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**New Mexico Highlands University's
Faculty Research Committee and
Sigma Xi Chapter proudly present the**

**6th ANNUAL
FACULTY AND STUDENT
RESEARCH DAY**

**April 25, 2008
Kennedy Hall**

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

2008 NMHU RESEARCH DAY PROGRAM

FACULTY ORAL PRESENTATIONS

8:30 Breakfast service; coffee, juice, doughnuts, and fruit.

8:50 Opening remarks.

9:00 **Rico Giron**, BS Psychology

The Art of Deception: How Life Insurance Companies and Life Insurance Agents Rip You Off

The basic premise of this guide is that the life insurance industry uses deceptive language to lie, cheat and steal from the consumer of life insurance. Language is distorted by the life insurance industry to maximize profits and pay out some extraordinarily high commissions to life insurance agents. In addition, the government acts like a patsy for the industry by passing laws written by the life insurance industry to protect and insulate the industry from market driven pricing. For many years the life insurance industry has pretended that life insurance is a holy product that can only be understood by, and sold by "holy practitioners" that are licensed to do so. This manuscript was written from the perspective that it is the only consumer oriented guide as to how to buy life insurance without all of the hoopla and fanfare.

9:30 **Steve Williams**, Professor of History

Medieval Student Power: Students, Teaching, and Educational Change in the Schools of Paris in the Twelfth and Thirteenth Centuries

Given our current assumptions about higher education, namely, that faculty determine both the content and the form of university teaching and that students are simply in school to learn, we might well think that students matter but little in determining the direction of the university, and that they are acted upon rather than actors. Europe's High Middle Ages provide a nice counter-example to such an idea. This FRC-funded research project has focused on how, at the schools of Paris in the twelfth and thirteenth centuries, students profoundly influenced programs of study, the content of courses, and pedagogical practice.

10:00 **Veronica Suanero-Ward**, Associate Professor of Spanish Language

The Dialectic Between Jouissance and Desire: Lacan and Nessuno Torna in Dietro

Alba DeCéspedes (1911-1997) is a well-noted Italian author, intellectual, and journalist, with strong ties to Latin America. Her grandfather from her father's side was the first president of Cuba. Influenced by her father's political and intellectual world DeCéspedes developed a deep political consciousness. In 1938 she publishes *Nessuno torna indietro* (There Is No Turning Back) causing an explosive reaction amidst a Fascist regime. The novel narrates the story of eight young women living in a boardinghouse in Rome as they complete their university studies. The purpose of my essay is to demonstrate how the characters of *Nessuno torna indietro* illustrate the search for that that is intangible and unknown (Desire) and though they succeed to change their lives, and leave behind the Fascist model of the "new woman," they are caught in the endless metonymic chain of signifiers experiencing the Lack of a desire that can never be articulated.

Peter Ngam, Lisa Esquibel, Jennie Guilez, Ryan Elliott, and Ben Nelson
Antibiotic Resistance Levels in Enterococci Bacteria Isolated From Humans, Cattle, and Elk in San Miguel County, New Mexico.

Antibiotics are used worldwide in human medicine and agriculture. The emergence and dissemination of antimicrobial resistance in bacteria has been well documented as a serious public health problem worldwide. Infections from methicillin-resistant *Staphylococcus* and vancomycin-resistant *Enterococci* are of particular concern. Though naturally occurring levels of antibiotic resistance is expected in environmental bacteria isolates, inadequate resistance information exists on isolates from the environment. Establishing the level of antibiotic resistance in isolates from the environment, with varying exposure to human produced antibiotics, will provide a baseline and allow monitoring of changes in resistance over time. The objective of this study is to determine and evaluate the level of antibiotic resistance to twelve commonly utilized gram-positive antibiotics in *Enterococcus spp.* isolated from four cohorts. The cohorts consist of: human clinical isolate results from the Alta Vista Regional Hospital, Las Vegas, New Mexico (for five antibiotics only), domestic cattle (*Bos taurus*) in the Turkey Mountains, wild elk (*Cervus elaphus*) in the Turkey Mountains, and Las Vegas wastewater treatment plant affluent. Fifty *Enterococci* isolates from each cohort are being compared. *Enterococcus spp.* are isolated on bile esculin azide agar utilizing standard methods to produce pure cultures. Antibiotic susceptibility testing is performed using the Kirby-Bauer technique. Preliminary data suggest that there is significant difference in antibiotic resistance between cohorts, but with no consistent pattern, for clindamycin, tetracycline, gentamicin, and ciprofloxacin. The antibiotics with least resistance in all cohorts are vancomycin, penicillin, ampicillin and amoxicillin/clavulanic acid. Ampicillin, amoxicillin/clavulanic acid, and penicillin are among the earlier clinically used antibiotics, yet they had less than 10% resistance in humans and 0% resistance in the bovine cohort. This type of descriptive study is important to understand and measure changes in antimicrobial resistance over time in various populations of *Enterococcus spp.*

parts of Latin America, recent research has demonstrated that the plebeian classes were quick to appropriate and make use of liberal and constitutional ideology and language to demand rights and an active role in government; in the *sur del lago de Maracaibo*, however, the rural population was by 1839 still clinging to an earlier discourse of paternalism, while those seeking to control them made use of the new language of constitutionalism and inalienable rights to attack them.

2:30 **Carol Linder, Assistant Professor of Biology and Merritt Helvenston, Professor of Chemistry**
Chemistry and Cancer: Using Mice to Test New Cancer Drugs

The goal of our research is to test anti-cancer drugs in a well-characterized breast cancer mouse model. Mouse models are ideal for this purpose because their genetics, physiology, and disease progression are very similar to humans. Additionally, tightly controlled experiments can be conducted in cancer prone mice over a reasonable time span from tumor onset through progression to metastasis (6-12 months). Finally, multiple drug candidates can be tested and full analysis of their results determined. We are using a well-characterized genetically-engineered strain, FVB/N-Tg(MMTVNeu)202Mul/J, that overexpresses the Neu oncogene in mammary tissues. Most female mice spontaneously develop mammary tumors between 4 and 6 months of age with metastasis of these tumors occurring in the lung. Our initial experiments are devoted to determining the effectiveness of salicinium on tumor progression with a goal of synthesizing and testing glycosylated derivatives of salicinium. Salicinium is a natural compound originally identified by Brown and Lemaire, and clinically studied by Forsythe, MD & HMD. Unpublished reports on the effectiveness of salicinium in stage 4 cancer patients suggest that it is effective in reducing metastatic disease and extending the lifespan of treated patients. Our initial experiments were aimed at confirming these findings in mice. Salicinium is delivered by intraperitoneal injections into mice once tumors are detected. Four treatment groups were initially established: (A) Cancer mice - salicinium treated (n=8); (B) Cancer mice - vehicle treated (n=7); (C) Control mice - salicinium-treated (n=8); and (D) Control mice - vehicle-treated (n=7). Compared to humans, salicinium treatment does not appear to be as effective in reducing the size or number of tumors in mice. We have altered the dosage amount and the frequency of drug administration in an effort to optimize an effective treatment plan. Histological and biochemical analysis of cancer prone mice and controls is underway.

3:00 **Nicholas Cuccia, M.S. Candidate, Psychology**
Validation of the Chinese Big Five: Forming a Dialogue between Eastern and Western Traditions

In a previous study, we developed a personality measure based on Five Element Theory from Traditional Chinese Medicine. Factor analysis revealed five factors consistent with Five Element Theory: Fire, Water, Wood, Earth, and Metal. The purpose of the present study was to correlate these five personality factors with individual difference measures from Western psychology including the NEO-PR-I, Independence/Interdependence, Sensation Seeking, Need for Cognition, Type A personality, Need for Power, and Authoritarianism. The results indicate that the Chinese Big Five personality factors correlate in a predictable fashion with the selected measures from Western psychology.

temperature curve show features that are typical of the different mineral groups. On the basis of the orientation of the neighboring atomic magnetic moments and their relative magnitude, three types of materials with aligned magnetic structure are distinguished: ferromagnets, ferrimagnets, and antiferromagnets. There are no known "true" ferromagnetic natural minerals of terrestrial origin. The phenomenon of ferromagnetism (*sensu lato*) appears only below a certain temperature which is known as the Curie point (Curie temperature in the case of ferromagnets and ferrimagnets, and the Neel temperature in antiferromagnets). This temperature depends on the substance. For example, paramagnetic minerals, such as hornblende, biotite, and micas, typically yield hyperbola-shaped curves. Ferromagnetic minerals (*sensu lato*), magnetite, and antiferromagnets, hematite, yield more complex susceptibility versus temperature curves that are characterized by a sharp decrease in susceptibility at a critical temperature (Curie/Neel temperature), beyond which the material behaves as a purely paramagnetic phase. The Curie temperatures of different minerals can be very diagnostic and therefore be used as an identification tool for the various magnetic phase(s) within a sample. For example, in the titanomagnetite solid solution series, the bulk magnetic susceptibility of the titanomagnetite strongly depends on the Ti-composition of the Fe-Ti oxide phase. Curie point analysis allows for an estimate of titanomagnetite composition since the Curie temperature of pure titanomagnetite (magnetite) decreases almost linearly from 590°C to -200°C for ulvöspinel. Thus the Curie point serves as an indicator of the Ti^{4+} in the $Fe_{3-x}Ti_xO_4$ solid solution. Overall the susceptibility versus temperature results for the dorsal ridge intrusions yield somewhat consistent results characterized by complex behavior during the heating curve and a substantial increase in susceptibility and similar behavior on the cooling curve; although some variations were observed. Of the 15 samples analyzed, six show a behavior where the susceptibility increases substantially on the cooling curve following the heating experiment. Some of the samples show a simple temperature dependence of susceptibility reflecting typical thermomagnetic behavior of intermediate titanomagnetite solid solutions, while others exhibit a more complex behavior with the presence of two or more Curie temperatures. Compositional variations and resulting differences in magnetic susceptibility might be caused by a variety of primary and secondary processes during ascent and emplacement of the melt, such as fractionation, high temperature deuteric oxidation, and hydrothermal alteration. Additional rock magnetic experiments and petrological studies are underway to fully characterize the magnetic phases of the dorsal ridge intrusions.

Rhonda Trujillo, Calvin Parson, and Jennifer Lindline

The Petrology of Mafic Dikes in the Turkey Mountains, Mora County, New Mexico

The Turkey Mountains, a laccolith that was likely produced by a Tertiary intrusion, contains numerous north- to northeasterly-trending steeply dipping to vertical mafic dikes. The dikes intrude Mesozoic strata and range in size from 0.30 to 1.0 meter in thickness and up to 1200 meters length. We examined field relations and hand specimen features to assess the dikes' genesis and relation to magmatism in northeastern New Mexico. We have two working hypotheses for the origin of the dikes: 1) the dikes relate to the granite intrusion that formed the laccolith structure; and 2) the dikes relate to extrusions of the Ocate Volcanic field. All dike rocks are gray to dark black in color and display aphanitic to porphyritic textures. One dike contains augite phenocrysts, one contains quartz phenocrysts, and one contains quartz plus olivine phenocrysts. A sample of the Baldy Mountain cinder cone, representing Ocate volcanism, contains quartz plus olivine phenocrysts. All phenocrysts are subhedral to anhedral and relatively small, averaging 0.2 mm in diameter. Most dikes contain vesicles and some contain amygdaloidal fillings. The Turkey Mountain dikes, together with dikes from the Las Vegas and adjacent quadrangles, show a mean orientation of N20°E (n = 26). This trend parallels that of the Jemez Lineament, a weakness in the earth's crust that is thought to give surface expression to the 1.65 billion year old suture between the Southern Yavapai and Mazatzal Provinces of the southern Laurentian supercontinent. The concordance of the Turkey Mountain dikes with the Jemez Lineament suggests that Turkey Mountain magmatism may be related to this regional magmatic event. We are currently studying the dikes petrographically and geochemically to characterize

Brenda F. Fonju, Brian J. Miller, Edward A. Martinez, David W. Hacker, Amanda Chavez, and Sara Aragon

Camera Trap Monitoring of Coyote (Canis latrans) and Other Mammals in the Wind River Ranch, Watrous, NM

To managers and conservationists, very efficient and reliable methods are required to monitor relative abundance and richness of animal species worldwide because this provides a catalogue to make the right decisions in conservation practices. A primary purpose of conservation biology is cataloguing and describing species and relationships among species and habitats in a given area. Large mammals in particular are good candidates for monitoring since they are very sensitive to human disturbances. Recently, camera trap technology has offered a preferred method for cataloguing species diversity and abundance. The present study conducted at Wind River ranch woodland and prairie areas is the first in New Mexico to test coyote (*Canis latrans*), raccoon (*Procyon lotor*) and desert cottontail (*Sylvilagus audubonii*) species richness and abundance using camera trapping. Digital cameras were deployed in three habitat types; grasslands, pinon juniper, and riparian to determine significant differences for species distribution among habitat types and significant differences in preference of bait types in different habitats. In the grasslands 16 coyotes, 1 raccoon and 39 cottontails were caught. In the Pinyon-Juniper (*pinon edulis/ juniperus spp*) woodlands, no coyotes were caught but 2 raccoons and 21 cottontails. In the riparian, none of these animals were photographed. Preliminary results indicate that Coyotes prefer fish oil to congregation (an assembly or mixture containing flesh, skin, fur, urine of carcass) and the control makes no significant differences. Cottontails have a preference for congregation over the fish oil bait. Raccoons are attracted by either bait type. These animals were more abundant in the grasslands than in any other habitat. Overall, there is diversity but abundance/richness of species is minimal in the WRR and some significant differences exist in the use of different bait types in winter seasons.

Bruceline Fru, Brittany White, Edward A. Martinez

Determination of Heavy Metal Concentrations in Urban Runoff from the City of Las Vegas, NM

This study focused on the urbanized watershed of Las Vegas which covers approximately 52,500 acres to the West of Las Vegas and developed primarily with residential and light commercial areas. Significant amounts of non point source pollution (NPS) (urban runoff) enter the Gallinas River without pre-treatment. The primary objective of this study was to identify the various heavy metals and their concentrations associated with aqueous and suspended solid phases during wet weather flow before discharged into the Gallinas River. This was done by collecting runoff samples by hand from three different sampling points that discharge directly into the Gallinas River during four different rainfall events that occurred on 15th July, 29th July, 29th August and 9th September 2007. After collection, samples were analyzed for heavy metals using ICP-MS. The results indicated that suspended solids had different volumes in the three different sites with some volumes higher than the standards set by the USEPA (limits of 45 mg/L for fresh water aquatic life) for example we could measure volumes up to 500mg/L, 84mg/L, 130mg/L and 216 during rain events. Heavy metals identified show different concentrations between the three sampling sites with concentrations higher than the numerical water quality criteria set by USEPA for example Pb had concentration up to 18µg/L and 38µg/L in some cases which were higher than the standards set for humans in drinking water (15µg/L). Again Zn showed concentrations of 560µg/L and 285µg/L which were higher than the standards set for acute and chronic criteria for fresh water aquatic life (120µg/L).

will be started when the mice have palpable tumors. All mice will be examined. They will be weighed, palpated for tumors, and tumors will be measured once a week.

A.S. Romanov, D.V. Muratov, Z.A. Starikova, M. Yu. Antipin, W. Siebert, A.R. Kudinov

Synthesis and Structural Characterization of Oligodecker Complexes with Bridging 1,3-diboroly Ligand

Che Shu-Nyamboli, **Joel Lowry**, and Edward A Martinez

Determination of Selected Heavy Metal Concentrations and Distribution in the Gallinas River Using Macrophytes

Recent studies (Tabe-Ebob et al. 2004; Duran et al. 2005) have reported elevated concentrations of arsenic (0.039mg/L) and other heavy metals during high flow events in the Gallinas River (GR). This is of particular concern as the GR meets 95% of the domestic water needs of the city of Las Vegas, New Mexico (population of 18,000 people). Previous research to assess water quality in the Gallinas River has been limited to conventional analytical methods (soil, sediment, and water sample analyses). The use of macrophytes to assess heavy metal contamination in this river has not been reported. We hypothesize that concentrations of heavy metals (As, Pb, Cd, Cu and Zn) within macrophyte tissues, will correlate positively with concentrations of same metals in sediments of the Gallinas River. We measured the concentration and distribution of heavy metals (Pb, Cd, Cu, Zn, As) within the Gallinas River using macrophytes. Macrophytes and sediment samples were collected from four sites (upper Gallinas; Montezuma; lower Gallinas, above and below the waste water treatment plant) in the spring and fall. At least two macrophyte species were hand-picked at random from each sampling site, rinsed with stream water, tap water and finally with deionized water. The plants were divided into roots and shoots and oven dried at 80°C for 96 hours. 0.5g of raw plant samples were digested using a mixture of HCl (3.5 mL), HNO₃ (5 mL), H₂O₂ (3 mL), HF (0.1 mL). Prior to the analysis digest was diluted 1:10 with deionized water. Heavy metal analysis was performed using a Finnegan Mat Element 2 High Resolution ICP/MS (HR-ICP-MS). Instrument performance during the analysis was monitored using Rh/Ir internal standard. Stream flow and water quality (temperature, dissolved oxygen, pH, and conductivity) measurements were taken at each site using a wading rod and water quality meters. Preliminary results show that on average, plant tissues contain higher concentrations of heavy metals than sediments. Plant roots contain higher concentrations than shoots. Furthermore, metal concentrations vary according to site and sample period.

Paul Tongwa and Tatiana Timofeeva

Novel Three-Component Synthesis and Antiproliferative Properties of Diversely Functionalized Pyrrolines

A novel multicomponent synthesis involving reaction of various N-aryl- and N-alkylsulfonamido acetophenones with aldehydes and malononitrile have been used to obtain a variety of substituted 2-pyrrolines which are useful pharmaceutical agents. Reaction products from multicomponent synthesis have been separated by crystallization from different solvents. It was found that synthesis gives a mixture of *cis*- and *trans*-products. The *trans*-isomer has a centro-symmetric space group of P2₁/n, Z=4, while the *cis*-isomer has an acentric space group P2₁, Z=8 with four molecules in asymmetric unit. Molecules of the *trans*-product have an R, S-configuration of two chiral centers in pyrroline ring. In *cis*-product, all four molecules differ by orientation of substituents and two molecules out of four have R,R- and another two S,S-configuration of the chiral centers. Superposition of molecules of *cis*-product revealed that conformational differences are not very significant and that inverted R,R-form has molecular conformation close to S,S-form. However, search for additional symmetry elements connecting all four molecules in crystal gave negative results. It gives us reason to suggest that in spite of acentric space group of *cis*-product, it is effectively a racemic mixture of two forms. Results of testing of cytotoxicity against cancer cells of these and similar materials will be discussed in connection with their molecular structure.

Carlos Herrera, Carlos Gonzales, Rico Blea, Kari Anglin, Joel Lowry, Brittany White, Joe Zebrowski, and Edward Martinez

Spring 2008 (Forestry 417/517) Project: Mora River Watershed Inventory and Assessment Plan

Water is possibly our most precious natural resource. Its abundance and quality are threatened daily through global climate change and other anthropogenic activities. Over the past twenty years watershed management has become an increasingly important method of managing our water resources. The purpose of this project was to develop a watershed management plan for the Mora River Watershed. To accomplish this, students conducted an in-depth literature search to inventory the Mora River Watershed. Upon review of the research students developed maps describing watershed characteristics and assessed and identified sources contributing to low water quality within the watershed. On site observations also identified specific regions throughout the watershed that are areas of concern due to degraded conditions. Results indicate that the Mora River is a typical Southwestern watershed, with its headwaters located in the Sangre de Cristo mountain range, and its mouth on the upper Canadian River. Urban areas, rural towns, scattered development, logging, agriculture, ranching, and areas of recreational use are found throughout the Mora River watershed. These land uses were also found to be the causes of water quality impairment within the watershed.

Geetha Kicchaiahgari and Tatiana Timofeeva

Synthesis, Structural and Spectral Characterization of Cytotoxic Dyes

J.W. Lowry, M.S. Petronis, B. O'Driscoll, J. W. Geissman

Paleomagnetic Baked Contact Test of Permo-Carboniferous Dike Intruding the Ross of Mull Granite, Isle of Mull, NW Scotland

The ca. 400 Ma Ross of Mull Granite forms the western-part of the Ross of Mull peninsula, NW Scotland, and consists of three roughly concentric zones that vary outward in composition from diorite, granodiorite, to granite. At least two (pre-Tertiary) episodes of dyke emplacement occurred after granite emplacement. These dykes are of intermediate to mafic composition and considered to be dominantly of late-Silurian to Permo-Carboniferous age. Palaeomagnetic and rock magnetic analyses are being carried out on samples collected from seventeen mafic dikes, as well as on a detailed sample set from the Ross of Mull granite, so that post-emplacement deformation of the intrusion and the antiquity of the magnetization of the granite can be evaluated. Additionally, a detailed palaeomagnetic baked contact test of a dyke hosted by granitic country rock is currently underway to determine if the characteristic remanent magnetization (ChRM) of the granite is a thermoremanent magnetization acquired at the time of cooling, or if the granite has been remagnetized since the emplacement of the dykes. The contact test consists of analyses of ten palaeomagnetic samples from a Permo-Carboniferous lamprophyric dyke to define its ChRM. The results of these analyses will be compared with data from 22 samples collected from the granite at progressively farther distances from the contact with the dyke. Additional rock magnetic experiments (e.g. hysteresis, temperature dependence of susceptibility, IRM acquisition) and petrographic observations will allow us to better characterize the mineralogy and magnetic properties of all rock types under study.

Estevan Martinez and Edward A. Martinez

New Mexico Highlands University/Luna Community College Science and Agricultural Summer Experience (NMHU/LCC-SASE) Project 2007

The NMHU/LCC-SASE Project is a three year project that was funded at \$334,000 by the USDA-HSI program. This project provides underrepresented students from northern New Mexico high schools and Luna Community College (LCC) with an experiential learning opportunity in water science, soil science and the integration of these sciences into geographical information systems (GIS). The USDA HSI program fits well with NMHU's efforts to meet educational needs in northeastern New Mexico. With Hispanics comprising a majority of the student population, issues

specific to Hispanic education provide the cornerstone for institutional goals. The goals of the project are: to provide students with an opportunity, early in their academic career, to conduct hands-on research in the natural sciences using state of the art scientific instrumentation and to encourage students through experiential learning to pursue a degree and an eventual career in an agriculturally related field. These goals directly address USDA goals of enhancing and diversifying the Nation's scientific and professional workforce. Outreach efforts include recruitment of students from northern New Mexico to participate in the summer institute and encourage students to major in science at NMHU.

Marvin Mascarenas and Rudy Martinez

The Synthesis and Uses of ¹³C Labeled Phenylvinyl Sulfide, Sulfoxide and Sulfone

Joseph M. Mulroy, Alexander S. Romanov, Merritt Helvenston, Tatiana V. Timofeeva, Mikhail Yu. Antipin
Structure of Halogen-Substituted Ferrocenes

The structure of ferrocene and its derivatives has been of considerable interest since these compounds were first characterized. The solid state structures were determined using X-ray crystallography.¹ In this work we report the first structural study of low-melting monohalogen-substituted ferrocenes, and the influence of this substitution on Fe-Cp(centroid) distances for the substituted ring. The variation in Fe-Cp bond length in the solid state with substitution was observed in all previous works and can be rationalized by considering the electronegativities of the Cp constituents. For instance, in Cp⁺FeCp, the Fe-Cp⁺ bond length is shortened because methyl groups are less electron withdrawing than protons. Conversely, CpCl₅ should show lengthening the Fe-Cp_{sub} bond because the chlorine atoms remove electron density from the bonding orbitals in the cyclopentadienyl ring. Therefore, single substitution by halogen also should be considered as a factor for increasing Fe-Cp bond distances in halogen-substituted ferrocenes. Surprisingly our results do not support the trend of increasing Fe-Cp bond length upon electronegative substitution of the Cp-ring. Rather, the substitution of a single halogen atom appears to decrease the Fe-Cp bond length by 0.01 Å and 0.02 Å for bromo- and iodoferrocene respectively. The Fe-Cp bond length, 1.658 Å and 1.652 Å for bromo- and iodoferrocene, was found to be almost equal to value of 1.654 Å for ferrocene in the solid state. The difference in expected and observed results is most likely due to interactions in the crystal than the effects of the halogen substitution. Synthesis of bromo- and iodoferrocenes was performed according to the well-known procedure.²

¹Seiler P., Dunitz, J. D.; Acta Crystallogr., Sect. B 1979, **35**, p 1068. ²R.W. Fish, M. Rosenblum.; J. Org. Chem. 1965, **30** (4), p 1253.

L.E. Nfonsam, L.F. Bentson, L.N. Agbor, V.A. Agbor, S.A. Bornstein, M.A. Handel, and C.C. Linder

Differential Golga3 Expression and Defective Spermatogenesis in C3Fe;B6-repro27

C3Fe; B6-repro27 is a genetic mouse model of male infertility generated by the Jackson Laboratory ReproGenomics Program. The repro27 mutation is recessively inherited and mice show gender-specific infertility. Testes/body weight ratios are the same in mutant and control mice at 2 wks. However, by 3 wks mutant mice have significantly lower ratios with increase germ cell loss at later stages of meiosis. TUNEL analysis implicates apoptosis. Spermatocytes that survive undergo abnormal spermiogenesis; sperm cells have deformed heads and tails, some without tails. Epididymal sperm cells show very low concentration and motility, and *in vitro* fertilization is unsuccessful. We identified a point mutation in the Golgi autoantigen, golgin subfamily A member 3 (*Golga3*) gene that is absent in controls. The ~50 kb *Golga3* gene is located on Chr 5 and contains 25 exons. The mRNA transcript is 4,815 bp encoding a 1,447 amino acid polypeptide. The point mutation in exon 19 converts a cytosine to a thymine; when translated this changes a glutamine (CAA) to a stop codon (UAA) thereby truncating the last 6 exons (~38 Kd).

Western blot analysis using N-terminal and C-terminal GOLGA3 antibodies (courtesy of Dr. Matsukuma, Kanagawa Cancer Center Research Institute, Nakao, JP) and transmission electron microscopy (TEM) were performed. Different body tissues of mutant mice express minimal amounts of full-length GOLGA3 protein compared to controls with no evidence of truncated protein expressed at the expected band size (~129,000 Kd) except for the heart. Electron micrographs show sperm cells with fused heads (acrosome) and tails. Sperm cells demonstrate extreme vacuolization around the head region. Our working hypotheses are that the truncated GOLGA3 protein is unstable and degraded. More GOLGA3 protein will be expressed in the testis compared to other body tissues. Spermatid heads and tails are defective in C3Fe; B6-repro 27 mutant mice. The interaction between adhesion proteins and the acrosome probably play a role in keeping sperm cells firmly attached to their supporting Sertoli cells. Formation of full length GOLGA3 protein may be due to alternate splicing at exon 19 or translational read through passed the stop codon in mutant mice.

Sheri Nsamenang, Ian Williamson & Bame Nsamenang

Forgiveness Across Cultures: Interdependence In Families and Its Effect on the Ability To Forgive

This research examines differences in the process of forgiveness between the two cultures of Cameroon and the United States. We expect differences because of the greater interdependence among Cameroonians compared to Americans. The strong social network in Cameroon should aid in mediating an interpersonal conflict (Sandage & Williamson, 2005). Furthermore, in Cameroon, we would expect to find that the process of forgiveness will not be primarily determined by the individual, whereas in America, forgiveness would be construed as a personal choice (Sandage & Williamson, 2005). Data for this study has been collected from Bamenda in Cameroon and the Las Vegas community in New Mexico. We measured the victims' interdependence with their own families, the offender, and the offenders' families. We also measured forgiveness and related concepts such as empathy and forgiveness anxiety. We hypothesized that the family environment would influence an individual's ability to forgive. We also speculate that the victims' social relationship to the offenders and their families will also have an impact on the process of forgiveness.

Geniel Parson, M. Leonela Mora, Amelia Martinez, Jennifer Woods, Ryan Elliott, Ben Nelson, Carol Linder, and Merritt Helvenston

The Synthesis and Study of a Salicinium Analog as a Possible Treatment for Breast Cancer

I will be synthesizing, analyzing, and studying the effects of salicinium analogs on breast cancer using FVB/NJ-Tg(MMTVNeu)202Mul/J mice. FVB/NJ mice will be used as controls. This study has relevance and importance in both the scientific and medical communities. Finding a cure for cancer is the goal for many research scientists and will have a significant impact on the world. In my research I will be synthesizing, analyzing, and studying the effects of salicinium analogs. Salicinium is a known drug with anticancer effects. The question we are asking is, "Do salicinium analogs have the same anticancer effects as the salicinium parent?" Since it has been shown that salicinium works in human patients, we have high hope that the analogs will be as effective or more effective in the treatment of cancer. As previously stated finding new treatments, as well as possible cures, for cancer is immensely important in today's medical community. Cancer affects and takes many lives. The study of new potential treatment options, as well as potential cures, is of the utmost importance. At the end of my research, I hope to obtain results that support the anticancer effects of the salicinium analogs. Moreover, I hope to obtain results that show that the analogs have a higher anticancer effect than that of salicinium. The synthesis and analysis of the salicinium analogs will take place in Dr. Merritt Helvenston's lab under his supervision. These analogs will be synthesized using organic synthesis methods. The analogs will be analyzed using Nuclear Magnetic Resonance (NMR) for purity and product confirmation. The salicinium analogs will be dissolved in dimethylsulfoxide (DMSO) and diluted with a saline solution. Select FVB/NJ-Tg(MMTVNeu)202Mul/J mice will be given IP injections of the salicinium analogs twice a day, while FVB/NJ mice will be given DMSO and dilute saline solution only twice daily. Injections

Jose H. Gallegos, Andrey A. Yakovenko, Mikhail Yu. Antipin, Tatiana V. Timofeeva.

Crystal Structure of Complexes 1,2-Bis(chloromercurio) Tetrafluorobenzene with Nitrocompounds

Over the two last decades, there has been a rapid progress in supramolecular chemistry of multidentate Lewis acids. It was found that the bidentate Lewis acid, 1,2-bis(chloromercurio) tetrafluorobenzene p -(C₆F₄)(HgCl)₂ (**1**) forms complexes with monodentate Lewis bases such as dimethylsulfoxide (DMSO), dimethylformamide (DMF), acetone, dimethyl methylphosphonate (DMMP), benzaldehyde, acetonitrile, THF and propylene oxide. However, for now we did not find in the literature complexes of **1** with bidentate Lewis bases. It is known that such bases are very important in organic synthesis and catalysis. In our project complexes of **1** with a series of aromatic nitrocompounds Lewis bases have been prepared and structurally characterized. For example, in the case of nitrobenzene, the resulting complex $\{[p\text{-(C}_6\text{F}_4\text{)(HgCl)}_2\text{](PhNO}_2\text{)}_n\}$ (**2**) contains one molecule of a Lewis base per one molecule of **1**. Complex **2** have chiral supramolecular structure (space group $P 2_1$), where each oxygen atom of nitro group is coordinated with one mercury atom of **2**. Also it is interesting to mention that in this case acentric crystal is built of non-chiral molecules.

Louis Garcia, Michael S. Petronis, Jennifer Lindline, and John W. Geissman
AMS Data Bearing on the Deformational History of the Proterozoic Basement in the Las Vegas Area, Southern Sangre de Cristo Mountains, New Mexico

Models for the deformational history of deep- to middle-crustal rocks rely heavily on the documentation and interpretation of rock structures which are not always detectable in the field. Anisotropy of magnetic susceptibility (AMS) analysis allows for the evaluation of non-visible petrofabrics as it can detect structural anisotropies of less than 1% in rock samples. We conducted anisotropy of magnetic susceptibility (AMS) analysis on Proterozoic basement rocks west of Las Vegas, NM, in an attempt to better document and interpret deformation features. We studied medium-grade gneisses outcropping along County Road 65 in the Gallinas Canyon, which dissects a portion of the Hermit's Peak batholithic complex. Rock types include quartzofeldspathic gneisses, biotite schists, and laminated amphibolites. The gneisses show intense penetrative deformation defined by a strong steeply dipping northeast trending axial planar foliation. Minor macroscopic linear structures, including isoclinal fold hinges and prismatic mineral alignments, plunge moderately to the southwest. Oriented AMS samples, typically eight to twelve samples per site, were collected from twelve sites distributed throughout the canyon. All samples were analyzed on an AGICO static KLY-4S Magnetic Susceptibility/Anisotropy System at the University of New Mexico Rock Magnetism Laboratory in order to characterize the magnetic mineralogy and magnetic fabric of the rocks. Preliminary rock magnetic data indicate that the dominant magnetic phase in most specimens is a ferri/ferromagnetic oxide (magnetite, maghemite) as demonstrated by an average bulk susceptibility of 8.5×10^{-3} SI. Additional rock magnetic experiments are being conducted to identify other magnetic phases. The AMS fabric data are consistent with the macroscopic structural features, particularly the lineations, which were visible at only a fraction of the study sites. We propose that our petrofabric and rock magnetic data reflect the dominance of northwest-southeast contractional deformation and southwest-northeast extension in the assembly history of the continental lithosphere during the Proterozoic. Our study shows that AMS petrofabric analysis is a simple yet powerful tool for obtaining high quality orientation data from crystalline rocks for which visible rock structures may be lacking or tenuous.

Marcy Torres, Louis Garcia, Mike Salazar, Brenda Folefac, Che Shu-Nyamboli, Joe Zebrowski, and Edward Martinez
Fall 2007 Limnology (Forestry 408/508) Project: Characterizing Morphy Lake

Lake characterization is an important first step in limnological studies. The purpose of this project was to introduce students in the Fall 2007 FOR 408/508 Limnology course at NMHU to lake characterization. Through experiential learning students were exposed to the various field sampling and data collection techniques using limnological equipment and processed samples collected in the laboratory. To accomplish this Morphy Lake State Park was selected as the study site. At Morphy Lake, morphological parameters as well as physicochemical parameters were measured using water quality meters. The Kemmer water sampler, zooplankton net, and Eckman dredge were used to collect water, zooplankton, and benthic samples respectively. To determine clarity of the lake a secchi disk and irradiance meter were used and turbidity was measured. In the laboratory water samples were processed where alkalinity and hardness were determined. Zooplankton and benthic invertebrates were identified and enumerated. Results of the study indicate that Morphy Lake is about 8 meters at its deepest point and has water clarity of up to 2.5 meters. The lake appears to stratify in the winter and summer with lake turn-over in the spring and fall. Physicochemical parameters are indicative of water quality that supports cold water fisheries. Invertebrate densities are high and provide plenty of food for the various fish species found in the lake. The overall data gathered and analyzed from Morphy Lake indicate that the trophic status of the lake is mesoeutrophic, indicating medium productivity.

Jennifer Lindline and Roberto Trevizo
Preliminary Petrologic Analysis of Proterozoic Hermit's Peak Batholith Orthogneisses, North-Central New Mexico

We report preliminary petrologic results on mafic and felsic orthogneisses of the Hermit's Peak batholith, a Proterozoic plutonic-metamorphic complex in the southern Sangre de Cristo Mountains northwest of Las Vegas, New Mexico. We studied rocks that outcrop along County Road 65 in the Gallinas Canyon, which dissects a portion of the batholith. Major rock types include quartzofeldspathic gneisses and laminated amphibolites. The felsic gneisses contain microcline + albite + quartz \pm biotite in a medium- to coarse-grained anhedral granular texture. Muscovite is rare and often secondary in origin. The felsic gneisses commonly display quartz ribbons and microcline porphyroclasts and are interpreted as metagranites. They have Rb-(Y+Nb) and Nb-Y variations indicative of volcanic-arc-granites. The mafic gneisses contain hornblende + plagioclase + quartz + titanite \pm epidote and display a fine- to medium-grained subhedral granular to idiomorphic texture. They show igneous differentiation trends on Niggli variation diagrams and are interpreted as metabasalts. They plot as island arc tholeiites and ocean island arc basalts on tectonic discriminant diagrams. The granite gneisses and amphibolite gneisses are interpreted as part of an arc system that was accreted to North America during the assembly history of the continental lithosphere. The bimodal nature of igneous activity suggests a magmatic rift may have been operative during their formation. We continue to analyze our data to see if differentiation of the proposed rift setting (juvenile or continental) is possible and test whether our data are consistent with an arc accretion model or if an expanded model including crustal extension is required.

M.S. Petronis, A. Delcamp, S.S. Harlan, and R. Trevizo
Magnetic Susceptibility Versus Temperature Data from the Dorsal Ridge Mafic Intrusions, Tenerife, Canary Islands, Spain

The investigation of temperature variation of bulk susceptibility is a powerful technique of identification of magnetic mineral phases in a rock sample. The susceptibility versus

STUDENT POSTER PRESENTATIONS

Vamshi Krishna Abbanaboina and Mary Shaw

Gene Sequencing and Annotation of a Piece of a Phytoplasma DNA

Phytoplasmas are wall-less prokaryotic pathogens which affect several hundreds of plant species. Phytoplasmas are restricted to the phloem of the plants and are transmitted by insects, mainly leaf hoppers. Phytoplasmas are fastidious, pleomorphic and are of great economic concern. Researchers have sequenced the complete genome of onion yellow phytoplasma. In this study, I hypothesize that the nucleotide sequence of the phytoplasma DNA fragment that I have is similar to the sequence of onion yellow phytoplasma chromosome. Recombinant plasmid DNA, containing the cloned phytoplasma DNA, was isolated and the cloned phytoplasma DNA was purified. Sequencing reactions were carried out using the Big dye terminator reaction mix and forward and reverse primers. An ABI 3100 automated DNA sequencer was used for sequencing. Sequences obtained were aligned and assembled using Vector NTI software. A database search for the sequences with significant homologies to our sequence was performed using NCBI BLAST, Ensembl. Results supported the similarity of the sequences with many purported genes of onion yellow phytoplasmas. Significant similarities were found to the genes of onion yellow phytoplasmas with the current data. These results provide information about a new phytoplasma strain and its similarity to the existing database of onion yellows and other phytoplasmas.

Sara Aragon, Amanda Chavez, Brenda Fonju, Dr. Brian Miller, and Dr. Edward Martinez

*Monitoring the Population Density of the Black-Tail Jackrabbit *Lepus californicus* and the Bobcat *Lynx rufus* in the Grassland, Pinion-Juniper, and Riparian Locations of the Wind River Ranch Using the Cuddeback Camera Trapping Method*

Population density determination is very important for various mammals to adequately be supported by the area's natural resources. Measuring the population density of the black-tail jackrabbit and the bobcat is very important for conservation and land management of the Wind River Ranch in Watrous, New Mexico. The purpose of the study was to analyze population density of bobcats, *Lynx rufus* and black-tail jackrabbits, *Lepus californicus* within three distinct habitats at the Wind River Ranch in Watrous, New Mexico. To measure the population density of these species, the Cuddeback Camera Trapping Method was used to accurately count the frequency of their presence within three different habitats. Habitats included grasslands, pinion-juniper, and riparian areas of the Wind River Ranch. This was done over a six week period during the winter season of 2008. Eighteen cameras were placed at the three different habitats in fourteen day intervals. At each site non-baited (controls) and two baits were used to attract animals. Baits included fish oil and congregation (mixture of feces, hair, and urine from mammals). Pictures were downloaded and jackrabbit and bobcat density frequency were determined. Results indicated that within the pinion-juniper, riparian, and grassland habitats bobcat population density and frequency ranged from one to five and black-tail jackrabbit population ranged from zero to fourteen. Data collected indicate bobcats prefer the grassland habitat and were attracted more to the congregation bait. Data collected also showed black-tail jackrabbits appearing more in the grassland habitat with no preference for bait. The methodology used will be an ongoing research study extended into the summer season at the Wind River Ranch to obtain more data to analyze and be able to calculate numerous variations in wildlife population densities.

Elizabeth M. Archuleta and Rudy Martinez

Synthesis of ¹³C and ¹⁵N Labeled Compounds

their source magmas, assess correlations among samples, and test petrogenetic models.

Jennifer B. Woods, Daniel Griffith, M. Leonela Mora, Anita Lopez, Lisa F. Bentson, Carol C. Linder, Richard Lizong, and Michael Griswold

Finding Genes for Male Infertility – Lessons from C3Fe;B6-repro29 Mice

Analysis of mouse models with defects in spermatogenesis aids in the identification of genes and processes required for normal human fertility. The ReproGenomics Program at The Jackson Laboratory (NIH P01HD42137) has generated a series of infertility mutants by chemical mutagenesis. We chose to characterize spermatogenesis defects in C3Fe;B6-repro29 mutant mice and search for the genetic defect that causes these male specific abnormalities. Genetic mapping of meiotic recombinants locates the repro29 mutation to Chr 5 within a ~5.1 Mb region (120,067,589 – 125,118,214 bp). This region contains approximately 113 known genes, 6 of these genes are known to code for proteins with reproductive functions (*Adam1a* and *1b*, *Atxn2*, *Ppp1cc*, *Ptfn11*, *Clip1*). Likely candidate genes are being evaluated for differential gene and protein expression and the candidate genes sequenced as appropriate. Mutant mice exhibit normal testes and seminal vesicle weights compared to heterozygous and wildtype controls at 3, 5, 9, 10, and 12 wks. Quantification of germ cell types in the seminiferous epithelium suggest differences during the first two waves of spermatogenesis but the number of elongating spermatids in 12 wk old mice does not differ. Germ cell associations in the spermatogenesis cycle are disrupted suggesting defects in the timing of germ cell development. Epididymal sperm concentration is lower in mutants compared to controls. The heads and tails of sperm are abnormal compared to controls. Most sperm are not motile and those that are lack directionality. Further characterization and positional cloning to identify the gene responsible for the C3Fe;B6-repro29 phenotype will increase our understanding of normal spermatogenesis.

Andrey A. Yakovenko, Mikhail Yu. Antipin, Tatiana V. Timofeeva

Crystallization and Crystal Structure of Low Melting Isomers of Nitrotoluene

The molecular and crystal structures of low melting isomers of nitrotoluene (*orto*- and *meta*-derivatives) have been determined. The single crystals of *o*- and *m*-isomers, have been grown using the miniature zone melting *in situ* crystallization technique. It was found that *m*-nitrotoluene undergoes on cooling an order-disorder phase transition from monoclinic to triclinic phase at about 200K. X-Ray diffraction analysis and quantum calculations on MP2/6-31G** level have shown that all nitrotoluenes have similar structural parameters clause to those found in toluene and nitrobenzene. In crystals of isomers studded molecules are linked in sheets by short N-O...H interactions between oxygens of nitrogroups and hydrogens of benzene rings.

Sean J. Murphy, Vladimir N. Nesterov, Lev N. Zakharov

Synthesis and structural features of 2,6-Diamino-4-aryl-3,5-dicyano-4H-thiopyrans and their possibilities to recyclize to 6-Amino-4-aryl-3,5-dicyanopyridine-2-thiones

Synthesis and X-ray structural investigations have been carried out for two compounds: 2,6-diamino-4-(*m*-nitrophenyl)-3,5-dicyano-4H-thiopyran (III) and 2,6-diamino-4-(*p*-nitrophenyl)-3,5-dicyano-4H-thiopyran (IV) as potential bioactive compounds. In both molecules, a heterocyclic ring adopts a boat conformation. In the molecules, the dihedral angle value between axial aryl substituent and the flat part of the heterocyclic ring is equal to 85.7(1) and 89.3(1)°, respectively. Molecules have different rotation of the NO₂ group relative to the Ph-ring: dihedral angle values are 17.3(1) and 8.2(1)°, respectively. In the crystals of both compounds, intermolecular hydrogen bonds link molecules in a three-dimensional framework.

10:30 Coffee Break

11:00 **Curtis Sollohub**, Associate Professor of Computer Science
Palestine: A Brief History of Non-Violent Struggle

Regardless of how one sees the present situation in Israel – Palestine, there is no question that Palestinians see themselves as an oppressed people. Most Americans can name at least a few examples of violent resistance by Palestinians against this oppression. Few, however, can name examples of Palestinian non-violent resistance. Without making any value judgments on the validity of Israeli or Palestinians claims, this presentation will focus on examples of non-violence activism in Palestine with a special emphasis on the place and potential of non-violence in the present struggle.

11:30 **Edwardo Tafoya**, Associate Professor of English
Stand-up's Prehistory: Flung Dung to Mark Twain

Although stand-up comedy is phenomenon of American vaudeville, its roots are long and complex. This presentation examines many of the art form's most important precursors, including simian humor, court jesters, the Victorian music hall, burlesque shows, medicine shows, and Mark Twain's lectures.

12:00 **Student Poster Presentations and Catered Luncheon**

1:30 **Michael L. Meyer**, Associate Professor of Forestry
Discharge Measurements Using Rhodamine WT Dye Tracer at Los Alamos National Laboratory

Streamflow measurements in arroyos of the arid regions of the southwestern U.S. are complicated by the ephemeral nature of runoff events, complex cross-sectional channel geometry, and steep slopes. The short duration of runoff events makes it difficult or impossible to use manual onsite discharge measurements to develop stage-discharge relationships. The purpose of this project was to develop stage-discharge rating curves at selected Los Alamos National Laboratory (LANL) stream monitoring sites using a dye tracer (Rhodamine WT). Automated tracer injection and collection during storm runoff events during the summers of 2005 and 2007 was successfully used to develop stage-discharge rating curves during numerous short events in canyon streams. Utilization of this method will assist in accessing total maximum daily discharge (TMDL) and mass transport of water quality contaminants at the Los Alamos National Laboratory and other surface waters in New Mexico and the southwest.

2:00 **Peter Linder**, Associate Professor of History
'Please Oblige Your Blacks': Resistance, Paternalism, and Class Conflict in cantón Gibraltar in 1839

In March of 1839, the black residents of the town of Gibraltar, south of Lake Maracaibo, forcibly expelled both the parish *alcalde* and the collector of municipal revenues from the community. The expulsion was the culmination of a lengthy confrontation that pitted the Afro-Venezuelan small farmers native to the area against *criollo* merchants and officials from Maracaibo who sought to exercise control over the community and its resources. This and similar disturbances represented the inhabitants of the region's defense of their hard-won autonomy and lands in the face of efforts by regional authorities and the region's agricultural and commercial elite to control them. Questions remain, however, about the precise nature of the conflict, and about the worldview and mentality of those struggling against outside encroachment. In many

WELCOME

Welcome to the 6th Annual New Mexico Highlands University Faculty and Student Research Day! We are pleased to showcase faculty presentations throughout the day and student poster presentations during the lunch period. Most of the faculty research presented represents work funded through institutional Faculty Research Funds. Research and travel grants are awarded each term to faculty through a competitive selection process. The Faculty Research Committee congratulates the 2007-08 grant recipients and encourages their colleagues to apply for research support. For more information about the Faculty Research Funds, contact one of the faculty representatives listed on the back of the program.

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 and the Faculty Research Committee. We applaud our student participants for their hard work and dedication to research and scholarly activity. 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 the poster exhibit.

ACKNOWLEDGEMENTS

The Faculty Research Committee thanks New Mexico Highlands University for its continued recognition and support of the research and scholarly activity of its faculty and students. We thank Dr. Ian Williamson, 2007-2008 Faculty Research Committee Chair, for his lead role in organizing today's event. We also thank Vice Presidents Linda LaGrange, Gilbert Rivera, and Bill Taylor for their continued support of faculty research. We thank Ms. Germaine Alarcon for her administrative assistance and Ms. Roberta Lisenbee for her assistance with the program.

The New Mexico Highlands University Sigma Xi Chapter thanks the following individuals for volunteering to serve as judges for the Student Poster Competition: Bob Amai, Lisa Bentson, Ryan Elliott, David Glass, Tiffany Kinnibrugh, Mary Shaw, and Curtis Sollohub.