauren Roth, & Dr. Elizabeth Holbrook**

**The Roanoke Valley Community Healthy Living Index**

Faculty Sponsor: Dr. Elizabeth Holbrook (holbrook@roanoke.edu)

Department: Health and Human Performance

Through community-based collaborative research, we seek to assist in the rejuvenation efforts of the Hurt Park and West End neighborhoods of Roanoke. Using census data, Geographic Information Systems (GIS) analyses, and through the implementation of a previously validated resource developed by the U.S. Centers for Disease Control (e.g., the Community Healthy Living Index), environmental and sociocultural barriers and facilitators to healthy living within the aforementioned neighborhoods will be identified.

**Mr. Alexander Hawes (abhawes@mail.roanoke.edu)**  
**Synthesis of Novel Ethers from 1,2,3,4-tetrakis (Pentafluorophenyl)cyclopentadiene, 1,2,3-tris (Pentafluorophenyl)cyclopentadiene, and Various Alcohols**

Faculty Sponsor: Dr. Gary Hollis (hollis@roanoke.edu)  
Department: Chemistry

Several fully substituted ether derivatives were synthesized by reacting the para fluoro phenyl regions of 1,2,3-tris(Pentafluorophenyl)cyclopentadiene with deprotonated ethylene glycol monomethyl ethers, aliphatic, or fluorinated alcohols. A fully-substituted derivative between the tris starting material and 2,2,3,3,3-pentafluoropropanol was synthesized in a 20% yield. A second fully-substituted derivative between the tris starting material and 2,2,3,3,4,4,4-heptafluorobutanol was synthesized in an 18% yield. Three reactions, each using either 2,2,2-trifluoroethanol, 2-methoxyethanol, or ethanol, with 1,2,3-tris(Pentafluorophenyl)-cyclopentadiene as a substrate were optimized to produce a 30%, 62%, and 48% yields, respectively. Various chromatographic techniques were employed to increase efficiency of product purification. All products were characterized by <sup>19</sup>F and <sup>1</sup>H NMR spectroscopy.

**Ms. Shana Hensley (shensley@mail.roanoke.edu)**  
**Cardiovascular response to graded exercise in the Atlantic blue crab, *Callinectes sapidus*.**

Faculty Sponsor: Dr. Dar Jorgensen (jorgensen@roanoke.edu)

Department: Biology

My experiments are designed to monitor the functioning of the cardiovascular system in Atlantic blue crabs (*Callinectes sapidus*) while they undergo graded exercise in the form of underwater walking. I measured pulsatile hemolymph (crab vascular fluid) pressure in the ventricle (heart), in the pericardial sinus (the space in which the ventricle is suspended), and in the infrabranchial sinus (the space in which hemolymph collects before moving through the gill circulation - the part of the circulatory system located immediately upstream from the pericardial sinus). Ventricular and pericardial pulse pres-

sure (difference between maximum/systolic and minimum/diastolic pressures) and mean infrabranial sinus pressure was determined from the digitized data. Animals were prepped for experimentation 24 hours in advance and allowed a minimum of 30 minutes to acclimate to the experimental tank before beginning data collection. While at rest, data were collected for 30 minutes, then the animal walked on an underwater treadmill for 15-30 minutes. After the treadmill was stopped, the animal's recovery was monitored for 30 minutes. Mean IB pressure increased on average 40% while walking and decreased 25% during recovery. Average pericardial and ventricular pulse pressures increased by 20% during exercise and decreased by 50% while recovering.

**Mr. Matt Joseph (rmjoseph@mail.roanoke.edu)**  
**Synthesis of Melt Processable Poly(acrylonitrile-co-methylacrylate) Copolymers**

Faculty Sponsor: Dr. Sue Mecham (sjmecham@vt.edu)  
Department: Macromolecules and Interfaces Institute  
Poly(acrylonitrile-co-methyl acrylate) (AN/MA) copolymers with acrylonitrile contents >80% are currently solution processed to produce acrylic fibers and carbon fiber precursors. Solution spinning is a less environmentally friendly and economically desirable alternative to melt spinning. Melt processability of high acrylonitrile content polymer is challenging due to the relatively low temperature cyclization process which polyacrylonitrile (PAN) undergoes at temperatures in the range of 200°C coupled with the relatively high apparent melting transition temperature ( $T_m$ ) of the PAN. Melt extruded PAN copolymer fibers and films are anticipated to have many useful properties due to the potential for high strength and high barrier properties. Our research has focused on the synthesis of high molecular weight AN/MA copolymers via heterogeneous aqueous suspension polymerization. We have produced a series of high potentially melt processable copolymers using both AIBN and ammonium persulfate at two levels including dodecyl mercaptan as a chain transfer agent to limit molecular weight. Chemical structure was determined using proton nuclear magnetic resonance ( $^1H$  NMR) spectroscopy, Molecular weight using size exclusion chromatography (SEC), thermal transitions using differential scanning calorimetry (DSC), and viscosity using parallel plate rheology.

**Ms. Lillian Judge, Ms. Caroline Mueller, Ms. Leah Hall, & Dr. Elizabeth Holbrook**

**Evaluation of a School Running Program for Youth with Sensory Impairment**

Faculty Sponsor: Dr. Elizabeth Holbrook  
(holbrook@roanoke.edu)

Department: Health and Human Performance

Against the backdrop of declining health status among American youth, wherein 17% of children and adolescents are considered obese, we recently observed persistently higher levels of comorbidity and insufficient health-related physical fitness in youth with visual disabilities. As a result of poorly developed motor patterns during early childhood, visually impaired youth display low levels of health-related fitness across each of the five domains (including cardiovascular fitness, muscular strength and endurance, body composition, and flexibility). Unfortunately, few programs are available to youth with visual or other sensory disabilities which specifically seek to enhance participation in physical activity and, ultimately, improve health-related fitness status. Even among youth enrolled at schools for the blind and deaf, where adaptive equipment and facilities are readily

available, limited options are provided for sport and recreation participation. To address the need to enhance program availability at a local level, faculty at the Virginia School for the Deaf and Blind are implementing one of the first-known cross-country running programs for youth with sensory impairments this fall. The aim of this ongoing research study is to evaluate the efficacy of the running program for improving health-related physical fitness and self-efficacy among participants.

**Mr. Kyle King (kwking@mail.roanoke.edu)**  
**Effects of Shading on Belowground Biomass in two Biofuel Species (Switchgrass and Giant Miscanthus)**

Faculty Sponsor: Dr. Katherine O'Neill  
(oneill@roanoke.edu)

Department: Environmental Studies

In recent years, there has been growing interest in the use of biofuel grasses as feedstocks for bioenergy production. However, understanding the effects of shading on biomass production is essential for evaluating the feasibility and impacts of intercropping biofuel species within timber stands. The greenhouse study described in this poster was conducted by researchers at NC State University as part of a larger set of studies into the sustainability of biofuel production (the Lenoir 1 Intercropping Sustainability Study) which was established, and is being maintained, by Catchlight Energy LLC, a joint venture between Chevron and Weyerhaeuser Company. Two different biofuel species, Giant Miscanthus (*Miscanthus × giganteus*) and Switchgrass (*Panicum virgatum*), were grown at four shading levels (0%, 30%, 50%, and 70%) in a greenhouse in North Carolina (NC State University). Following the harvest of aboveground material, the samples were shipped to Roanoke College where belowground biomass was determined by removing the plant and root ball from the containers and either sieving the soil mix and roots through a 5-mm sieve (switchgrass) or wet sieving the samples using a system designed at Roanoke College (Miscanthus). Both species showed significant declines in belowground biomass as a function of shading, with the greatest decline in total biomass observed in switchgrass (98% reduction in biomass at the 70% shading level). A nonlinear exponential regression model provided the best fit to the data ( $R^2 = 0.99$  and  $0.98$  for switchgrass and Miscanthus, respectively). Results have implications both for biofuel yield in intercropped systems and the potential for carbon sequestration in root and soil systems.

**Mr. Kyle King (kwking@mail.roanoke.edu)**  
**Synthesizing Biodiesel from Used Vegetable Oil: Development of a Lab Activity for Environmental Studies and INQ courses**

Faculty Sponsor: Dr. Katherine O'Neill  
(oneill@roanoke.edu)

Department: Environmental Studies

Rising oil prices and concerns about anthropogenic climate change has led to increased interest in the production of biodiesel. To help teach students about the environmental and economic efficiency of biodiesel production and use, I developed a lab activity targeted for students in introductory Environmental Studies and INQ courses using grease and oil wastes from the Roanoke College campus. Making bio-

diesel involves three processes: titration, mixing, and washing. The basic reaction is the substitution of methanol in place of glycerine using lye (sodium hydroxide) as a catalyst, which creates a more viscous fuel with a lower boiling point than the original straight vegetable oil. The overall goals of the lab are to (1) teach students about the chemistry of biodiesel using an accessible, hands on experiment, and (2) to illustrate issues related to the economic and environmental costs and benefits of small and large-scale biodiesel production.

**Mr. Patrick Kohlhaas (pekohlhaas@mail.roanoke.edu)  
Palladium Catalyzed Synthesis of Hydroxyproline Derivatives**

Faculty Sponsor: Dr. Skip Brenzovich  
(brenzovich@roanoke.edu)

Department: Chemistry

Derivatives of naturally occurring molecules have been found to exhibit valuable medicinal activity, thus the ability to cheaply synthesize these molecules is paramount to new drug development. Specifically, hydroxyproline, a common amino acid found in many proteins in the body, is of increasing interest in the pharmaceutical industry. We will explore the synthesis of hydroxyproline derivatives using palladium as an active catalyst. Not only is palladium a versatile metal in terms of its synthetic capabilities, it is cost effective compared to many related species such as platinum and gold. By using palladium, inexpensive amino acids will be converted into new and interesting starting materials for pharmaceutical drugs.

**Mr. James Lee (jdlee@mail.roanoke.edu)  
Monte Carlo Simulations of Perfluoroalkane-Alkane and Ether-Alkane Mixtures near a Gold Surface**

Faculty Sponsor: Dr. Anderson Kelly Anderson  
(kanderson@roanoke.edu)

Department: Chemistry

With rapid technological advances, nanotechnology becomes practical leading our interest to the behavior of lubricants near a solid surface. About 3-6 Å from the surface, we observe the formation of the first layer known as the monolayer that retains more solid like properties than a liquid. The behavior of the monolayer is dependent upon the composition mixture in our simulations. Previous research indicates that in a liquid of molecules with the same functional group, the longer chained lubricant will take precedence at the interface due to greater interaction with the surface. In our simulations, the Monte Carlo method, Hautman-Klein potential, and TraPPE force field parameters were used. The simulated mixtures are comprised of alkanes with perfluoroalkanes and with ethers. The behaviors of these mixtures were analyzed using density profiles, mole ratio profiles, heats of adsorption, surface orientation and examining liquid structures near a gold surface.

**Mr. Cody Meadows (cameadows@mail.roanoke.edu)  
Palladium-Catalyzed Synthesis of Hydroxyproline Derivatives**

Faculty Sponsor: Dr. Skip Brenzovich  
(brenzovich@roanoke.edu)

Department: Chemistry Department

The goal of this project was to synthesize hydroxyproline derivatives via palladium-catalyzed coupling reactions. In order to accomplish this, a method for constructing the proper starting materials, allylated amino acids, was explored. For two amino acids, phenylalanine and

phenylglycine, a pathway to create the proper substrates for the palladium reaction was successfully developed. However, various problems arose with the palladium-catalyzed portion of the synthesis. In the future, experiments will be conducted to gather additional information about what structural and chemical limitations might be responsible for the difficulties encountered in the palladium-catalyzed reactions.

**Ms. Jan Minton (jminton@roanoke.edu) & Ms. Talia Logan  
A Community Art Project - The Roanoke Valley Reef**

The Roanoke Valley Reef is a satellite of the international Hyperbolic Crochet Coral Reef project. Margaret and Christine Wertheim, founders of the Institute for Figuring in Los Angeles, were inspired by the work of Cornell mathematics professor Daina Taimina who introduced crocheted models of hyperbolic surfaces. The Wertheims realized these shapes resemble forms in a coral reef. Artists, environmentalists and crafters around the world embrace these ideas and work together to produce beautiful crocheted coral reef installations that highlight the critical role of coral reefs in the well being our planet. The Roanoke Valley Reef project began in 2011 and work continues toward an exhibition in Olin Gallery to open January 25, 2013. Everyone is welcome to contribute to this unique project.

**Ms. Caroline Mueller (cimuelled@mail.roanoke.edu) Mrs. Cynthia Edmunds, & Dr. Elizabeth Holbrook  
The Efficacy of Fitness for Life Classes on the Fitness Profiles of Roanoke College Students**

Faculty Sponsor: Dr. Elizabeth Holbrook  
(holbrook@roanoke.edu)

Department: Health and Human Performance

It is well known that a regular exercise regimen, whether intense or moderate, has positive health benefits ranging from fat loss, cardiorespiratory improvements (such as an increase in VO<sub>2</sub> max), a greater range of flexibility, and muscular strength and endurance. For these reasons, Roanoke College has many opportunities for students and faculty alike to participate in group fitness activities, including Zumba, Pilates, Yoga, intramural sports, and off-campus excursions. To further emphasize the importance of exercising on health, it is mandatory for all students to participate in at least one one-semester-long fitness class. The primary goal of this study was to research how participation in a required college activity course, specifically Fitness for Life, affects overall fitness profiles in Roanoke College students.

**Ms. Michelle Pasier (mpasier@mail.roanoke.edu)  
Characterization of an IMP Cyclohydrolase in *Haloferax volcanii***

Faculty Sponsor: Dr. Cathy Sarisky (sarisky@roanoke.edu)  
Department: Chemistry Department

Purine biosynthesis is a fundamental metabolic pathway in organisms. Unlike bacteria and eukaryotes, the domain Archaea does not universally share enzymes for purine biosynthesis, and those they do possess are not necessarily homologous to non-archaeal purine biosynthesis enzymes. The final reaction of purine biosynthesis is the conversion of FAICAR to IMP. In *Haloferax volcanii*, this reaction is catalyzed by an IMP cyclohydrolase. *Haloferax volcanii* is a halophilic archaeon. Though its genome is sequenced, the characterization of *Haloferax volcanii*'s genes is not completed. The gene HVO\_0011 encodes an amino acid sequence with a high similarity to TKO430, an Archaeal IMP cyclohydrolase. The gene HVO\_0011 was inserted into E.

coli cells in the vector pMal-c5e, to produce its protein. This protein was extracted from those E coli cells by sonication. The protein encoded by HVO\_0011, in a crude form, was placed in assays with FAICAR to test for IMP cyclohydrolase activity. The production of IMP from FAICAR in the presence of the protein encoded by HVO\_0011 was confirmed from these assays using HPLC chromatography.

**Mr. Jonathan Perkins (jperkins@mail.roanoke.edu)**

### **Ethers and Fluoro-ethers from Pentafluorophenyl-Substituted Cyclopentadienes**

Faculty Sponsor: Dr. Gary Hollis (hollis@roanoke.edu)

Department: Chemistry

1,2,3,4-Tetrakis(pentafluorophenyl)cyclopentadiene and 1,2,4-tris(pentafluorophenyl) cyclopentadiene were reacted with fluorous and non-fluorous alcohols of differing chain length to produce tetrafluorophenyl ethers and fluoroethers. The reaction of 1,2,3,4-tetrakis(pentafluorophenyl)cyclopentadiene with 2-methoxyethanol (8 equivalents) and sodium hydride (100 equivalents) produced the tetra-substituted product in a <10% yield. The reaction of 1,2,4-tris(pentafluorophenyl)cyclopentadiene with 2,2,3,3,4,4,4-heptafluorobutanol (6equivalents) and sodium hydride (50 equivalents) produced the di-substituted product in a 51% yield and the tri-substituted product in a 3% yield. The reaction of 1,2,4-tris(pentafluorophenyl)cyclopentadiene with 2-methoxyethanol (6 equivalents) and sodium hydride (50 equivalents) produced the tri-substituted product in a 10% yield. The reaction of 1,2,4-tris(pentafluorophenyl)cyclopentadiene with 2-(2-ethoxymethoxy) ethanol (6 equivalents) and sodium hydride (10 equivalents) produced a crude mixture of the mono- and di-substituted product. All products were purified using silica gel flash chromatography and characterized by <sup>19</sup>F and <sup>1</sup>H nuclear magnetic resonance spectroscopy. Computational calculations were performed on the cyclopentadienyl anion form of 1,2,4-tris(pentafluorophenyl)cyclopentadiene to determine the equilibrium geometry and charge density map of the molecule. The calculations were done using Gaussian 03 Revision E.01 at the B3LYP level of theory using a 6-31G\* basis set.

**Mr. Ben Shapiro (beshapiro@mail.roanoke.edu)**

### **Immune System in the American Lobster - Response to a Double Bacterial Challenge**

Faculty Sponsor: Dr Darwin D. Jorgensen

(jorgense@roanoke.edu)

Department: Biology

The American lobster (*Homarus americanus*) is able to mount a rapid and effective immune response to acute bacterial exposure. Previous work in our laboratory has shown a decrease in circulating bacteria and hemocytes (the lobster analog to our white blood cells) in experimental lobsters within the first 15 minutes following a single bacterial injection. My experiments are designed to monitor the immune response in lobsters exposed to two bacterial loads administered within 24 hours of each other. Is the immune system response to the second exposure different? I have found that the clearance of bacteria from the hemolymph (blood) following the second bacterial challenge is more rapid than that shown after a single challenge.

**Mr Tyler Stoneham (trstoneham@mail.roanoke.edu)**

### **An Investigation of Hormonal Control of a Novel Plant-Resistance Trait: Defense by Ducking in Goldenrods**

Faculty Sponsor: Dr. Michael Wise (wise@roanoke.edu)

Department: Biology

While plants form the base of nearly all food webs, plants are far from defenseless. Plant defenses generally involve physical obstacles (like thorns or spines) or chemical toxins. Recently, an entirely new kind of adaptation has been identified in goldenrod plants: "defense by ducking." Most goldenrods grow vertically from emergence through senescence. Ducking plants emerge vertically but bend like a cane in spring before straightening again later in the summer. Ducking plants suffer only half the usual level of insect attack. Through greenhouse and laboratory studies using high performance liquid chromatography (HPLC) and polar auxin transport assays, this research project began investigating hormonal control of this fascinating plant behavior. Although it was found that while there is a statistically greater flow of auxin through the stem of a ducking goldenrod compared to a non-ducking goldenrod, larger sample sizes would need to be conducted in order to conclude that auxin is the hormone responsible for ducking.

**Mr. Connor Toomey (cjtoomey@mail.roanoke.edu)**

### **Colombia: A Sociopolitical Study of Past and Present Conditions through *One Hundred Years of Solitude* by Gabriel Garcia García Márquez**

Faculty Sponsor: Dr. Dolores Flores-Silva

(flores@roanoke.edu) & Dr. Virginia Stewart

(stewart@roanoke.edu)

Department: Modern Languages & English

This project examines how Colombia's political history has produced a fragmented society. Research into Colombia's history as well as analysis of Nobel Prize winner Gabriel Garcia Marquez's most complex novel, *One Hundred Years of Solitude*, from historical, economic, social, and political perspectives will provide a framework through which to interpret the past and present realities of Colombian society. In addition, data collected during a four-week stay in Cali and Medellin, Colombia in May 2012 will be analyzed, synthesized, and applied in order to compose a more integrative and lucid understanding of how political histories affect the cultural values, norms, and circumstances of Colombian society.

**Ms. Chava Urecki (czurecki@mail.roanoke.edu)**

### **The Development of the Preference for Complexity Scale**

Faculty Sponsor: Dr. Christopher Buchholz

(buchholz@roanoke.edu)

Department: Psychology

What draws a person to like the things that they like? For example, why do some people like more abstract artwork whereas others prefer much more realistic images? We hypothesize that many of our preferences in life are determined by our inherent tolerance for complexity. In other words, why we like the things we like is dependent on our individualistic preference for an optimal level of complexity or unpredictability in a given stimulus. We believe that one's individual preferences can vary from situation to situation but our overall liking/enjoyment of a stimulus is ultimately dependent on the level of complexity which it possesses. We have been developing a scale to measure one's optimal level of complexity in order to predict what an individual might prefer when given a particular stimulus.

**Ms. Kathleen Wager (kfwager@mail.roanoke.edu)**

### **Investigation of 5,10-Methylnltetrahydrofolate Synthetase (MTHFS) in Standard and Auto-Induction and Protein Sta-**

## **bility and Storage**

Faculty Sponsor: Dr. Timothy Johann  
(johann@roanoke.edu)

Department: Chemistry

Enzyme 5,10-Methylnltetrahydrofolate Synthetase (MTHFS) is necessary for DNA and protein synthesis, found in the folate pathway. The investigation involved comparing the common method of expressing the MTHFS gene by standard inducing media to the new form of auto-inducing media. Both method of induction expressed the MTHFS gene at a shaking incubation at 37°C. However, kinetics supported that standard-induction had the more active form of the MTHFS enzyme. In addition, protein stability and storage was tested by expressing the MTHFS gene by standard-inducing media and split into six various storage conditions. Storage of the enzyme buffer with glycerol at -20°C was supported by kinetics to retain the enzyme's integrity for the first and second month of preparation.

**Ms. Rebecca Ward (raward@mail.roanoke.edu)**

## **The Role of Ethylene in Stem and Root Elongation of Cellulose-Deficient Mutants of *Arabidopsis thaliana***

Faculty Sponsor: Dr. Leonard Pysh (pysh@roanoke.edu)

Department: Biology

Cellulose is a major component of the cell wall, providing structure to plants. The presence of ethylene in *Arabidopsis* results in shortened roots and stems, swollen roots and an exaggerated apical hook. Ethylene insensitive mutants do not express these traits. To determine the effects of ethylene response in cellulose-deficient mutants root and stem length. There was no significant difference seen in the root and stem lengths of the double mutant crosses.

**Mr. Nicholas White (ntwhite@mail.roanoke.edu)**

## **Ether Derivatives of 1,2,3,4-tetrakis(pentafluorophenyl)cyclopentadiene**

Faculty Sponsor: Dr. Gary Hollis  
(hollis@mail.roanoke.edu)

Department: Chemistry

My desired products were synthesized from reacting 1,2,3,4-tetrakis(pentafluorophenyl)cyclopentadiene with an alcohol and sodium hydride. In this research, 1,2,3,4-tetrakis(pentafluorophenyl)cyclopentadiene was successfully reacted with ethanol, propanol, octanol, and trifluoroethanol to give us our desired fully substituted products. These products showed a low yield due to the low reactivity of the starting material, 1,2,3,4-tetrakis(pentafluorophenyl)cyclopentadiene also known as tetrakis. The unwillingness of tetrakis to react is due to the aromaticity found in the rings. However, under the right conditions, one can break aromaticity and give the desired product with a moderate yield. This is done by adding energy to the reaction by the form of heat to acquire enough activation energy. For the ethanol product, I was only able to obtain a 50% yield. For the rest of the reactions, the percent yield would be reduced from one product to the next. The reaction with the lowest yield was with the octanol product showing only around a 10% yield. The trifluoroethanol was the second highest product to give me a percent yield of around 40% and propanol product with around a 32% yield. I was able to prove my finding through the NMR of my products.

**Ms. Casey Wojtera (crwojtera@mail.roanoke.edu)**

## **Implementation of a Yeast Expression System**

Faculty Sponsor: Dr. Timothy Johann

(johann@roanoke.edu)

Department: Chemistry

The purpose of this research was to successfully express 5,10-methylnltetrahydrofolate synthetase, or MTHFS, from *Mycoplasma pneumoniae* using a yeast expression system. MTHFS from *M. pneumoniae* has been extensively expressed, studied and has demonstrated activity. This MTHFS gene was used as a control to test the efficacy of a yeast expression system. If working properly, the system should make active MTHFS. The kit system also provides an additional positive control that should express maltose-binding protein (MBP) when the system works. Based on transformation yields, the DNA appears to have been incorporated into the cell properly. However, no evidence of MTHFS was identified after several attempts of cellular expression. MBP was expressed once, but was not expressed consistently. Future attempts at expression will address hypothesized causes for the lack of both MTHFS expression and consistent MBP expression.

**Dr. Stella Xu (sxu@roanoke.edu), Ms. Kathleen Ouyang  
Mr. Thomas Emerson, & Ms. Mathilda Nassar  
The Silk Road**

Faculty Sponsor: Dr. Stella Xu (sxu@roanoke.edu)

Department: History (East Asian Studies)

The Silk Road is the first transcontinental trading route to connect East and West. Through this long-lasting transportation channel, people not only traded luxury goods and commodities, but also exchanged ideas, religious beliefs, artifacts, foods, and forms of entertainment. This joint research project aims to use the Silk Road as a metaphor to understand trans-continental cultural interaction during the premodern period, and to explore the legacy of the Silk Road in contemporary Chinese society. Students have been working on various projects that focus on the cultural interaction that occurred along the Silk Road, aiming to reach a more comprehensive understanding of globalization in the past and present. Research topics include the dissemination, domestication, and revival of Buddhism in China, and the practice of Chinese traditional medicine. One other student will work on the complex issue of the recent opening of the National Museum of China in March 2011 in the context of China's re-orientation of her place in global society. Field trip sites include Buddhist temples, Christian churches, museums, and hospitals and clinics of Chinese medicine in Beijing, Xi'an, and Dunhuang.

**Ms. Yuki Yamazaki (yyamazaki@mail.roanoke.edu)**

## **Assessing Cognitive Processes of Self-Actualization**

Faculty Sponsor: Dr. Ed Whitson (whitson@roanoke.edu)

Department: Psychology

Abraham Maslow characterized self-actualizing people as having the ability to transcend arbitrary dichotomies (to not think in black and white terms), a synergistic (win-win) orientation, and the ability to perceive reality accurately (Maslow, 1954). The current study dealt with creating two behavioral methods to assess these cognitive processes of self-actualizing individuals outlined by Maslow. The discipline of Game Theory can be used to assess the behavioral aspect of synergistic orientation (not to view situations as a zero-sum-game) and the cognitive process of transcending dichotomous thought (win versus loss); a computerized Prisoner's Dilemma game can accomplish this. In addition, the computerized game was pilot tested by 11 undergraduate students. The creation of a video of individuals retelling a personal "life story" was attempted for this study to assess the cognitive process of the ability accurately to perceive reality; but be-

cause of matters beyond the control of the researchers, that has not come into fruition. However, an alternative behavioral method to assess this cognitive process is discussed. The overall goal of this study is to use these behavioral methods in a larger scale project to study the validity and relative effectiveness of three instruments that purport to measure Maslovian self-actualization (Maslow, 1954). This will be achieved by comparing which of the three instruments can best predict these important cognitive and behavioral dimensions outlined by Maslow. The three self-actualization measures are the Personal Orientation Inventory (POI), a short form of the POI (The Short-Index of Self-Actualization), and the Measure of Actualization of Potential (MAP). It is hypothesized that the first two will have no correlation with the cognitive measures, but the MAP will.

**Ms. Laura Zdziarski & Dr. Elizabeth Holbrook**  
**The Relationship between Perceived Fitness Status and Physical Activity Level**

Faculty Sponsor: Dr. Elizabeth Holbrook  
(holbrook@roanoke.edu)

Department: Health and Human Performance

Despite compelling evidence to the contrary, most American adults believe they are healthy. According to the Transtheoretical Model of Behavioral Change (TMBC), this mismatch between perception and reality of one's health may have significant repercussions. To examine the TMBC firsthand, the aim of this study was to evaluate the relationship between physical activity (PA) level and perceived fitness status (PFS) in adults. Forty-one adults completed a 7-day assessment of PA using a pedometer. In addition, they were asked to rank their fitness level on a 10-point Likert Scale [1=not at all physically fit; 10=extremely physically fit]. Following accepted guidelines, participants were grouped as sedentary, low active, somewhat active, or active according to PA level. One-way ANOVA was used to assess differences in PFS relative to PA. A significant difference in PFS was evidenced between sedentary and somewhat active individuals ( $p = .03$ ), indicating that somewhat active individuals perceived their fitness status as higher than sedentary individuals. No differences were observed between sedentary, low active, and active individuals ( $p$ 's  $> .05$ ). Our findings suggest that physically inactive adults perceive that they are insufficiently active, yet this information may not be motivating enough to stimulate behavior change related to physical activity.