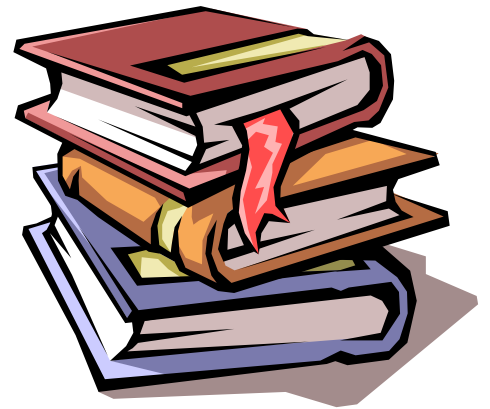
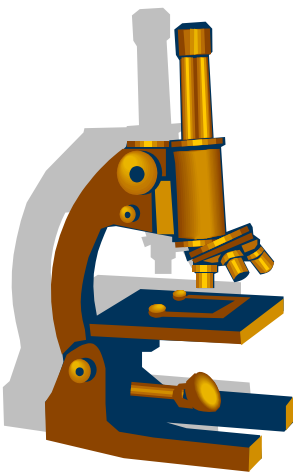


**THE NEW MEXICO HIGHLANDS UNIVERSITY  
FACULTY RESEARCH COMMITTEE  
presents the 7<sup>TH</sup> annual**

## **RESEARCH DAY**



**April 24, 2009  
Sala de Madrid**



*Celebrating the research and scholarly  
accomplishments of faculty and students.*



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## **WELCOME**

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Welcome to the seventh annual New Mexico Highlands Research Day! We are pleased to have the opportunity to highlight the scholarship and research of our faculty and students. Much of the faculty research presented today represents work that was funded through the Faculty Research Funds. Research and travel grants are awarded each term to faculty through a rigorous review and selection process. The Faculty Research Committee congratulates all grant recipients and encourages other faculty to apply for research funds and conference travel support. Many of the student poster presentations represent work that was funded through the NMHU Sigma Xi Chapter Student Research Fund. We congratulate them on their awards and applaud all of our student participants for their hard work and dedication to research and academic advancement.

For more information about the Faculty Research Funds, contact Michael Petronis (2008-09 Faculty Research Committee Chair) at 505.454.3513 or [mspetro@nmhu.edu](mailto:mspetro@nmhu.edu). You are also invited to visit the Faculty Research Committee's web page at [www.nmhu.edu/FacultyStaff/research/committee.aspx](http://www.nmhu.edu/FacultyStaff/research/committee.aspx).

The New Mexico Highlands University Sigma Xi chapter is sponsoring the student research presentations. Additional financial support is provided by the New Mexico-Idea Networks of Biomedical and Research Excellence (RR-016480) and the Faculty Research Committee. Sigma Xi's mission is to enhance the health of the research enterprise, foster integrity in science, and promote the public's understanding of science for the purpose of improving the human condition. The society is a diverse, chapter-based organization dedicated to the advancement of science and engineering through outstanding programs and services delivered in a collegial and supportive environment. For more information about the NMHU chapter and its activities, please visit <http://nmex.net/sigmaxi/index.php>.

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## **ACKNOWLEDGEMENTS**

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The Faculty Research Committee wishes to thank New Mexico Highlands University for its continued recognition and support of the research and scholarly activities of its faculty and students. In particular, we thank President Jim Fries and Vice Presidents Linda LaGrange, Gilbert Rivera, and Bill Taylor for their continued support of faculty research. We recognize Mike Petronis for arranging the faculty-graduate student oral presentations and Carol Linder for coordinating the student poster presentations. We kindly acknowledge Ms. Germaine Alarcon for her administrative assistance and continued support of the Faculty Research Committee and its grant awardees.

The New Mexico Highlands University Sigma Xi Chapter thanks the following individuals for volunteering to serve as judges for the Student Poster Competition: Ken Bentson, Lisa Bentson, Amanda Aragon, Adam Brister, Melanie Gallegos, Dick Greene, Merritt Helvenston, Rosie Lamphere, Edward Martinez, Christina Muniz, David Sammeth, Mary Shaw, Kurt Short, Rahul Sigdel, Arlie Tagayuna, and Tom Ward.

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### **2008-2009 NMHU SIGMA XI CHAPTER OFFICERS**

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Maureen Romine, Ph.D. – President

Lisa Bentson – Vice President

Carol Linder, Ph.D. – Treasurer/Secretary

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### **STUDENT POSTER SESSION COMMITTEE**

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Lisa Bentson (Judging Organizer)

Carol Linder, Ph.D. (Lead Organizer)

Jennifer Lindline, Ph.D. (Program Designer)

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## 2009 NMHU RESEARCH DAY PROGRAM

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- 8:30** Displaying of Student Poster Presentations
- 8:45** Coffee, Tea, and Snacks
- 9:00** Opening Remarks  
Sigma Xi and Faculty Research Committee Representatives
- 9:30** **Richard Plunkett, Ph.D.** (Assistant Professor of Biology)  
*Microbiology in the Plunkett Laboratory: from cleaning up infections to cleaning up the environment.*
- 10:00** **Kingsly Sufor** (Graduate Student in Life Sciences)  
*Design and characterization of hybrid antimicrobial peptides (hAMPs).*
- 10:30** **Travis Simcox** (Graduate Student in Behavioral Sciences)  
*Prior expectations have an effect on selective transfer from iconic memory.*
- 11:00** **Donna Woodford-Gormley, Ph.D.** (Assistant Professor of English)  
*Hasta que la muchacha llega: Doing research in Cuban libraries.*
- 11:30** **Kristie Ross, Ph.D.** (Assistant Professor of History)  
*The Woolsey sisters: A case for reconstruction.*
- 12:00** Lunch and Student Poster Session. Authors will be present from 12:00-1:30 for discussion.
- 1:30** **Kenneth Bentson, Ph.D.** (Associate Professor of Forestry)  
*Evolution of New Mexico's vegetation.*
- 2:00** **Peter Linder, Ph.D.** (Associate Professor of History)  
*The flagellants, the governor, and the bishop: Public penance and social reform in Eighteenth Century Maracaibo, 1767-1778.*
- 2:30** **Steven J. Williams, Ph.D.** (Professor of History)  
*Roger Bacon, Francis Bacon, & the Scientific Revolution.*

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## 2009 NMHU RESEARCH DAY ABSTRACTS

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### ORAL PRESENTATIONS

Abstracts are listed in the order that they appear in the program.

#### **Richard Plunkett, Ph.D.** (Assistant Professor of Biology)

*Microbiology in the Plunkett Laboratory: from cleaning up infections to cleaning up the environment.*

Since arriving at New Mexico Highlands University in Fall 2008, I have initiated several lines of research. I am continuing my postdoctoral research investigating designed antimicrobial peptides as alternatives to traditional pharmaceutical antibiotics in the war against antibiotic-resistant agents of disease. I have also revived my interest in environmental biology, especially studies of the great potential for microbially-assisted remediation of chemical and heavy metal pollutants. I will report the progress of experiments in my lab conducted by graduate and undergraduate NMHU students. These include the preliminary steps toward generating and evaluating novel antimicrobial peptides. Also in progress is the characterization of copper-resistant microorganisms isolated from a contaminated mining site near Cuba, NM. Future directions of these projects and others will be discussed, including opportunities for student involvement.

#### **Kingsly Sufor** (Graduate Student in Life Sciences)

*Design and characterization of hybrid antimicrobial peptides (hAMPs).*

The overwhelming challenges in antibiotic resistance from conventional antibiotics have necessitated efforts to design and characterize new antimicrobial compounds. We will design hybrid antimicrobial peptides by combining functional domains from insect-derived antimicrobial peptides (AMPs) called cecropins. These cecropin molecules that have been characterized in great detail contribute to the innate immune defenses in some insects. We hypothesize that the generated peptide molecule will show different activity, target specificity and a lower minimum inhibitory concentration than either parent molecule. We have undertaken experiments to generate a hybrid AMP (hAMP) by linking the N-terminal  $\alpha$ -helix of cecropin A from the mosquito *Aedes aegypti* to the C-terminal  $\alpha$ -helix of cecropin A from the cecropia moth *Hyalophora cecropia*. Using a process of overlap PCR we have successfully begun to build a chimeric artificial gene for the recombinant expression of our hAMP. The antibacterial activity will be determined by testing the hAMP against different Gram-negative and Gram-positive bacteria. Hemolytic activity against mammalian red blood cells will be tested to determine how detrimental our hAMP could be to eukaryotic cells.

#### **Travis Simcox** (Graduate Student in Behavioral Sciences)

*Prior expectations have an effect on selective transfer from iconic memory.*

The modern modal model of memory postulates three memory systems: a brief information register for each sense, short-term memory, and long-term memory. Iconic memory, the sensory memory register for vision, is assumed to have unlimited capacity but very short duration. Its function is to temporarily store visual information in a raw format, without categorizing it.

When subjects view a brief stimulus, it is stored in iconic memory. A retrieval cue immediately after the stimulus can influence what parts of the stimulus are transferred from iconic memory to short term memory, changing the transfer process from a somewhat random to a focused one. An experiment was conducted to test if expectation prior to the presentation of a stimulus, a higher-order process, can affect transfer from iconic memory to short-term memory.

Subjects experienced blocks of trials in three conditions in a counterbalanced design. In all conditions, subjects saw a random 4x4 array of black and white squares on a computer monitor for 10 msec. In the whole-report condition, subjects were instructed to report each black square in the entire array using a 4x4 keypad. In the control condition, subjects were instructed to report one row randomly cued by previously learned audio cues. In the experimental condition, subjects were instructed to report a randomly cued row as in the control condition. However, there were arrows displayed on the screen pointing to one of the rows. On half of such trials the arrows correctly predicted the row to be cued, creating an expectation of which row would be cued. Response times and accuracy data were recorded from all trials.

Accuracy was greater when the expectations were fulfilled ( $M = 3.02$ ,  $SD = 1.086$ ) than when expectations were violated ( $M = 2.81$ ,  $SD = 1.096$  Mann-Whitney  $U = 57748$ ,  $p < .001$ ,  $r = .0969$ ). The response times for correct responses in trials in which expectations were fulfilled were shorter ( $M = 1537.24$ ,  $SD = 962.496$ ) than trials in which expectations were violated ( $M = 1739.75$ ,  $SD = 983.211$  Mann-Whitney  $U = 453271.5$ ,  $p < .001$ ,  $r = .1012$ ). A test of mediation indicated that the effect of expectation on accuracy controlling for response time was significant,  $p = .0049$ . These results illustrate that subjects' expectations prior to the display of a stimulus caused a change in the transfer process from iconic memory to short-term memory after the stimulus was presented.

**Kenneth Bentson, Ph.D.** (Associate Professor of Forestry)

*Evolution of New Mexico's vegetation.*

New Mexico has one of the most diverse floras in the United States. Sharp gradients in temperature and precipitation due to mountains and weather patterns maintain today's diversity. However, New Mexico's vegetation is the product of continental drift, orogeny, climate change and evolution of plants and animals over hundreds of millions of years. Frequent climate changes on evolutionary time scales have caused the widespread migration and sorting of plant taxa into the habitat types apparent today. Either global warming or resumption of glacial conditions has the potential of substantially altering New Mexico's vegetation over the next few millennia.

**Peter Linder, Ph.D.** (Associate Professor of History)

*The flagellants, the governor, and the bishop: Public penance and social reform in Eighteenth Century Maracaibo, 1767-1778.*

The eighteenth century saw the emergence of a dynamic elite culture in Maracaibo and the region it dominated. Venezuela had developed since the years of the Spanish conquest a Catholic culture shared by most segments of colonial society, but that culture evolved gradually over time, and was the object of efforts made to modify it. Efforts to change this culture began during the eighteenth century. Bourbon officials attempted to modify religious customs to conform to a changing idea of propriety. A fascinating example of this program of social and cultural reform occurred in the early 1770s. A severe drought led the ecclesiastical authorities to organize a series of penitential processions, in which both men and women participated. The Spanish governor unsuccessfully attempted to block the participation of women in the events, and eventually involved King Carlos III of Spain and the Bishop of Caracas in the controversy. In the wake of the clash over women's processions, Bishop Mariano Martí made a visit of inspection to Maracaibo. He used excommunication and other episcopal weapons in his efforts to impose new ideas of morality and behavior in Maracaibo. The events of the 1770s reflect the emerging conflict over culture and control in this key region of Venezuela.

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## **POSTER PRESENTATIONS**

Abstracts are listed in alphabetical order according to the first author.

***Docosahexanoic Acid: A potential neuroprotective substance for ethanol-damaged C6 glioma cells***

**A. Baca and L. LaGrange**, Behavioral Sciences Department, New Mexico Highlands University

Ethanol intake by pregnant mothers can cause severe neurological damage to a developing fetus. This may result in a variety of cognitive deficits and craniofacial abnormalities collectively referred to as Fetal Alcohol Spectrum Disorder (FASD). A nutritional supplement that may mitigate ethanol induced neural damage is Docosohexanoic acid (DHA). It is well established that DHA and other omega-3 fatty acids are essential for proper brain development. Additionally, research has shown low serum levels of DHA correlate positively with brain abnormalities, including FASD (Seo, Blaner, & Deckelbaum, 2005). DHA supplementation has also been shown to increase levels of brain-derived neurotrophic factor (BDNF) (a naturally occurring neural substance necessary for proper brain development). Low serum levels of this factor are found in infants with FASD. To test the potential neuroprotective effect of DHA, I plan to utilize a well established cell culture model of ethanol induced neurotoxicity consisting of cultured C6 glioma cells incubated in media containing ethanol. Following incubation, the cells will be supplemented with DHA at a concentration similar to what is normally found in the brain. The cells will be prepared for SDS-Page analysis, and then subjected to western blot analysis to quantify BDNF levels in each culture condition. I hypothesize that DHA supplementation may ameliorate or reverse ethanol induced damage to developing glial cells.

***Proofreading: a preliminary investigation. What's so difficult about detecting function word errors?***

**J. Baldy (New Mexico Highlands University), M. Pilotti ((New Mexico Highlands University and Hunter College), M. Chodorow (Hunter College), and F. Schauss (Dowling College)**

Reading may be conceptualized as a recapitulation of the processes underlying speech production, in which a structural frame is established with empty slots that might then be filled with words (Koriat & Greenberg, 1994). Accordingly, at the early stages, the goal for readers is to assign a structural frame to a large unit of text (a sentence) so that sequentially processed smaller units (words) can be assimilated into it (Aaronson & Ferres, 1983). Readers are assumed to engage in a shallow analysis of the text by searching for markers that disclose the sought-after structure. These markers are function words (prepositions, conjunctions, articles, and auxiliary verbs) which serve to express grammatical relationships among words within a sentence. They are different from content words (nouns, verbs, and adjectives) which carry distinct meanings. Typographical errors are consistently more difficult to detect in function words than in content words (Haber & Schindler, 1981). If the difficulty of proofreading errors in function words is due to their role as structural markers, then errors that merely transform one function word into another function word, preserving its role as structural marker

("then" instead of "them"), should be more difficult to detect than errors that change the function word into a content word (replacing "over" with "oven"). Of course, the difficulty of detecting errors in function words may also be due to their frequency of occurrence in the language. Namely, if the frequency of the expected (correct) word is high, proofreaders may be likely to engage in shallow analyses and thus overlook the error. In addition, if a word (e.g., *then*) occurs several times before appearing as an error, these occurrences may promote a shallow analysis of the error-bearing word, resulting in increased misses. The present investigation examined these factors in reference to proofreading accuracy. It was found that function-to-function errors yielded a higher proportion of misses than function-to-content errors (.62 vs. .47). However, the frequency of the correct word and prior occurrences of the error word did not significantly account for misses.

### ***Decision-making styles: The importance of context and gender***

**T. Cole and M. Pilotti**, Behavioral Sciences Department, New Mexico Highlands University

The present study explores gender differences in decision-making styles across different decision-making scenarios (important decisions vs. less important). After reading each of twelve decision-making scenarios, participants were asked to (1) rate the decision's importance and (2) answer questions from a modified version of the General-Decision Making-Style (GDMS) inventory (Scott & Bruce, 1995) as they relate to each scenario. Participants were then asked to report demographic information. The results suggested that the importance of the scenario influenced the choice of a decision-making style. Participants were more likely to endorse items related to the rational and dependent decision-making styles when the decision-making scenarios were judged to be important. In contrast, the spontaneous and avoidant styles were used more often when the decision-making scenarios were judged as less important. Consistent with previous research, there were no gender differences in decision-making styles.

### ***Comparison of Final Energies of Four Different Polymorphic Forms of Cyclohexanone***

**N. Dasari and T.V. Timofeeva**, Chemistry Department, New Mexico Highlands University

Polymorph Predictor program software from Accelrys, allows us to predict potential polymorphs of a given compound directly from the molecular structure. Polymorphism is the ability for a compound to crystallize in more than one chemically identical but crystallographically distinct form, prediction of these polymorphs plays a key role in controlling the crystallization and formulation conditions so that undesirable polymorphs are avoided. It is therefore important to know how many polymorphs are possible as well as how their properties might differ when working in the solid state. The approach is based on the generation of possible packing arrangements in all reasonable space groups to search for the low-lying minima in lattice energy. Many of the esters and ketones used in the flavors and fragrances industry are liquids at room temperature, which means that crystalline derivatives were prepared in the past for X-ray analysis. Low molecular weight ketones are liquid at room temperature. The main objective of this study is to compare the minimized energies of four different polymorphs of Cyclohexanone. Variation in lattice energy parameters and deviation of the angle ( $\beta$ ) are studied. The above polymorphic crystal structures are validated using Cerius2 program with Dreiding force field. The data obtained suggest that polymorphic form 1 with a space group  $P2_12_12_1$  and  $Z=4$  of cyclohexanone has lower energy compared to other the 3 forms. As a result polymorph 1 of cyclohexanone is found to be the most stable when compared with the remaining.

### ***Copper Resistant Bacteria (I): Possible Bioremediators for the Nacimiento Copper Mine Pit Lake***

**D.P. Delgado and R.M. Plunkett**, Biology Department, New Mexico Highlands University

The Nacimiento Copper Mine Pit Lake is an aquatic environment near Cuba, NM which has been polluted by copper. The copper level within the Pit Lake was shown to be 0.1 mM (6.3 ppm), which is considered toxic by EPA safety standards. We have successfully isolated bacteria from the site that are able to thrive in high copper concentrations. We are currently working with twelve individual isolates for which we have been able to determine a specific minimum inhibitory concentration (MIC) for copper. The MICs for our isolates range from 1.6-3.3 mM  $CuSO_4$ . We observed a correlation between the locations from which the samples were taken and the MICs of the isolates. This correlation will allow us to focus on the specific areas of the pit lake in which bacteria with the highest MICs came from. The overall focus is determine whether copper resistant bacteria with the ability to immobilize copper from the water can be used as effective bioremediators for this site and possibly some of the many copper-contaminated environments in dire need of remediation.

### ***Finishing dot chromosome from Drosophila mojavensis: Fosmid DGA03P06***

**D.P. Delgado and M.E. Shaw**, Biology Department, New Mexico Highlands University

The goal of this research was to improve and finish raw DNA sequences from the dot chromosomes of *Drosophila mojavensis* using the computer program Consed. This project was conducted in collaboration with Genomics Education Partnership (GEP), which includes Highlands and a number of other institutions and is funded by a grant from HHMI to Washington University, St. Louis (WUSTL). Washington University provided the raw sequence data to be finished as well as basic instructional material and technical support. Finishing of a sequence involves examining sequencing files to resolve problem of base identification that the computer could not distinguish. In addition new primers were designed to re-sequence areas that did not have good sequence information originally. Humans can do a better job of finishing than the computer. Data gathered by the student researchers will be compiled by researchers at WUSTL and used in their research to better understand genomic features involved in the formation of heterochromatin.

### ***New Mexico Highlands University/Luna Community College Science and Agricultural Summer Experience (NMHU/LCC-SASE) Project 2008***

**J. DeSanto and E. A. Martinez**, Natural Resources Management Department, New Mexico Highlands University

The SASE program's second year included two areas of study currently offered at Highlands University. These fields of study included Soil Science and GPS/GIS technology. Students were exposed to these areas of study for two weeks, one week per subject. The NMHU/LCC-SASE Project is designed to provide recent high school graduates and community college transfer students a field science experiential learning opportunity in an agriculturally related topic. New Mexico Highlands University recognizes the importance of agriculture to northeastern New Mexico, as well as the critical need for professionals trained in agricultural sciences. A grant from the USDA Hispanic Serving Institutions Initiative made possible creation of the Science Agricultural Summer Experience (SASE) project directed by Dr. Edward Martinez. This project recruits seniors, and juniors from high schools in northern New Mexico and transfer students from Luna Community College to participate in a summer institute exposing them to agriculturally related scientific activities and to career options in agencies that fall under the United States Department of Agriculture's (USDA) umbrella. The second (of three) SASE Institutes was held at New Mexico Highlands University (NMHU) on June 2-14 2008.

### ***Surveying antibiotic resistance of staphylococcus isolates from remote locations unexposed to antibiotics***

**R. Elliot and B. Nelson**, Biology Department, New Mexico Highlands University

Antibiotic resistant bacteria of the genus *Staphylococcus* are becoming increasingly problematic in both human and veterinary medicine. Most studies on antibiotic resistance conclude that resistance to antibiotics arises from chronic exposure of bacteria to antibiotics in hospital and veterinary settings. Because antibiotics developed over the past 60 years are based on naturally derived chemicals that have been present for millions of years, it would be expected that *Staphylococcus* isolates from remote locations unexposed to clinical antibiotics would still contain a certain level of resistance against them. Little research has been performed surveying the antibiotic resistance of *Staphylococcus* in remote areas. This study will test *Staphylococcus* isolates from several types of animals that live in remote areas for antibiotic resistance. Among them will be insects, cattle, and possibly elk or deer that live in the Pecos wilderness. Isolates from animals in the town of Las Vegas, including humans will also be tested in order to compare antibiotic resistance between cohorts.

### ***Juvenile Competency Quiz - evaluating clinical factors***

**K. E. Esquibel and T.D. Taylor**, Behavioral Sciences, New Mexico Highlands University

**Faculty Sponsor: J. L. Hill**

The Juvenile Competency Quiz is a semi-structured interview tool used to aid in determining the competency of juvenile defenders. Clinical factors, including academic and intelligence abilities, mental health disorders, foster placement, and medical or neurological conditions, were studied to determine their relationship to juvenile competency.

**Problem or Major Purpose:** According to the Dusky standards, a competent individual is one who has the ability to consult with his or her attorney, and possess a rational and factual understanding of the legal proceedings. The Competence Assessment for Defendants with Mental Retardation (CAST\*MR), Competency Assessment Instruments (CAI), MacArthur Competence Assessment Tool-Criminal Adjudication (MacCAT-CA), and other related tools are used to assess the competency of adult defenders, however little research has been conducted to understand the elements of juvenile competency.

The current research focuses on the Juvenile Competency Quiz (JCQ), a semi-structured interview tool used to aid in determining the competency strengths and weaknesses of juvenile defenders. The JCQ incorporates clinical factors that may reduce a juvenile's ability to be competent to stand trial; however, these factors were not included in the original scoring system. These factors include academic and intelligence measures, mental health disorders, foster placement, and medical or neurological conditions. The purpose of this research is to determine which factors hold the most weight in reducing competency-related abilities with the goal of including them in the scoring system of the JCQ.

**Procedure:** The data-set used in this study was collected from two groups of adolescents. With the permission of the New Mexico State Child Youth and Family the data were collected from 116 Juvenile defenders from Santa Fe, San Miguel, and Mora counties in New Mexico. The juvenile defenders ranged from nine to 19 years old, and charges ranged from property crimes to crimes with weapons and interpersonal violence. Each of the juvenile defenders was court ordered to complete a competency to stand trial evaluation. The competency interview included informed consent by a parent or guardian, client history (including social history, education, and developmental milestones), and a review of his or her current charges. Each juvenile was read aloud each question of the JCQ. The juveniles' responses were given verbally, and the evaluator wrote down verbatim their response on the JCQ form. Middle- and high-school adolescents in Santa Fe, NM, without prior involvement with the juvenile justice system, formulated the second group of adolescents used in this study. There were seventy-nine middle school students ranging in age from 11 to 14 and fifty-five high school students ranging in age from 15 to 19.

**Anticipated Results:** It is hypothesized that academic and intelligence abilities will hold the most weight in predicting a juvenile's competency to stand trial because these abilities are fundamental in the decision making process. Mental health disorders are anticipated to follow. Mental health disorders have the potential to hinder both decision-making and other cognitive abilities, as well as the ability to make sound, rational judgments. Medical or neurological conditions are anticipated to hold less weight than those factors previously listed, however they are still factors that may affect a juvenile's ability to be competent to stand trial. Foster placement is hypothesized to hold the least amount of weight when determining competency to stand trial.

**Conclusions and Implications:** Research has been done on clinical factors and on juveniles' competency to stand trial; however, research linking the two has not been done. This research pertaining to the JCQ will link the two and will provide evaluators with detailed information about the relationship between clinical factors and juveniles' competency to stand trial.

### *The impact of inter-tree competition on old Ponderosa pines*

**B. Gillock, and K. Bentson,** Natural Resources Management Department, New Mexico Highlands University

A better understanding of how size, age, productivity and density of young trees contribute to the competitive stresses on older Ponderosa Pines (*Pinus ponderosa*) will help land managers design restoration treatments that balance the preservation of old pines with the management of resilient forest structure. This study investigates the extent to which the vigor of old-growth Ponderosa Pines decreases as density and size of woody plants in their understory increases. The sample currently includes 75 Ponderosa pines between 160-450 years of age. Each old Ponderosa Pine was cored and measured for Diameter at Root Crown (DRC), Diameter at Breast Height (DBH), Height (H), Crown Area (CA), and Live Crown Ratio (LCR). A 6.5 m radial plot was established around each old pine. Each tree and shrub within this the plot was measured for DRC, DBH, H, CA and Distance to Center Tree. At each plot, geomorphology, aspect, slope and dominant vegetation was recorded. Data analysis has not begun in earnest, but preliminary results indicate that regeneration under older Ponderosa Pines is more frequently composed of Two-needle Pinon (*Pinus edulis*), Gambel Oak (*Quercus gabelii*) and Rocky Mountain Juniper (*Juniperus scopulorum*) than of young Ponderosa Pine. These observations may reflect shifting successional processes as a result of climate change, and may have important implications for forest management practices that seek to maintain resilient forests in the face of climatic uncertainty.

### *Comparison of drinking water quality between municipal drinking water supplies and privately owned wells in northern New Mexico*

**The FOR 333 Water Science Class: M.F. Keahon, H.J. Lara, F. Proffit, J.R. Romero, N.A. Wales, D.E. Williams, W. Jaremko-Wright, and E.A. Martinez,** Natural Resources Management Department, New Mexico Highlands University

The Safe Drinking Water Act (SDWA) of 1974 provided the framework for the proper management of drinking water. This provided a framework for controlling pollution, preventing pollution, managing pollution and monitoring past, present and future contamination. The standards within the Act are administered by the Environmental Protection Agency (EPA) which in turn is responsible for monitoring municipal water supplies. However, in rural areas water supply does not come from municipal sources, but rather from privately owned wells. The purpose of this investigation was to determine the differences in water quality between several different municipal water supplies; determine the differences in water quality between several different privately owned wells; and determine the differences in water

quality between municipal water supplies and private water supplies. Determinations as to whether or not the municipal and privately owned water sources were meeting or exceeding the water quality standards set forth by the EPA and New Mexico Environment Department (NMED) were also made. Three municipal water supplies were monitored as well as five privately owned wells for hardness, alkalinity and fecal coliforms. Nitrate-nitrogen ( $\text{NO}_3\text{-N}$ ) was measured utilizing the newly acquired FS 3100 chemical analysis machine and software.  $\text{NO}_3\text{-N}$  concentrations were found ranging from 0.16 parts per million (ppm) at the Santa Rosa site to 5.49 ppm at the Ojitos Frios site. It was found that all of the water supplies tested were meeting and exceeding the water quality standards set forth by the EPA and NMED. The drinking water supplies were deemed safe for human consumption.

### *Chemical and physical effects of the City of Las Vegas Wastewater Treatment Plant discharge on the Lower Gallinas River*

**The FOR 333 Water Science Class: M.F. Keahon, H.J. Lara, F. Proffit, J.R. Romero, N.A. Wales, D.E. Williams, W. Jaremko-Wright, and E.A. Martinez,** Natural Resources Management Department, New Mexico Highlands University

In 1972 the Clean Water Act was implemented in order to help decrease and control the amount of pollutants into United States waterways in order to provide for essential services derived from water dependent ecosystems. Since then, the Act has been amended several times to include other pollutants of interest, including pollutants discharged by wastewater treatment plants. The purpose of this investigation was to determine the chemical and physical effects that are bestowed upon the lower Gallinas River by the City of Las Vegas wastewater treatment plant (WWTP). Also, there was a need to determine if the WWTP indeed discharges water that meets or exceeds the water quality standards set forth by the Environmental Protection Agency (EPA) and New Mexico Environment Department (NMED). Four sampling points were monitored for physical water characteristics such as temperature, pH, and dissolved oxygen in situ. Other water parameters measured in the laboratory included turbidity, hardness, alkalinity, dissolved oxygen, total suspended solids (TSS) and fecal coliforms. Nitrate-nitrogen ( $\text{NO}_3\text{-N}$ ) was measured utilizing the newly acquired FS 3100 chemical analysis machine and software.  $\text{NO}_3\text{-N}$  concentrations were found ranging from 0.17 parts per million (ppm) at the upstream site to 9.5 parts per million at the point source of discharge. It was found that all water quality standards were being met and exceeded by the WWTP. Dilution occurred within a short distance from the wastewater treatment plant discharge and there was little effect on the water quality of the Gallinas River.

### *Mood and Productivity Over the Days of the Work Week*

**M. Leonela Mora and L. Boback,** Behavioral Sciences Department, New Mexico Highlands University

**Research Problem:** Lavis (2002) found that sad participants were significantly more productive in that they committed significantly fewer assembly errors. Happy participants were thought to have maintained their mood by devoting less effort into the task at hand. Toward the end of the week, participants devoted less effort to maintain a happier mood, perhaps because of the weekend ahead. Our research is also focused on the topic of mood. We decided to find out about how mood affects people in their daily work lives. We sought to find a correlation between people's mood and their productivity depending on the day of the week. We hypothesized that people will be happier as the week goes on, and less productive as the week goes on. Therefore, we also predicted a negative correlation between mood and productivity. We also examined the correlation between mood and productivity on individual days of the week.

**Procedure:** Data was collected from the survey of 51 participants. Participants ages ranged from 20-50, and worked 40 hours per week, Monday thru Friday. Participants lived in Pennsylvania and New Mexico. Demographic information was also gathered from participants. SPSS was used to interpret the data. Five-item Likert scales were used to assess mood. The five items were bored, optimistic, angry, sad, and happy. Four-item Likert scales were used to measure productivity, including "Were you productive at work today?" and "Did you finish all the work assigned for today?"

**Results:** A repeated-measures ANOVA was used to analyze the data. There was a significant linear trend for mood,  $F(1, 49) = 17.37, p < .001$ . Between Monday and Friday people's moods seem to improve during the work week. Surprisingly, people's productivity showed a curvilinear trend,  $F(1, 48) = 7.19, p = .01$ . Between Monday and Wednesday, people's productivity increased slightly and then dropped significantly toward Friday. The correlation between mood and productivity over the week was small but positive,  $r = .14, p < .05$ . On Monday thru Wednesday, there was a moderate correlation between mood and productivity,  $r = .32, p < .001$ . On Thursday and Friday there was no relation between mood and productivity,  $r = -.09, p = .40$ .

**Conclusions:** The hypothesis that people will be happier as the work week proceeds was fully supported in our data. Nevertheless, the study did not support the hypothesis that people are less productive as the week goes on. Productivity improved from Monday to Wednesday but declined on Thursday to Friday. The study showed a small positive correlation between mood and productivity over the whole week. Interestingly, there was a moderate positive correlation between mood and productivity in the early part of the week, but no correlation at the end of the week.

One possible explanation for the productivity finding is that people take a while to hit peak productivity as they reacclimate to their work each week, and then decline again as they are distracted by the weekend. Furthermore, mood might be a good indicator of more energy for productivity during the early week, but then is independent of productivity at the end of the week as it becomes conflated with anticipation of fun on the weekend.

### ***GOLGA3 expression in repro27 mice***

**A. C. Lopez, L. Bentson, and C. Linder**, Biology Department, New Mexico Highlands University

C3Fe;B6-*repro 27* mice are a chemically-induced genetic mouse model of male infertility. Male *repro27* mutant mice are viable and appear normal. However, male mice are completely infertile having small testes with few spermatids and spermatozoa and abnormal acrosome development. Female mutant mice are fertile. Spermatogenesis in mutant mice appears normal until two weeks of age when testes show significant loss of germ cells during late meiosis. A few germ cells complete meiosis and require a longer period of time to do so. We identified a point mutation in the Golgi autoantigen, golgin subfamily A member 3 gene (*Golga3*) in *repro 27* mutant animals that appears to be the genetic cause of the infertility. The *Golga3* gene is almost 50 kb and contains 24 exons encoding a 1,447 amino acid polypeptide (167 kDa). A C to T mutation in *repro27* mice results in the inappropriate insertion of a stop codon in exon 18. We predict that the last six exons of the GOLGA 3 protein are not made and may result in the expression of a truncated protein (129 kDa). To test this prediction and analyze GOLGA3 expression patterns, custom antibodies to N- terminal and C-terminal ends of the protein were designed and commercially developed. Antibody optimization was performed to determine optimal protein concentrations and antibody dilutions. Protein expression was measured by Western blotting using the GOLGA3 primary antibodies and anti-rabbit HRP secondary antibodies and signal detected by chemiluminescence. GOLGA3 expression patterns were analyzed in 14 day old and adult *repro27* mutant and control mice on two genetic backgrounds (mixed C3Fe;B6 and a pure C3HeB/FeJ inbred background). I have confirmed that full-length GOLGA3 is not expressed in the testes of mutant male *repro27* animals. There is also no evidence of a truncated form suggesting that the GOLGA3 protein is degraded. Western blotting further confirms that GOLGA3 expression is not observed in liver, heart or brain samples of mutant or control animals. Preliminary data suggests that a larger protein product may be expressed in the brain. Overall, these results suggest that GOLGA3's actions are limited to the testes, confirming the observed phenotype. The mutant *repro27* animals' failure to express functional GOLGA 3, and resulting infertility, indicate that GOLGA 3 is essential for normal spermatogenesis.

### ***Comparing and contrasting two measures of the "Five Element Personality": A test-retest study***

**J.C. Marcinak, S. Nsamenang, and I. Williamson, and N. Cuccia**, Behavioral Sciences Department

We believe that psychology can aid in Chinese medical diagnoses by using psychometric testing to validate and improve upon existing conceptions of personhood in the field. Toward that end, this test-retest study compares an existing measure of the five elements in Chinese medicine with one that was developed through psychometric testing by psychologists. We expected that Cuccia and Williamson's (2007) psychometrically developed questionnaire would show better inter-item reliability and better test-retest reliabilities than the informally developed questionnaire of Beinfield and Korngold (1991). Furthermore, because these questionnaires measure the same constructs, we hypothesized that the correlations between the two measures of the same construct would be high. We found general support for the hypotheses.

### ***Copper resistant bacteria (II): Identifying unknown organisms from the Nacimiento Copper Mine pit lake***

**D.M. Martínez and R.M. Plunkett**, Biology Department, New Mexico Highlands University

The Nacimiento Copper Mine Pit Lake is an aquatic environment located within an area that was previously a functional copper mining area. The copper level of the Pit Lake was shown to be 6.3 parts per million, which is considered to be a toxic level according to the EPA. In 2008 we isolated twelve individual bacterial isolates from the pit lake that have the ability to thrive in high copper concentrations. We intend to identify them by 16S ribosomal RNA sequences. Genomic DNA was extracted followed by a procedure known as Polymerase Chain Reaction (PCR), which is an effective way to amplify a specific piece of DNA. Our PCRs used primers specific for 16s genes (27F bacterial and 1492R universal). Gel electrophoresis was used to see if the DNA we were looking for was amplified. We also attempted to transform *E. coli* with our amplified PCR product, which has been unsuccessful to date. In the future, will use different PCR programs and combinations of primers to amplify, clone and sequence 16s genes. Our overall goal is to identify the organisms' mechanisms of copper resistance, which will hopefully lead to an effective method of copper bioremediation.

### ***University Studies Senior Capstone Project***

**L. Montano**, University Studies Program, New Mexico Highlands University

**Faculty Advisors: Jennifer Lindline and Eric Romero**

This presentation describes my program of study within the Bachelors of Arts in University Studies (USBA) degree program. I entered the program having completed a number of courses that did not align with any one particular major. The USBA program allowed me to build upon my existing coursework and further explore three areas of interest – Business, History and Political Science, and Art. My involvement in the USBA program has helped me to develop critical thinking, effective communication, enhanced reasoning, and life-long learning skills. I am exploring several career paths (HIV counseling, infectious disease research, and computer programming). The interdisciplinary nature of my program will permit me flexibility in my career options.

### ***Sequence of D. mojavensis Fosmid 09XBAC***

**E.M. Montoya and M.E. Shaw**, Biology Department, New Mexico Highlands University

The dot chromosomes of the *Drosophila* species tend to be heterochromatic, meaning that the chromatin remains condensed throughout the cell cycle and is generally inactive. The genome of *D. melanogaster* has been sequenced and it has been shown that the dot chromosome does have genes present. Because of this, the genomes of other species of fruit flies have been sequenced to compare the sequence of these areas and determine if there are genes present in these species as well. Information concerning gene expression in heterochromatin in other species may help us understand the heterochromatic areas of human DNA. The Genomics Education Partnership (GEP), based at the Washington University in St. Louis has provided the means necessary to take raw sequence data from closely related species of *Drosophila* and finish it to a high quality sequence. The data are then pooled and used in their research on chromosome structure. I received the fosmid 09XBAC from the GEP. Using the computer program CONSED, the fosmid was edited by looking at areas that were low quality. Primers were then designed to repair these problem areas. The primers were ordered through the GEP, the sequencing reactions were run in their facility, and the sequences were sent back. The results were loaded into CONSED again and whatever errors were left were manually edited. Based on the differences in the high quality reads of the fosmid after finishing took place, the fosmid has been sequenced to a higher quality.

### ***Improvement of a sequence of a D. mojavensis Fosmid***

**E.M. Montoya and M.E. Shaw**, Biology Department, New Mexico Highlands University

The dot chromosomes of the *Drosophila* species tend to be heterochromatic, meaning that the chromatin remains condensed throughout the cell cycle and is generally inactive. The genome of *D. melanogaster* has been sequenced and it has been shown that the dot chromosome does have genes present. Because of this, the genomes of other species of fruit flies have been sequenced to compare the sequence of these areas and determine if there are genes present in these species as well. Information concerning gene expression in heterochromatin in other species may help us understand the heterochromatic areas of human DNA. The Genomics Education Partnership (GEP), based at the Washington University in St. Louis has provided the means necessary to take raw sequence data from closely related species of *Drosophila* and finish it to a high quality sequence. The data are then pooled and used in their research on chromosome structure. I received the 36853 base pair fosmid 09XBAC from the GEP. Using the computer program CONSED, the fosmid was edited by looking at areas that were low quality. Primers were then designed to repair these problem areas. The primers were ordered through the GEP, the sequencing reactions were run in their facility, and the sequences were sent back. The results were loaded into CONSED again and whatever errors were left manually edited. Based on the differences in the high quality reads of the fosmid after finishing took place, the fosmid has been sequenced to a higher quality.

### ***Determination of molecular and crystal structure with X-ray crystallography in piperidone derivatives***

**S.L. Nayani, T.V. Timofeeva, V.N. Khrustalev, and P. Tongwa**, Chemistry Department, New Mexico Highlands University

X-ray crystallography is a method of determining the arrangement of atoms within a crystal, in which a beam of X-rays strikes a crystal and scatters into many different directions. A three-dimensional picture of the electron density within the crystal is determined from the angles and intensities of the scattered beams. A crystal is initially grown in the laboratory and then its structure determined. The present research concentrates on the determination of atomic arrangement in the five piperidone derivatives. Piperidone derivatives have been used for years as a base for drug design. They have been found to possess high cytotoxic and antitumor activity towards different cell lines. The structure-activity relationship studies also suggested the increase in cytotoxic activity with the increase of electron withdrawing properties of the phenyl ring substituents and also decrease in the fluorescent activity. Combination of anti-tumor activity and fluorescent properties makes these types of compounds exceedingly attractive as drug candidates.

### ***Copper resistant bacteria (III): Identifying unknown organisms from the Nacimiento Copper Mine pit lake***

**S.J. Nealy and R.M. Plunkett**, Biology Department, New Mexico Highlands University

The Nacimiento Copper Mine Pit Lake is an aquatic environment that is located at the center of a site that was used in the past as a copper mine. The copper level within the Pit Lake was shown to be 6.3ppm, which is considered to be toxic by the EPA safety standard for copper contamination. We have isolated twelve individual bacterial isolates from the site that thrive in high copper concentrations. We attempted to generate 16S rDNA sequences by PCR using primers designed for bacteria (27F bacterial and 1492 universal). We were able to amplify two 16S fragments but cloning attempts have been unsuccessful. We are troubleshooting this problem by using new primer combinations and different thermal cycling conditions. Future work with these organisms has the potential to lead to an effective method of copper bioremediation.

### ***WNT and FSH act in synergy to stimulate aromatase gene expression***

**S. Nesterova and J. Hernandez Gifford**, Biology Department, New Mexico Highlands University

Normal ovarian development and steroidogenic functions are governed by the pituitary gonadotropins LH and FSH. Within the ovary, theca and granulosa cells of the mature Graafian follicle produce estrogens in response to LH and FSH stimulation. First, LH binds to its receptor on theca cells to stimulate the production of androgens. Second, the androgens migrate into granulosa cells which, under the influence of FSH, upregulate aromatase enzyme expression to facilitate the conversion of androgens into estrogens. Recently it has been shown that the secreted glycoprotein family of WNTs also plays an important regulatory role in estrogen production within granulosa cells. WNTs signal by binding to a seven transmembrane Frizzled receptor on the granulosa cells and activating numerous cellular processes one of which is the upregulation of  $\beta$ -catenin, a downstream transcriptional cofactor.  $\beta$ -catenin is translocated into the nucleus where it stimulates transcription of genes. It has been shown that  $\beta$ -catenin gene ablation significantly reduces levels of aromatase. Therefore, we hypothesized that the canonical WNT signaling pathway converges with FSH to allow maximal stimulation for aromatase gene transcription. A human tumor granulosa cell line, KGN, which retains its steroidogenic properties and functional FSH receptors, was used to test this hypothesis. KGN cells were exposed to increasing concentrations of a recombinant mouse WNT3A (5, 50, and 500ng/ml) in the presence of vehicle or FSH (1 and 100ng/ml) for 24 hours. Expression levels of aromatase (CYP19A1) and  $\beta$ -catenin (CTNNB1) mRNA were quantified using real time PCR analysis. Stabilization of  $\beta$ -catenin protein will be confirmed by Western blotting. The data illustrated that WNT alone only minimally stimulated aromatase gene expression as compared to a control. At a minimal concentration of FSH (1ng/ml) increasing quantities of WNT showed an increase in aromatase gene expression in a dose dependent fashion. Finally, at a higher concentration of FSH (100ng/ml) increasing amounts of WNT stimulated aromatase expression above the control levels. These data suggest that WNT alone stimulates some aromatase gene expression and possibly has a synergistic affect with FSH to increase aromatase transcription.

### ***Anisotropy of magnetic susceptibility and petrography of the Ross of Mull granite, NW Scotland: Implications for ascent and emplacement of a reversely-zoned intrusion***

**M.S. Petronis<sup>1</sup>, B. O'Driscoll<sup>2</sup>, C.T.E Stevenson<sup>3</sup>, R.J. Reavy<sup>4</sup>**

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The Ross of Mull granite is a ca. 400 Ma reversely-zoned granite-granodiorite-diorite pluton. Field and petrographic observations suggest that late-stage intrusion of hot mafic magmas, evidenced by centrally located swarms of diorite enclaves with superb mixing and mingling textures, had profound effects on the cooling granite mush. These features, together with exceptional coastal exposure, provide a unique opportunity to study magma flow within a petrologically dynamic and potentially long-lived magmatic system. One hundred and thirty two sites were sampled across the Ross of Mull granite for anisotropy of magnetic susceptibility (AMS) study in order to constrain the internal architecture and post emplacement deformation of the intrusion. The principal objectives of the study are to develop an intrusive model for the pluton, attempt to determine the emplacement direction of the magma, and the observed zonation pattern. Curie temperature measurements, estimated from experiments on the temperature dependence of susceptibility, yield values of 594C, consistent with average bulk magnetic susceptibilities of  $10.78 \times 10^{-3}$  SI, that suggest a low-Ti Fe-oxide or mixture of oxides as the principal magnetic phases. Hysteresis data at ambient and high temperatures reveal a narrow range of response with low  $M_{rs}/M_s$  and high  $H_{cr}/H_c$  values consistent with a multidomain Fe-Ti oxide phase. The AMS fabrics are internally consistent at the site level. The corrected degree of anisotropy ranges from 5 to 15 percent and anisotropies are variable in shape between oblate and prolate. In oblate sites, the well-constrained foliation dips steeply west, whereas in prolate sites, the lineation plunges moderately southeast and southwest. The fabric data have begun to describe that magma possibly originated in the southwest but with flow modified or controlled by the movements on the Sound of Iona Fault (west-dipping oblate fabrics) before flowing eastward or upward to the east (southwest and southeast steep plunging lineations). Additional AMS data will be used to further constrain magma flow and may also yield insights into post-emplacement deformation or tilting.

### ***Error detection in text***

**M. Pilotti (New Mexico Highlands University and Hunter College), T. Simcox (New Mexico Highlands University), M. Chodorow (Hunter College), and F. Schauss (Dowling College)**

The present study examined the influence of three factors on proofreading speed and accuracy: word frequency of the error-bearing word, predictability arising from sentential constraints and predictability arising from text familiarity. Its goal was to determine whether these factors, either independently or jointly, would impair error detection in text by making proofreading driven by top-down processes. Prior to the proofreading task, subjects were presented with half of the sentences without errors, which they were asked to read, copy, memorize or paraphrase. These tasks represented a continuum of progressively more demanding and time-consuming activities, which were thought to lead to comparable increases in text familiarity and thus predictability. In this investigation, proofreading times were affected neither by whether the sentences had been encountered earlier nor by the specific familiarity-inducing activity performed prior to proofreading. Proofreading was simply slower and less accurate for high frequency words and for high-constraint sentences. Yet prior memorization produced divergent effects on accuracy depending on the predictability of the text, suggesting that excessive predictability, as that produced by memorizing high-constraint sentences, can increase the probability of overlooking errors.

### ***Finishing of the dot chromosome sequence from *Drosophila mojavensis****

**J.B. Romero and M.E. Shaw, Biology Department, New Mexico Highlands University**

The objective of this project was the finishing of a 35,000 base pair region of the dot chromosome from *Drosophila mojavensis* more commonly known as a fruit fly. Finishing is the process of taking the raw sequence data from the previously sequenced dot chromosome of *Drosophila mojavensis* and creating a high quality sequence by editing and calling for additional sequencing reactions (calling reads) to gather more data where needed. Finishing was largely accomplished through the use of the Consed program, which makes it possible to manually editing base pair disagreements and misalignments sequences. The Consed program also makes it possible to adding new sequences to low-quality regions of the consensus sequence. Though there are numerous programs that can read and predict a genomic sequence it is still necessary to manually determine the problems within low-quality regions. The results of the finishing are that the majority of sequence now consists of high-quality regions with the exception of the conventionally problematic ends to the sequence. The information that we are contributing will increase understanding of how genome structure influences gene expression. The information will also be useful in studies using comparative genomics to understand the evolution of the various *Drosophila* species and in explaining the formation of heterochromatic and euchromatic DNA.

### ***Identification and characterization of WNT target genes in a human tumor granulosa cell line***

**T. Ruiz and J. A. Hernandez Gifford, Biology Department, New Mexico Highlands University**

WNT signaling has been implicated as a crucial component in early development of the female gonad. Regulated expression of WNTs has been localized to specific ovarian compartments at distinct stages of follicular development, although the precise role for WNTs in the ovary has yet to be defined. This study was designed to identify potential WNT target genes in granulosa cells of the ovary. To achieve this purpose several WNT target genes were identified through literature searches including, aromatase,  $\beta$ -catenin, Follistatin, and *AXIN2* and quantified by real-time PCR. A human tumor granulosa cell line (KGN) was used as an in vitro cell model. KGN cells were cultured with vehicle or 500 ng/ml of WNT3A protein for 6 hours. Following removal of the exogenous WNT, the KGN cells were incubated with or without FSH for 24-hr. Quantitative PCR results indicate that *AXIN2* is a WNT target gene in granulosa cells as it is specifically induced in cells treated with WNT3A. Additionally, WNT alone was able to cause an increase in aromatase expression over controls. Conversely, follistatin appears to be down regulated in KGN cells exposed to WNT. Though, *CTNNB1* levels did not appear to change among the treatments, this may not be surprising since stabilization of  $\beta$ -catenin protein is the hallmark of canonical WNT signaling. Together these data suggest that culturing KGN cells in the presence of recombinant mouse WNT3A protein effectively induces the WNT signaling pathway and is an appropriate means to begin to identify WNT target genes in granulosa cells.

### ***Is there a relationship between performance on the clinical dementia rating scale and performance on the mini-cog test?***

**C. Strickland, Behavioral Sciences Department, New Mexico Highlands University**

**Faculty Mentor: M. Pilotti**

The purpose of this study is to determine whether there is a relationship between performance on the Clinical Dementia Rating (CDR; Morris, 1993) scale and performance on the Mini-Cog test (Borson et al., 2000). Participants were 19 older adults whose age ranges from 65 to 80. Each participant and a significant other underwent a structured interview. The interview data were used to determine the participant's score on each of the six dimensions of the CDR scale (scores range from 0 = no dementia to 3 = dementia). The participant was also given the Mini-Cog test (from 0 = dementia to 3 = no dementia). There was a negative correlation between Mini-Cog scores and CDR ratings. Namely, when the Mini-Cog test yielded impaired performance, the CDR scale did also report impaired performance.

### ***Crystal Growth and Characterization of Polymorphs of Pharmaceutical Materials***

**R.D. Tammisetti, M.Y. Antipin, T.V. Timofeeva, V.N. Khrustalev, and P. Tongwa**, Chemistry Department, New Mexico Highlands University

Crystalline polymorphism is the existence of multiple crystals that have the same chemical compositions, but different chemical structures. Polymorphism of organic crystals has generated experimental and theoretical results for decades that have significant implications for many fields. The area of the study is related to actively growing field of modern chemistry and pharmaceutical science – design of drugs with enhanced bioactivity due to specific crystalline alignment of the molecules achieved in crystalline polymorphs. Accurate study and correct prediction of polymorphic structure will allow for evaluation of enthalpy of crystal formation and relative pharmaceutical polymorph's stability. Solubility and dissolution rate of a polymorph are related directly to the crystal structure and to the strength of intermolecular interactions and it is very much important for applications because solubility strongly influences pharmaceutical activity. The project included growing polymorphs of bioactive pharmaceutical compounds such as acetaminophen and L-glycine. For all polymorphic modifications, X-ray diffraction analysis was conducted. We also used existing theoretical/computational approaches for the prediction of crystal structures, including structures of polymorphs. High-resolution X-ray diffraction analysis of polymorphic pharmaceuticals will allow us to quantify the particular intermolecular forces that determine given crystal structure of polymorphs, which will also allow to justify experimentally existing force field models for crystal structure prediction. The outcome of the project will be deeper understanding of principals of crystal formation and design of pharmaceutical polymorphs with lower crystalline stability and higher solubility.

### ***Are educational levels reflected in CDR performance or is there no significant relation?***

**V. Trujillo**, Behavioral Sciences Department, New Mexico Highlands University

**Faculty Mentor: Maura Pilotti**

The purpose of the present investigation is to assess whether there is a correlation between healthy older adults' educational attainment and their scores on the Memory and Judgment/Problem Solving dimensions of the Clinical Dementia Rating (CDR) scale. Fourteen healthy older adults (age range: 66-86) with different levels of education attainment (range: 8 years-22 years) were given a structured interview. The interview consisted of several questions regarding the participants' orientation, memory, home and hobbies, community affairs, and judgment and problem solving skills (CDR scale). Higher CDR scores indicate severe impairments. A significant negative correlation was found between years of education and CDR memory and judgment/ problem solving scores. These results suggest that the application of the CDR scale may be problematic if the subjects are healthy older adults with minimal education attainment.

### ***The effects of the anti-cancer drug salicinium on the fertility of C3HeB/FeJ mice***

**B. Valencia (Biology Department), C. Linder (Biology Department), and M. Helvenston (Chemistry Department)**, New Mexico Highlands University

The oocyte depends on the metabolism of pyruvate, which is the output of the anaerobic metabolism of glucose known as glycolysis, which is necessary for a successful oocyte maturation and the resumption of meiosis. Cancer cells multiply rapidly and such multiplication requires a lot of energy. Glycolysis is the preface to energy production. Cancer cells increase glycolysis for ATP generation due to mitochondrial respiration injury and hypoxia. Inhibition of glycolysis depletes ATP in cancer cells. This new anti-cancer drug, salicinium, is thought to inhibit glycolysis through its ability to bind and suppress an enzyme that catalyzes the initial metabolic step in conversion of glucose to glucose-6-phosphate during glycolysis causing a depletion of ATP which then causes a block in cell cycle progression. The thought that salicinium inhibits glycolysis and glycolysis and pyruvate are very important in the implantation of embryos, leads us to believe that the salicinium may have an effect on fertility. All of this information ties in the reason why Highlands University students want to do a study the effects of infertility using the anticancer drug salicinium that they are already using to study cancer in Dr. Linder's Mouse Lab.

There are two mice per cage (1 male and 1 Female). There are ten cages. Five cages contain the female mice that are going to receive IP injections of 0.5 ml salicinium (0.17ml salicinium diluted with 2.83ml saline) solution twice a day and the other five cages contain the females mice that are going to be used as controls and receive IP injections of 0.5 DMSO solution (2.83ml saline and 0.17ml DMSO only) twice a day. These injections began a week before the male is added to the cage. The pups of these mice were then placed in a mating trial, when at the appropriate age, and the fertility of these mice were then monitored. The fertility of the F2 generations are then monitored to prove or disprove our hypothesis that the salicinium will effect the fertility of these mice.

There was no significant fertility difference between the mice that received salicinium injections and the control mice that received DMSO injections. The fecundancy and the number of litters did not change from before the injections began. Therefore, our hypothesis was disproved.