

Talk and Performance Abstracts

(In alphabetical order by author)

Najah Al-Shanableh; Computer Science, NMSU

Healthcare Data Mining

Data mining is at the heart of the hottest strategic applications today. From Customer Relationship Marketing (CRM) to Fraud Detection to Market Basket Analysis, data mining is providing the competitive edge to companies in every major industry – including yours!

According to Wikipedia [2] Data Mining Defined as “Data mining (the analysis step of the “Knowledge Discovery in Databases” process, or KDD)[1], an interdisciplinary sub field of computer science, is the computational process of discovering patterns in large data sets involving methods at the intersection of artificial intelligence, machine learning, statistics, and database systems. Data mining has been used intensively and extensively by many organizations. In healthcare, data mining is becoming increasingly popular, if not increasingly essential. Data mining applications can greatly benefit all parties involved in the healthcare industry.

Faris H. Almansour & Dr. Hansuk Sohn; Industrial Engineering, NMSU

An Optimization Model and Its Application to Carbon Capture and Storage problem with Enhanced Oil Recovery

The goal of this research is to implement mathematical models to optimize an infrastructure for the Carbon Capture and Storage (CCS) with Enhanced Oil Recovery (EOR). The CCS is a technology that can be adopted by major emitters to mitigate the carbon emissions without affecting our daily needs of energy and power. The CCS is also considered an important “bridging” technology because it allows societies to continue using their existing fossil-fuel infrastructure while minimizing the adverse effects of doing so on the climate of the earth. That is, the CCS prevents large amounts of CO₂ from being released into the atmosphere without affecting our daily needs of energy and power. The process of the CCS starts by capturing CO₂ at power plants where CO₂ will be first separated from other gases, and then its gas chemical state will be transferred to supercritical fluid state, which is midway between gas and liquid. The captured CO₂ will be transported by pipelines, and then injected into a rock formation at a geological reservoir. Injection of CO₂ for enhanced oil recovery (EOR) is a well-established technology used to increase oil production as well as reduce the carbon emissions significantly. As a result, it reduces dependency on foreign oil. During the last decade, there has been a considerable amount of research, and several models have been developed to analyze infrastructure, market, and cost barriers of the CCS process. Literature review suggests, however, that there have been minimal attempts to develop research on the process of the CCS with EOR operation. Therefore, in this research, we focus on optimization modeling for the CCS with EOR. Unlike the previous models, the proposed model includes the concept of the injection of CO₂ for EOR operation, which will ensure considerable cost savings.

Armando Altamirano; Curriculum & Instruction, NMSU

Funds of Knowledge for Empowering Technology Use

Exploring different methodologies to address the needs of minority and underrepresented pre-service teacher candidates as they learn to use technology for teaching utilizing the framework developed by Gonzalez, Moll and Amanti (2005) identified as Funds of Knowledge, as a useful strategy for teaching the Technology component in a Teaching course within the Teacher Education program in a Hispanic-serving university.

Faisal H. Alturkistany, Varayini Pankayatselvan, Wenyan Li, Jeffrey B. Arterburn, Kevin D. Houston, & Jessica P. Houston; Molecular Biology, NMSU

Studying FRET between a novel fluorophore and enhanced green fluorescent protein to develop a new binding assay for estrogen receptor alpha

Förster resonance energy transfer (FRET) is a fluorescence-dependent phenomenon that is used in determining intracellular protein-protein interactions, ligand-receptor binding, or protein folding. In this project, we evaluate whether or not FRET is occurring between E2HPY (triazaborolopyridinium) and enhanced green fluorescent protein (EGFP). E2HPY is a fluorescent estradiol compound; it passes through the membrane of viable cells, binds to, and activates estrogen receptor alpha (ER- α), and fluoresces at approximately 620-nm. In order to screen at a high throughput the activation of ER-X by E2HPY, we have designed an EGFP-ER-X fusion protein. We hypothesized that the treatment of E2HPY in cells expressing ER- α -EGFP will cause FRET between the EGFP and E2HPY. To study this, we introduce E2HPY to Chinese hamster ovarian (CHO-K1) cells that transiently express ER- α -EGFP. The fluorescence intensity of each fluorophore is measured using fluorescence microscopy and flow cytometry to search for fluorescent quenching of the donor (EGFP) or the fluorescent increasing of E2HPY. We also look for FRET using time-resolved flow cytometry whereby we measure fluorescence lifetime changes of EGFP. Additional control experiments are accomplished such as adding non-fluorescent estradiol (17 β -estradiol, E2) to cells that express ER- α -EGFP. The results suggest that when both fluorophores are present, the fluorescence intensity of EGFP-ER- α fusion protein decreases and the fluorescence intensity of E2HPY increases. These fluorescence changes suggest possible FRET. After further work is accomplished to verify and design an ideal FRET pair, we anticipate a reliable, viable, screening assay for a variety of drug targets to estrogen receptor alpha.

Joshua William Amburgey; Physics, NMSU

Enhanced Raman Spectroscopy via Dipole Coupling in External Oscillation Electric Fields

Raman spectroscopy has become a staple technique used to probe biological systems. It is used to study the time scales and completeness of reactions, and the primary and higher order structures of proteins, nucleic acids and cells. It is employed to look at the fingerprint region of spectra in order to identify molecular groups, and has even been employed in the detection of disease. However, the signals produced in Raman spectroscopy tend to be weak, and increasing the signal strength has been essential to producing reliable, robust data. Surface Enhanced Raman Spectroscopy (SERS) is a common method used to increase signal strength, often by a factor of one million or more. SERS involves the introduction of nanoparticles, which directly interact with the material being measured through large electric fields at the nanoparticle surface. These nanoparticles introduce unwanted chemistry and make the measurement of systems in vivo and pure systems impossible. Electric Field Raman Spectroscopy (EFRS) was developed based on the interactions observed in SERS by introducing static electric fields externally, preserving the capabilities of measuring pure systems. EFRS proved to be an impractical technique, as generating sufficiently large electric fields is difficult and enhancements observed are relatively small. It is believed that the EFRS technique can be improved upon by introducing an oscillating electric field that more closely resembles electric fields seen in SERS. These oscillating fields are expected to further enhance the Raman signal in EFRS making the technique suitable for the exploration of systems. Discussed here is the exploration of a mechanism behind static and oscillating external electric fields and dipole coupling and the development of an Oscillating Electric Field Raman Scattering (OEFRS) instrument.

Soumik Banerjee; Electrical & Computer Engineering, NMSU

Study and Characterization of Mixed Abstraction System Modeling

With the growth of high performance computing, the need for accurate and faster simulators to model the next generation computing systems are in high demand. Simulators consist of models representing different components of a computer system (processors, memory subsystems, interconnection networks, peripherals, etc.) with relevant simulation infrastructure to support the simulation. The most common models used in popular simulators are cycle-accurate. These models emulate the components on a cycle by cycle basis providing accurate performance results. The main drawback for this type of modeling is its extremely high simulation time which severely affects the design process of future architectures. Researchers have devised several modeling techniques to reduce the simulation time

following various higher abstraction methods like Analytical, Statistical, Monte-Carlo, Functional, etc. Although these methods are effective in reducing the simulation time, the accuracy of the performance results is severely compromised.

At a system-level, the cycle-accurate simulators are extremely slow simulating the whole system and the abstract simulators are highly inaccurate causing a severe constraint in design space exploration required for the development of future large scale systems. The community lack models or techniques which can retain some degree of accuracy with a lower simulation time for a particular design space exploration. We identify a possible solution to this current issue as mixed-abstraction level system models which can be fast and accurate while exploring a particular design space.

This presentation discusses the current issues faced by computer modelling community and how this work would provide an insight for performance accuracy and simulation time trade-off at a system-level.

Kaylin Beeman; Chemical Engineering, NMSU

Measurement of Autofluorescence in Metabolically Altered Cell Line Using Time-Resolved Flow Cytometry

In today's world we have become accustomed to hearing the word cancer and inevitably knowing what that means for the struggle of the future. As researchers, it is crucial to expand knowledge and push towards a cure for this thing society calls cancer. It is my hope to do just that. It is known most cells naturally autofluoresce and that by exploiting the cell in certain ways we can better understand what is occurring in each cell. Nicotinamide adenine dinucleotide (NAD⁺ and its reduced form NADH) is a very good way to understand a cell. The cell uses NADH to produce energy for the cell in the form of ATP in the Mitochondrial Electron Transport Chain (ETC). NADH is known to be an autofluorescent property in a cell. It is our goal to metabolically map cells based on this knowledge. By changing the cellular environment (serum starvation and stopping the ETC) it can be shown to change cell autofluorescence. The ability to measure changes in autofluorescence via time resolved flow cytometry could be key in finding circulating tumor cells as well as sorting these tumor cells based on differences in fluorescence lifetimes. Preliminary data has shown cancerous cell lines (MCF-7 and A549) have different lifetime and intensity values when compared to Peripheral Blood Mononuclear cells. This knowledge could in turn help improve cancer diagnostic techniques.

Ahmed Benkhalti; Mathematics, NMSU

An Analysis of Transition-to-Proof Course Students' Proving Difficulties

I analyzed undergraduate students' examination papers from a transition-to-proof course. I have identified process, rather than mathematical content, difficulties such as not constructing a proof framework first, not unpacking the conclusion, and not using definitions correctly. Examples of these difficulties will be presented.

Kristen Bernhardt; Sociology, NMSU

Double Negative: Claude Cahun's Life as Art

Photographer Claude Cahun (nee Lucy Schwob) and her lover and stepsister Marcelle Moore (nee Suzanne Malherbe) attracted a great deal of attention when their estate was auctioned off after Moore's death and discovered by a private collector. Considered part of the surrealist movement between the world wars, the two gained some notoriety during their lifetimes but only for a short period, and Moore's role was mostly behind the scenes. Together they launched a counterinsurgency campaign against the Nazi occupation of the Isle of Jersey where they retreated later in life, producing and distributing countless tracts signed "the soldier without a name," for which they were eventually arrested and later released. Cahun's constantly-changing, androgynous self portraits and her provocative writing demonstrate her subversion of gender and sexuality norms. This paper approaches Cahun's constant construction, deconstruction, and reconstruction of her identity through a phenomenological lens drawing on performative theories of gender and the conception of reality as socially constructed. The social and historical context of Europe between the wars was a particularly permissive time for single or lesbian women, and Cahun's position as upper-class and well educated allowed her to exploit her personal freedom and explore different versions of herself. However, her

alignment with the surrealist movement meant that she was also influenced by the way she was culturally perceived, and constrained by the culture of misogyny that permeated surrealism at the time.

Ruofan Cao; Chemical Engineering, NMSU

Time-Resolved Flow Cytometry

Accurate and early diagnosis of disease is important for the improvement of global public health and health-promoting initiatives. Flow cytometry is one such tool that aids in disease diagnosis not only in first world countries but also in underserved and marginalized societies. Flow cytometers are high-throughput fluidic and optic-based measurement devices that enable the counting and sorting of single cells. The information obtained from a flow cytometer ranges from genomic data, to phenotype characterization between individual cells, as well as intracellular characteristics, molecular phenomena, and cellular morphology. Because of the broad spectrum of intra- and extracellular information that can be obtained from a flow cytometer, these devices have seen widespread use in hospitals, clinics, and research laboratories.

The focus of this work is to increase the information content from flow cytometers while maintaining flexibility and compactness for use. In general our work seeks to incorporate new cytometry parameters based on a key photo-physical trait of fluorophores called the fluorescence lifetime. This value provides information about the fluorescence relaxation, or intensity decay, of organic fluorophores, fluorescent proteins, and other biological and inorganic species that fluoresce when tagged to a cell. Having a sensitivity to intracellular microenvironments, the fluorescence lifetime can indicate a number of biologically significant phenomena including protein-protein interactions, cell signaling, and biochemical changes in the microenvironment such as pH and temperature, to name a few. In this symposium, I will talk about how the lifetime measurement is embedded into traditional flow cytometry systems. Also I will talk about the application of fluorescence lifetime in flow cytometry for cell sorting by phase-filtering method.

Dylan Clark; Anthropology, NMSU

Get Your Grind On: Ground Stone Artifact Interpretations of Subsistence and Mobility at Cottonwood Spring Pueblo

A common artifact type found at many Southwestern archaeological sites are ground stone tools. Though many types of ground stone tools were utilized, the most iconic are that of the mano and metate; a hand stone used for grinding paired with a stone surface typically used to process grain and other plant material. Though technical considerations constrain some material and design choices of these artifacts, what differences exist can be used to infer behaviors such as agricultural strategies, settlement organization, and mobility ranges of prehistoric population centers. Cottonwood Spring Pueblo, a large El Paso Phase (AD1300-1450) pueblo village in the Jornada Mogollon culture area is an agricultural site that would have extensively used manos and metates as well as other ground stone tools as part of their daily life. Existing archaeological and geological research combined with artifact analysis from the Cottonwood Spring assemblage will be used to make inferences about life ways and resource gathering strategies of this pre-Columbian population center.

Arturo Del Valle & Dr. Delia J Valles-Rosales; Industrial Engineering, NMSU

A rotor blade design optimization for a Fixed-Pitch Fixed-Speed Wind turbine

This work seeks to add a new approach to optimize a wind turbine blade's performance by implementing a surrogate model using the Kriging function with the chord, twist and the use of 3 different airfoils as design variables for the maximization of the Annual Energy Production. The SQP method for Local Search is used to exploit the model. A baseline design of the blade starts with a replica of the Phase VI blade utilized in a NASA-Ames experiment and a MatLab script utilizes the Blade Element Momentum Theory (BEM) for the aerodynamic analysis. Results show a 23% improvement in energy production by using this method.

Bishnu H. Dhakal & Dr. James W. Herndon; Chemistry & Biochemistry, NMSU

Fastest route for the synthesis of apomorphine skeleton through the net [5+5]-cycloaddition of γ,δ -unsaturated Fischer carbene complex and ortho-alkynylbenzoyl system.

The net [5+5]-cycloaddition of γ,δ -unsaturated Fischer carbene complexes and ortho-alkynylbenzoyl systems has been employed as a key step toward the synthesis of aporphine natural products. These efforts are exemplified by attempted total synthesis of apomorphine, a treatment for advanced Parkinson's disease. Route based on monoalkynylbenzaldehyde as [5+5]-cycloaddition substrates are examined. Subsequent Suzuki-Miyaura cross coupling with the aminoethyl organotrifluoroborates has provided a unique method for the incorporation of the heterocyclic ring and a fastest route for the synthesis of apomorphine skeleton has achieved.

Nalin Fernando, T.N. Nunley, S. Zollner, C. Xu, J. Menendez, & J. Kouvetakis; Physics, NMSU

Temperature and composition dependent optical properties of GeSiSn alloys

Band gap engineering of Ge by controlling tensile strain and alloying with Si and Sn has attracted great interest. Ge_{1-x-y}Si_xSn_y ternary alloy with two compositional degrees of freedom allows decoupling lattice constant and electronic structures. Hence it is important to determine the temperature and compositional dependence of optical properties of these materials. The complex pseudodielectric functions of Ge films grown on Si(100) and GeSiSn grown on buffered Ge were measured using spectroscopic ellipsometry in the 0.76-6.6 eV energy range between 77-800 K to investigate the E1 and E1+ Δ 1 critical point (CP) energies. CP energies and related parameters were obtained by analyzing the second-derivative $d^2\epsilon/d^2\omega$ of the dielectric function. Our experimental results are in good agreement with the theoretically predicted E1 CP energy shift of Ge on Si due to strain generated by thermal expansivity mismatch. We will discuss the compositional dependence of the E1 and E1+ Δ 1 CP energies of GeSiSn alloys and effects of temperature on shifting CP energies.

Diane Feuillet, Jon Holtzman, & Leo Girardi; Astronomy, NMSU

Ages of Giants with High Resolution Spectroscopy

In the age of high-resolution spectroscopic surveys, elemental abundance measurements for large samples of stars allow us to identify individual populations within the Milky Way disk, however; absolute age measurements are needed to put the evolution of the stellar disk populations in a Galactic context. We present a sample of 700 local ($d < 400$ pc) red giant stars observed using the New Mexico State University 1m telescope with the SDSS-III Apache Point Observatory Galactic Evolution Experiment (APOGEE) spectrograph, for which we estimate ages from the high-resolution spectroscopic stellar parameters and accurate distance measurements from Hipparcos. The high-resolution, near infrared APOGEE spectra provide measurements of the stellar atmospheric parameters (temperature, surface gravity, and overall metallicity), as well as abundances of 15 individual elements. Due to the smaller uncertainties in surface gravity possible with high-resolution spectra and accurate Hipparcos distance measurements, we are able to calculate the masses of our stars to within 40%. We target giants because the relatively rapid evolution of stars up the red giant branch allows an age to be estimated based on the mass using a mass-age relation of evolved stars from model isochrones. Using these age estimates and the APOGEE abundances, we examine the abundance trends of individual elements with age in the solar neighborhood. As with other recent surveys of disk stars, we find older stars to be enhanced in alpha-elements and more metal-poor, while younger stars have solar alpha-abundances and a spread in [Fe/H] around solar. We find a flat age-metallicity relation with a large spread in metallicity at a given age, however; we note that our sample lacks metal-poor stars. This method of estimating ages of red giants is developed with the intent of estimating ages for the much larger sample of $>10,000$ APOGEE survey giants that will have parallax measurements from Gaia.

Ferdinando Fioretto; Computer Science, NMSU

Branch Consistency in Distributed Constraint Optimization

The DCOP model has gained momentum in recent years thanks to its ability to capture problems that are naturally distributed and cannot be realistically addressed in a centralized manner. Dynamic programming based techniques have been recognized to be among the most effective techniques for building complete DCOP solvers (e.g., DPOP).

Unfortunately, they also suffer from a widely recognized drawback: their messages are exponential in size. Another limitation is that most current DCOP algorithms do not actively exploit hard constraints, which are common in many real problems. This paper addresses these two limitations by introducing an algorithm, called BrC-DPOP, that exploits arc consistency and a form of consistency that applies to paths in pseudo-trees to reduce the size of the messages. Experimental results shows that BrC-DPOP uses messages that are up to one order of magnitude smaller than DPOP, and that it can scale up well, being able to solve problems that its counterpart can not.

Miranda Flores; English, NMSU

The Squire's Economy of Knowledge: Chaucer and Class-Based Models of Epistemology

This paper argues that Chaucer's Squire uses magic in his Tale, in particular the brass horse, to establish an "economy of knowledge" in which only the social elites are allowed to participate. The first part of The Squire's Tale features a central image of a stationary brass horse surrounded by a group of people buzzing about as they attempt to understand the function of this mysterious object brought to their king by a knight as a gift from a far-off king. The speculators seek knowledge of how to make this magical transportation device function, but their perceptive abilities and previous knowledge prove useless. The problem of the brass horse that cannot be made to move reflects the theory of epistemology that the Squire develops in order to privilege his own social group; this model can be called an economy of knowledge because the understanding of function passes solely between members of an elite social group. This paper discusses how the Squire only allows certain individuals to participate in this system – his own social group is included in this economy, and all others, despite whatever background they may have, fall outside of these boundaries, creating a binary system for the Squire of "us" versus "them." While the Squire is interested in knowledge as a feature of class, Chaucer has broader epistemological interests. Chaucer uses the Franklin's interruption to undermine the Squire's model of epistemology, criticizing the use of rigid us/them boundaries and the limitations of hoarding knowledge that the Squire presents.

Andrea Gallegos; Physics, NMSU

Lg Attenuation of the Western United States

Lg waveforms recorded by EarthScope's Transportable Array (TA) are used to estimate Lg attenuation in the Western United States (WUS). Attenuation is calculated based on Lg spectral amplitudes filtered at a narrow band from 0.5 to 1.5 Hz with a central frequency of 1 Hz. The two-station and reverse two-station techniques were used to calculate Q_0 values, which represent attenuation values. 398 events occurring from 2005 to 2009 and ranging from magnitude 3 to magnitude 6 were used in this study. The results show high Q regions (low attenuation) corresponding to the Colorado Plateau (CP), the Rocky Mountains (RM), the Columbia Plateau (COP), and the Sierra Nevada Mountains (SNM). Regions of low Q (high attenuation) are seen along the Snake River Plain (SRP), the Rio Grande Rift (RGR), the Cascade Mountains (CM), and in east and west of the Basin and Range (BR) where tectonic activity is more active than the central part of the BR. A positive correlation between high heat flow, recent tectonic activity and Q was observed. Areas with low heat flow, thin sediment cover, and no recent tectonic activity were observed to have consistently high Q. These new models use two-station and reversed two-station methods and provide a comparison with previous studies and better constrain regions with high attenuation. This increase in detail can improve high frequency ground motion predictions of future large earthquakes for more accurate hazard assessment and improve overall understanding of the structure and assemblage of the WUS.

Adriana Goenaga Ruiz de Zuazu; Curriculum & Instruction, NMSU

Literature Circles in the Classroom

This study took place in an elementary school in the Southwest of the United States. The participants are fifth-graders attending a dual language program. With an objective to familiarize the students with reading about social justice issues, I first read aloud a bilingual book. The bilingual children's book used for the study tells the story of a Mexican young girl who notices about the injustices that the migrant workers were experiencing (e.g. low wages and working conditions) and works for activism and justice. The literature circles' roles were explained during a discussion after the read aloud. I explained each role that was on display on the bilingual posters (English and Spanish) I made: "Moderador" or discussion leader, summarizer or "sintetizador," "recolector de palabras" or vocabulary enricher,

connector or “conector,” and “ilustrador” or illustrator. During both the read aloud and the literature circles I used both English and Spanish. The students had rich whole-group and small-group discussions, with my objective that they should be student-centered. During the literature circles the students led the discussions and got deeper in their reflections and comments choosing their own questions, making their own summaries, connections, and drawings, and finding important words and sentences for them. Having a role also helped them be on task and get engaged, and they liked interacting and “piggy-bagging” at each other’s ideas. It was a very beneficial experience to apply a read aloud and the literature circles, with a critical emphasis, in the classroom.

Candace Gray; Astronomy, NMSU

Venus’s Mysterious Aurora

Venus exhibits a unique emission after large solar storms. We propose that this emission is auroral in nature and only occurs after strong solar storms. We present ground-based data from Apache Point Observatory in Sunspot, NM and space-based data from the Venus Express spacecraft.

Patricia A. Grubel; Electrical & Computer Engineering, NMSU

Dynamic Performance Measurements for Adaptive Thread Scheduling

As parallel computation progresses towards the Exascale era where applications may run on millions of processors concurrently, all aspects of the computational model need to undergo a transformation to meet the challenges of scaling impaired applications. Graph applications, an important class of scaling impaired applications, are used in a variety of fields such as experimental science, social networking, medical analysis, and climate modeling. Thread scheduling mechanisms used to manage application level tasks are a fundamental part of the parallel computational model. The management of these tasks can increase overheads and impair performance of the application. To minimize these affects, we propose dynamic thread scheduling using the High Performance ParalleX (HPX) runtime system.

High Performance ParalleX (HPX) is a C++ runtime system that employs fine-grained task parallelism. HPX has a dynamic performance modeling capability and dual model thread scheduling mechanisms composed of a variety of thread scheduling policies and queuing models for work stealing and load balancing. It provides the ideal framework for studying parallel applications with the ability to make dynamic performance measurements and implement adaptive thread scheduling. Performance studies of HPX determine metrics that indicate portions of applications where dynamic adaptation of the thread scheduler may improve scaling of the application.

This presentation explains task parallelism in HPX, and demonstrates the progress of performance measurements with the implementation of new performance counters in HPX for obtaining measurements to be used towards dynamic adaptation of the thread scheduler in the runtime system.

Mahmoud Hammouri & Dr. Igor Vasiliev; Physics, NMSU

Electronic and Transport Properties of Waved Graphene Nanoribbons

First principles *ab initio* calculations are employed to study the electronic and transport properties of waved graphene nanoribbons. Our calculations are performed using the SIESTA and TRANSIESTA density functional electronic structure codes. We find that the band gaps of graphene nanoribbons with symmetrical edges change very slightly with the increasing compression, whereas the band gaps of nanoribbons with asymmetrical edges change significantly. The computed IV-characteristics of the waved graphene nanoribbons with different compression ratios reveal the effect of compression on the transport properties of graphene nanoribbons.

Supported by NMSU GREG Award and by NSF CHE-1112388.

Sten Hasselquist; Astronomy, NMSU

Detection of Neodymium in APOGEE H-band Spectra and its Application to Chemical Tagging

We report the successful detection of the rare earth element Neodymium (Nd) in the high-resolution, H-band spectra from the SDSS III Apache Point Observatory Galactic Evolution Experiment (APOGEE). Using the Nd II transition at 16058.014 angstroms, we have detected significant Nd enhancements in all stars observed by APOGEE belonging to the Sagittarius (Sgr) Dwarf Spheroidal (dSph) galaxy. Because Sgr is known to be enhanced in heavy s-process elements such as Nd, we can use this feature to identify and chemically tag Sgr stream members that have been observed in the Galactic halo by APOGEE. We also use this feature to characterize rare earth element abundance variations in clusters observed by APOGEE.

Scott Kevin Hays-Strom; Anthropology, NMSU

School House Rock: Lake Valley Mining District School House Archaeology

My goal in this proposal is to apply methods of institutional archaeology to the ethnographic and material record of the school houses of the Lake Valley Mining District, New Mexico to understand the cultural stratification of students and the use of the structure in their relationship to the greater social community of Lake valley. The two standing structures cover a long period of occupation at the town site displaying changes in social patters and usage. By studying the records and museum collections under control of the Bureau of Land Management, a more complete story of the cultural growth and changes of Lake Valley can be distilled. This study will be useful in providing a greater understanding of the mining cultures found throughout southern New Mexico and the greater Southwest.

Jacquelyn Heuer; Anthropology, NMSU

Applied Anthropology & Traditional Food Systems: How Anthropologists Can Aid in Indigenous Food & Nutrition Movements

Historically, indigenous populations have adopted Western diets as a direct result of colonization. Native Americans are no exception; many populations have lost knowledge of, as well as access to, their traditional food systems as a result of this dietary shift. Applied anthropologists are uniquely situated to assess the circumstances surrounding the loss of traditional food systems while simultaneously working with local communities to address the issues that arise as a result of this loss. The issues include loss of knowledge, dietary delocalization, food transitions, and dietary modernization, among others. This research addresses the various approaches that applied anthropologists can take to combat the issue of traditional food system loss and discusses the potential future directions of applied anthropological work.

Manzamasso Hodjo & Ram N. Acharya; Agricultural Economics & Agricultural Business, NMSU

Analyzing Policy impact and economic relationship among goods on the rice market in Togo

Rice is one of the major food crop produced and consumed in Togo. Although it has the potential to produce more than it needs, Togo imports nearly 50 percent of domestic consumption. Realizing its potential for increasing household income and food security, the government has been encouraging domestic production through various farm support programs since early 1990s. Although these programs have achieved some success in increasing production, it has failed to keep up with the soaring market demand. Moreover, despite consistent efforts from the government, only about 20 percent of the land suitable for rice cultivation was producing paddy until 2007. Although most native varieties are in high demand and receive significantly higher prices than imported varieties, factors such as limited access to modern inputs, lack of market information, and rising cheap imports are the primary constraints for steady growth in domestic rice production. In this light, this study aims to evaluate the impact of rising imports on domestic rice production in Togo. A source differentiated import demand function is used to evaluate the impact of importing broken, brown, and milled rice on domestic production. Analysis results show that policy impact is significant on domestic rice production and milled rice is considered as luxury good in Togo.

Sanjiv Kumar Jha & Dr. Igor Vasiliev; Physics, NMSU
Density Functional Study of Covalently Functionalized Graphene

The electronic, structural and vibrational properties of carbon nanomaterials can be affected by chemical functionalization. We applied *ab initio* computational methods based on density functional theory to study the covalent functionalization of graphene with benzyne, carboxyl groups and tetracyanoethylene oxide (TCNEO). Our calculations were carried out using the SIESTA and Quantum-ESPRESSO electronic structure codes combined with the local density and generalized gradient approximations for the exchange correlation functional and norm-conserving Troullier-Martins pseudopotentials. The simulated Raman and infrared spectra of graphene functionalized with carboxyl groups and TCNEO were consistent with the available experimental results. The computed vibrational spectra of graphene functionalized with carboxyl groups showed that the presence of point defects near the functionalization site affects the Raman and infrared spectroscopic signatures of functionalized graphene.

Supported by NSF CHE-1112388

Christopher James Kincaid; Government, NMSU
From War Fighters to Crime Fighters: The Origins of Domestic Police Militarization

Recent events in Ferguson, Missouri and elsewhere are awakening citizens to a robust array of military equipment and military ethos within the police. This paper will examine the effects of continuous wars within American society from the late 20th century to the present, and how it creates a climate resulting in the militarization of the nation's law enforcement agencies. Building on recent scholarship this research connects the nation's original fears of standing armies to the current prevalence in domestic police agencies and departments that employ the tactics and equipment designed for a military purpose. Driven by wars on drugs, crime, and now terror these tools are now part of everyday civilian law enforcement. The combination of the nation's fear of potential large-scale terrorist attacks, federal funds and grants for law enforcement, plus availability and marketing of military equipment to law enforcement is bringing military weapons and tactics to domestic police forces.

Michelle Lanteri; Art, NMSU
Collateral Damage: Jaune Quick-To-See Smith's Call-To-Action To Americans To Identify With Environmental Issues

Through her late 1980s/early 1990s *Chief Seattle* series, Native American Artist Jaune Quick-to-See Smith presented viewers with a call-to-action to seek more information about the state of the environment beyond what is pitched in mainstream news media. In this series, Smith visually described the intermeshing social, political, and ecological elements of environmental crises, as seen through her viewpoint as a Salish artist, academic, and activist. With an ecological focus, Smith's *Chief Seattle* series informed viewers of the nightmarish symptoms of a sick environment, like acid rain, and also anticipated our current concerns with climate change and global warming. Through her visual narratives of contemporary environmental tragedies that could have been averted, Smith placed herself at the center of a postcolonialist dialogue confronting the paramount issue of the exploitation of Native lands by the United States government.

Yanling Leng, Ruinian Jiang, & Sonya Copper; Civil Engineering, NMSU
Strengthening Transverse Connections of Adjacent Precast Concrete Box Beam Bridges Using Transverse Post-Tensioned Bars

Prefabricated concrete hollow core slab beam bridges account for approximately 25% of the total bridges in China. Most of these bridges were built in or before the 1990s and used plain concrete hinge joints as transverse connections between adjacent slabs. With the aging of these bridges, transverse connection joints have deteriorated and lost their functions. Hence, repairing and strengthening are needed to enhance the transverse integrity of the bridges. It has been noted by empirical observations and qualitative analysis that the loss of lateral connection between slab beams caused the "Single Plate Load Effect", in which each beam becomes an independent element and bears the load solely by itself. Customary strengthening methods such as thickening the bridge deck, patching steel plates or other fibre

compound materials, or applying longitudinal prestressing, have been used in practice. However, all these methods need closing traffic for installation, and the cost is relatively high. To overcome these drawbacks, a new strengthening method without interrupting traffic is put forward in this paper. The procedure is as follows: first, sealing cracks in hinge joints with epoxy mortar and curing it to the required strength; second, anchoring and bonding transverse post-tensioned bars to the bottom of the bridge beams at certain spacing via a tailor-made equipment, which would transfer the prestressing forces to shear keys in the joints and provide resistance to transverse moments. A finite element analysis and laboratory test have been conducted to validate this strengthening technique.

Gabriella Lewis; Management, NMSU

The implications of institutional theory and resource-based view at non-profit organizations: A triangulated qualitative case study analysis

Institutional theory and strategy constructs are extensively discussed topics in relation to for-profit organizations; however, they are rarely addressed in the nonprofit literature. This paper is a triangulated, qualitative case study investigation of a nonprofit art organization. The findings of the paper suggest that there are strong tendencies of institutionalized processes and isomorphic methods that hinder the effective functioning of this organization. At the same time, the organization possesses several distinctive attributes, which can be evaluated under the resource-based view. While the case is unique in several aspects, the implications can be applied to other nonprofit organizations.

Wenyan Li; Chemical Engineering, NMSU

Use of Flow Cytometry and Correlate GFP Fluorescence Lifetimes to pH Shifts in Macrophage cells infected by E. Coli

Macrophage cells ingest and degrade foreign substances, such as bacteria through phagocytosis. The evolution of phagosome maturation ensures the degradation of the engulfed bacterium with low pH, yet some bacteria that survive in the host are capable of manipulating the pathway to the phagosome maturation or escaping from the phagosome to the cytoplasm. Hence, tracking pH shifts during phagocytosis process is rather important in observing bacterial infection. To solve the problem caused by heterogeneity, time-limiting microscopy, spectral overlap issues, and subtle shifts in fluorescence intensity, we propose the use of fluorescence lifetime-based flow cytometry (FLFC). RAW264.7 cells were infected by GFP expressing E. Coli with 10 multiplicity of infection (MOI) for $t = 5, 30, 60, 90, 120$ or 180 min, respectively. Our initial results show that differences in the populations of E. Coli and RAW264.7 cells are detectable by their fluorescence and side scatter intensities, as well as by average fluorescence lifetime measurements. The fluorescence intensity of the infected RAW264.7 cells gradually increase as infection time increases and the average GFP fluorescence lifetime decreases. At $t = 5, 30, 60, 90, 120$ or 180 min, the average GFP fluorescence lifetime of the infected cells is $3.0 (\pm 0.1)$ ns, $2.8 (\pm 0.06)$ ns, $2.3 (\pm 0.09)$ ns, $2.1 (\pm 0.07)$ ns, $2.0 (\pm 0.06)$ ns, $2.0 (\pm 0.08)$ ns, respectively. The average GFP fluorescence lifetime, in contrast, does not change $3.1-3.3 (\pm 0.1)$ ns when E. Coli is not confined inside macrophage vacuoles. These results demonstrate that intracellular accumulation of E. Coli, which express GFP inside of macrophage cells, is correlated to a decrease in the GFP fluorescence lifetime when compared to control cells. We believe this presents an interesting step toward the use of GFP fluorescence decay kinetics as a pH indicator inside of cells. The results presented are a first step toward obtaining quantitative cell-to-cell statistics of subtle, intracellular pH shifts.

Ryan Martin MacLennan; History, NMSU

Much ado with Words: The Northern Star's Poetry Column and the Conflict with the Narrative of the Publication

After being over-looked during the passage of the Great Reform Act of 1832, Britain's working class population tried to pass a People's Charter, aimed at universal suffrage and five other political reforms. Though the campaign for the Charter, pursued between 1837 and 1848, failed, the working-class population remained united as Chartists. They held meetings throughout the counties and established a thriving press. The most influential Chartist newspaper, *The Northern Star*, was incredibly popular, read in pubs and homes throughout England. The *Northern Star* was the voice of the working class. Using the *Northern Star* along with other Chartist publications as primary sources, in addition to secondary essays on the psychological impact of poetry and journalism, this study compares and contrasts two elements of the *Northern Star's* publication—the poetry column and editorial articles. Contrasting

genres within the publication created a dichotomy within the working class community. The poetry column, with its vivid expressive language, evoked an immense emotional appeal, pushing Victorian working class citizens to the brink of revolution. Meanwhile, the journalistic articles wielded pessimistic images of struggle and speeches by prominent Chartists urging policy change, militated in favor of political reform instead of violent revolution. The paper also provides valuable insight into the question of why Great Britain did not have a revolution amidst so much violent revolutionary turmoil in Europe.

Nigel Mathes, Christopher Churchill, & Michael Murphy; Astronomy, NMSU
Characterizing MgII and CIV Absorption Around Galaxies

We present a large sample of 432 archival VLT/UVES quasar spectra which have been reduced and continuum fit accurately and uniformly. Using an automated line detection algorithm, we identify all intervening MgII and CIV absorption systems. We analyse the kinematic properties of the cool gas, traced by MgII systems, the warm gas, traced by CIV systems, and the systems which have absorption from both gas phases. We hope to identify whether the cool and warm gas phases are physically distinct, occupying separate regions in the halos of their host galaxies, or if these gas phases transition smoothly into one another, implying a common origin.

Jean McKeever; Astronomy, NMSU
Ages of Red Giants from Asteroseismology

Red giant stars are a fascinating laboratory to test stellar evolution, and with tools from asteroseismology we can gain a unique perspective into their deep interiors. Given the fast variation of oscillation-mode frequencies as function of evolutionary state along the red giant phase, we are able to determine an age. Stars in eclipsing binary systems also present us with the ability to precisely determine stellar properties, such as mass and radius. We present an initial analysis of the oscillations for several binary systems, all of which include a red giant and an F-type companion. We compare the modes that we observe in the red giant star to those expected from a stellar model. The models are created using the MESA stellar evolution code. Parameters for the stellar model come from binary light curve modeling and analysis of high resolution spectra of the systems.

Greggory McPherson; Physics, NMSU
Constructing a small angle light scattering instrument as a micron-scale structural probe of porous systems

The ability to measure changes in a material's porosity across multiple length scales as a function of chemical and physical processes is of interest to research ranging from energy storage to long-term remediation of environmental pollutants. Ultra-small and small angle neutron scattering have proven effective in studying structural features from nanoscopic to mesoscopic scales, but are limited in their ability to study larger features. Employing longer wavelengths, small-angle light scattering (SALS) is able to probe structural features from one to hundreds of microns, bridging the gap in accessible Q-range between neutrons at smaller length scales and quantitative large-scale structural data stemming from electron microscopy methods. Though SALS has been well developed for studying polymers and biomolecules, its applications in solid, multiphase systems is less established. To test the application of this technique to measuring changes in multi-scale porosity of geological rock samples subject to geochemical processes, a SALS instrument was designed and built by the Geochemistry and Interfacial Sciences group at Oak Ridge National Laboratory. Here will be discussed the instrument's design, challenges, some initial data, and future applications.

David Morales Andrade; Anthropology, NMSU
Iconography of Gods and Warriors of Tenochtitlan

The use of symbols and metaphorical meanings were one of the most meaningful ways to express the world view of the Mesoamerican cultures. Tenochtitlan gods and warriors symbolism and cloth were of great complexity. This work is based on a documentary research of primary sources as codex, chronicles and books of the Augustinian and Franciscan friars who came to Mexico, and of the work of contemporary authors like Clenningan, Berdan and Pohl, in order to make an interpretative approach of the iconography of Gods and warriors.

Yvonne Moreno; Special Education & Communication Disorders, NMSU

Transition: Results of the "Barriers to Transition Teacher Assessment" and the "Implementation of Transition Best Practices Inventory"

This presentation presents the results of the "Barriers to Transition Teacher Assessment" and the Implementation of Transition Best Practices Teacher Inventory". The purpose of the study was to examine the perceptions of special education case-managers about the impact that transition barriers have on the post-school outcomes of students with disabilities, and to determine whether best practices were being used as part of students' transition planning.

Paulo A. Oemig; Curriculum & Instruction, NMSU

Dramaturgical Critical Analysis: A Case Study for Performance Plays to Stage Critical Multicultural Analysis of Literature

The act of reading can assume different layers of engagement. There is no reason to consider one as superior to another e.g. reading for pleasure or reading for research. However, through schooling children are socialized not only into academic language or the school language. This alone merits inquiry; the irony is that academic language and the processes aimed at arriving at its proficiency should enable deeper levels of engagements with any literary text. My focus in this paper is to open a door to explore the utility of critical multicultural analysis as constructed by in the field of performance plays. A play is a literary work intended to be read, performed and engaged in by characters. It is through the performance that a wider transactional reading with the audience is possible.

Performance plays are usually not considered as an opportunity for students to engage in critical literacy. This project makes an inroad in the literature and enriches critical literacy by providing a sample study. When literature is performed and critically analyzed students experience multiple perspectives from where to contest implicit ideologies. Detecting whose voices are heard, or not, through critically analyzed performances promotes a reading that is inclusive and inquisitive. The overall guiding question in this research was to see how readings of plays and their performances can unveil ideological positions, prejudices and injustices? The results strongly support that performance plays can be utilized by high school students to practice dramaturgical critical analysis and heighten social justice issues.

Victor Owusu-Nantwi; Economics, Applied Statistics, & International Business, NMSU

Public Education Expenditures and Economic Growth in Ghana

This study investigated the long run relationship between education expenditure and economic growth in Ghana. Vector error correction and cointegration analysis is employed to test for the causal relationship between the variables for the period 1970 to 2012. The empirical results reveal that there is a positive and significant long run relationship between public education expenditure and real GDP, gross capital formation as well labor force participation. Also, in the short run, education expenditure Granger causes economic growth and vice versa. The result may provide some insights onto how the formulation and implementation of appropriate fiscal policies relating to education could help improve the quality of education and thereby contributes to economic development of Ghana.

Cecilia Palacio-Ribón; Curriculum & Instruction and Language & Linguistics, NMSU

Spanish Heritage Learners in a Spanish as a Second Language Class. The Outcome of a Teacher Practice.

In Spanish classes, it is usual to have two type of students, those considered as Second Language Learners (L2) and those categorized as Heritage Learners (L1). Experts suggest that both groups have their own needs and this is enough reason to take classes separately. However, due several factors, some classes end as mixed group. In this case, it is responsibility for the department through their instructors to approach the best available process in order to achieve the learning goals. This paper is the outcome of a teaching practice in a mixed Spanish class at New Mexico State University.

Yeshwanth Puppala; Electrical & Computer Engineering, NMSU

A 10 MHz Low Voltage, Noninverting, Synchronous Buck-Boost DC-DC Converter using current-mode feedback for Portable Battery Powered Applications

This paper presents the design and experimental results of an inductor based CMOS Buck-Boost Converter generating 3.3 V output with integrated power switches switching at 10MHz. A conventional voltage-mode with an integrated current-mode feedback control-loop was used to stabilize the regulator. The converter was designed to operate with a supply voltage range of 2.8 V to 4.2 V, which is suitable for portable battery powered applications. Peak power efficiency of over 85% was achieved for load current of 100mA and had stable, continuous and efficient operation for a load range of 20-200mA. It is observed that the output voltage ripple is 2% of V_{out} . Simulated line and load regulations are 51 mV/V and 30 %/A respectively. The DC-DC converter was fabricated using IBM 180 nm CMOS process.

Mohammad Abdul Qayum; Electrical & Computer Engineering, NMSU

Acceleration of Big Data analytic through parallel graph application optimization techniques

To achieve Exascale computational performance on Big Data analytics using next generation supercomputers, all aspects of computational models are evolving to support future applications that will execute billions of threads on millions of cores. Graph based applications are a special class of such applications that are common in Big Data type problems such as bio-informatics, social-networks, and cyber-security. A common characteristic of parallel graph applications is that computations using shared data are sparse in nature. In graph applications, two major synchronization policies are used to synchronize operations on shared data. The first one is coarse-grain synchronization which is relatively easy to program but not optimized since it serializes program execution. The second policy is fine-grain synchronization which is notoriously complex to program but provides better performance and scalability. On the other hand, Transactional Memory (TM) is a widely researched and novel synchronization scheme that is easy to program, scalable and non-blocking. TM based applications perform best when there are few conflicts among the transactions. Transactions are regions of codes containing shared data that can be executed concurrently. A Hybrid Transactional Memory (HyTM) scheme uses combinations of Software TM (STM) and Hardware TM (HTM) depending on the characteristics of the application. In this work, we first study the performance of several synchronization schemes used for parallel applications and a variety of transactional memory policies. Then, we propose an Adaptive Hybrid Transactional Memory (AdHyTM) that may outperform not only existing state of the art Hybrid, Hardware, and Software Transactional Memory but also most of other existing synchronization schemes. Also, our proposed AdHyTM will dynamically adapt to application behavior to provide improved performance, particularly in parallel graph applications.

German Reyes, Yuzhe Yan, & Hansuk Sohn; Industrial Engineering, NMSU

Optimization of Bio-fuel Logistics in the Southwestern United States

Optimization of Bio-fuel Logistics in the Southwestern United States; Bio-fuels have gained much attention over the last decade. However, most of the research efforts have been focused on improving the quality and increasing the productivity of bio-fuels, and there have been minimal attempts to develop research on the supply and delivery issues of these sources. We believe that the viability of bio-fuels is strongly related to the efficiency of the distribution networks. This paper presents an optimization model and its application to an infrastructure for bio-fuels distribution network. Unlike other studies on the topic acknowledging the fact that traditional sources of fuel (i.e. petroleum) will not readily disappear from the competitive landscape, we focus on the dynamic nature of how the "new" and "old" energy sources may ultimately co-exist by adjusting their geographic product offerings based on production and transportation costs. To handle the uncertain demands of bio-fuels, we adopt the concept of stochastic programming. The presented model also considers two different modes of transportation with heterogeneous fleet size. The applicability of the optimization model is demonstrated in the case study of Bio-fuels distribution network in the Southwestern United States. The results demonstrate that the model is a practical and flexible tool in solving realistic distribution planning problem of bio-fuels.

Susana Ríos & Louis Meza; Las Cruces Public Schools

Applying an Inter-Disciplinary Thinking Model to Teach Science coupled with Literacy, Math and Technology to support English language learners

Teaching and learning science stands with more emphasis than ever since the inception of the Next Generation Science Standards (NGSS) in North American classrooms and the crisis that Science, Technology, Engineering and Mathematics (STEM) subjects experience in contemporary learning environments with English Language Learners (ELLs). Supporting young ELLs with diverse socio-cultural and linguistic backgrounds to become scientifically literate entails understanding subject matter and how scientific knowledge -also referred as nature of science (NOS)-develops (Lederman, 2014). English language learners (ELLs) require of teachers to ease their cultural transition into the school setting while helping them learn English simultaneously (McMcrary, Sennette, & Brown, 2011). Teachers of ELLs must (a) provide adequate linguistic support, (b) provide access to second language acquisition resources and services for learning needs, and (c) be sensitive to students' cultural and linguistic backgrounds (Zimmerman, 2014) while practicing culturally responsive pedagogy (Stevens & Brown, 2011). Teaching today requires that teachers are prepared not only to teach with technology but to "become critical multicultural literacy educators" (Stevens & Brown, 2011, p. 32). A challenge is upon contemporary early childhood teachers of ELLs to integrate the NGSS into their instruction to ensure equitable education for the young.

This presentation has the purpose to encourage the use of a thinking model to teach science to young ELLs as an inter-disciplinary method that threads Literacy, Math and Technology through current research-based critical pedagogical practices. We aim to expand critical literacy pedagogy awareness, foster ELL's academic growth, and re-engineer the notion of teacher reflection.

Debasmita Roychowdhury; Curriculum & Instruction, NMSU

Analysis to Emancipation: Critical Discourse in a Composition Classroom

This presentation, using the critical discourse analysis framework (CDA), investigates how ideology and power represented in the discourse of war and weapon are hegemonic in nature and how they are influencing the American public opinion. My purpose, in this presentation, is to show that powerful social discourse affects our lives. As an instructor, I want my students to be aware of the power structure within which they live. The Rhetoric and Composition classroom can be the locus for an in-depth understanding of hegemonic power. Towards that goal, students in my classes are expanding their critical views of the current social realities through discussions and writing research papers on gun violence issues. After several semester, I am able to assess - albeit formatively - how students are being circumspect in their deliberations.

Lindsay Ruckel & Melanie Hill; Psychology, NMSU

The Death of Dating and the Birth of Hooking-Up: An Examination of Psychosocial Factors Relating to Young Adults' Hook-Up Experiences

On the majority of college campuses, it appears that dating is becoming less common and the prevalence of "hooking-up" or having casual sex in non-committed relationships is steadily increasing. Although the term "hooking-up" is quite ambiguous and varies by individual and context, most researchers refer to hooking-up as a sexual encounter in which there are "no-strings-attached" that is comprised of a variety of sexual behaviors from kissing to engaging in sexual intercourse (e.g., Reiber & Garcia, 2010). According to some research, between 65% to 80% of undergraduates have hooked-up with someone at least once while in college (e.g., England, Shafer, & Fogarty, 2007; Garcia & Reiber, 2008; Lambert, Kahn, & Apple, 2003). Although a dearth of research has been conducted on factors related to sexual satisfaction in relationships (e.g., Menard & Offman, 2009), less research has been conducted on the sexual experiences of men and women who hook-up. To date, studies show that psychological factors such as sexual assertiveness and body image are linked to sexual satisfaction. However, less research has been conducted on how these and other variables relate to sexual experiences in terms of hooking-up. The current study examined men's and women's hook-up behaviors, attempting to uncover important factors that relate to motivations to hook-up, frequency of hook-ups, comfort level during hook-ups, and positivity/negativity of hook-up experiences. Results and implications of the study will be discussed.

Margarita G. Ruiz Guerrero, Michelle Salazar Perez, & Elaine Mora; Curriculum & Instructions, NMSU

Black feminist photovoice: Early childhood teacher candidates critically examine systems of power while generating possibilities for resistance

In a family and community course at a public university in the borderlands of the U.S., early childhood teacher candidates engaged in photovoice, informed by Black feminist thought, to examine structural, disciplinary, hegemonic, and interpersonal power related to issues such as colonization and heteronormativity, and identity constructs such as race, class, gender, and dis/ability. In this roundtable discussion, we share how teacher candidates, through the use of Black feminist photovoice, worked collaboratively to (re)produce abstract representations of power that influence their experiences with, and ways in which they might generate support for, young children, families and communities.

Jesus Salvador Sambrano, Jr., Y. Smagley, A. Chigaev, L. Sklar, & J. Houston; Chemical & Materials Engineering, NMSU

Quantitative representation of multiple conformational states of integrins using high throughput lifetime-dependent flow cytometry

Integrins are adhesion receptors that mediate cell-to-cell adhesion, cell-to-cell matrices and cell-to-pathogen interactions. They are expressed on virtually every cell type. Integrin's ability to bind to its ligand is modulated through intracellular signaling that regulates integrin conformational. Conformational changes induce rapid molecular affinity modulation, vertical changes in a position of the ligand binding site (bent or extended state) and lateral distribution of the molecules on the cell membrane. The ability to understand these conformational changes will assist in further understanding of a pathogenesis of multiple diseases including blood diseases and cancer. We use Forster Resonance Energy Transfer (FRET) with fluorescence intensity-based measurements in human cell line U937, to study the structural transformations of integrins. FRET with fluorescence lifetime-dependent cytometry can be used to observe these structural transformations and exploit the homogeneity of integrin conformational states across the cell population. Upon ten repeated measurements, average fluorescence lifetimes of LDV-FITC in a non-quenched state is measured to be 4.00 ± 0.03 ns. During FRET events, the average fluorescence lifetime of LDV-FITC quenches to 3.1 ± 0.35 . Post-activation (de-quenching of the LDV-FITC), the fluorescence lifetimes are 3.4 ± 0.55 ns. We expect bent conformations that are engaged in FRET to have shorter lifetimes compared to the extended state, where longer lifetimes are expected. This study requires more work to quantify the fraction of integrins in various states for each individual cell. We are refining flow cytometers to enable this through a technique called "multi-frequency flow cytometry."

Rishi R. Sapkota, Steven J. Ontiveros, Charles B. Shuster, & Jeffrey B. Arterburn; Chemistry & Biochemistry, NMSU

Lysosome targeting new class of fluorescent compounds

Live cell imaging can provide plethora of information about the dynamics of biological systems, made possible by the development of specific fluorescence probes for intracellular organelles and physiological conditions. Here we described the synthesis and characterization of new class of fluorescent molecules starting from simple pyridine derivative and 9-fluorenone. These classes of dyes are called hydrazino pyridinium (HPY) dyes. HPY dyes are bright and possess a wide range of absorption and emission wavelengths with high quantum yield. As a proof-of-concept that these small, neutral dyes can be used as live cell probes, a basic HPY derivative was synthesized that targets acidic intracellular organelles like lysosomes in mammalian cells and vacuoles of the yeast. These probes were found to perform effectively in comparison with existing commercial products, and demonstrated additional capabilities suitable for selective imaging applications in non-mammalian systems.

Collin Scarince & Michael C. Hout; Psychology, NMSU

Cutting Through the MADness: Understanding Operator Performance on Complex and Dynamic Search

Human visual perception is amazing, but it is in no way perfect. This is in part because the visual system needs to be efficient across diverse scenarios. Most visual research has tested the visual system's proficiency in static environments—when no or few items in the display are moving. The present study was conducted to understand how people search very complex displays. Using a multi-element asynchronous dynamic search paradigm (MAD; developed by Kunar & Watson, 2011) in three experiments, participants were tested on their sensitivity and ability to respond to targets, as well as their search strategies in complex searches.

Sam Schonfeld, Stephen White, Carl Henney, Nick Arge, and James McAteer; Astronomy, NMSU

The Coronal Sources of Solar F_{10.7} Flux

We present results from the first full-solar-disk F_{10.7} (10.7 cm radio flux) image taken with the S-band receivers on the recently upgraded Karl G. Jansky Very Large Array (VLA). We find that $8.1 \pm 0.5\%$ of the variable component of the F_{10.7} flux is associated with the gyroresonance emission mechanism. Additionally, we identify optical depth effects on the radio limb which may complicate the analysis of F_{10.7} time series. The F_{10.7} flux is used in space weather studies as a proxy for the Sun's extreme ultra-violet (EUV) ionizing flux at Earth. Both bremsstrahlung emission from the bulk coronal plasma and gyroresonance emission from plasma interactions with strong magnetic fields contribute to F_{10.7}. However, only the bremsstrahlung emission correlates directly with EUV, therefore it is important to understand the fraction of F_{10.7} associated with these two emission mechanisms. Using coronal EUV images from the Atmospheric Imaging Assembly (AIA) we construct differential emission measures (DEMs) which we use to predict the bremsstrahlung component of the F_{10.7} flux. Comparing this bremsstrahlung prediction with the observed radio intensity and polarization we identify the morphology and amplitude of gyroresonance sources.

Megan Stamey McAlvain; Anthropology, NMSU

Assessing for Culturally Competent Older Adult Care

I will be focusing on medical residents' education in the field of gerontology/geriatrics, their experiences with culturally competent older adult care, and the patients' response to the medical residents' use of said training and treatment. I will be assessing for culturally competent older adult care at the Southern New Mexico Family Medicine Residency. I am focusing on the medical residents' education in culturally competent older adult care in order to better understand how medical residents in a borderlands region develop and use this knowledge in their treatment of patients. Additionally, I am focusing on the patients' response to receiving care, and whether or not the medical residents' in fact implement their training in a way that has a positive outcome for their patients. To gather qualitative data that can be used to develop curriculum in medical education, the project addresses the following research question: In what ways does Southern New Mexico Family Medicine Residency Program promote high quality older adult patient care through cultural competency training? Addressed in 3 steps: 1. In the context of cultural competency training, to what extent are the medical residents trained in older adult care? 2. To what extent are residents implementing their training in older adult care? 3. Do patients experience a positive patient-resident interaction (positive outcome)?

Kathryn Steakley; Astronomy, NMSU

Investigating Dust(less) Devils with Mars Science Lab

Understanding the frequency of and conditions that facilitate dust devil activity on Mars are key questions in determining whether convective vortices that lift dust are the main contributors to background dust opacity. Using pressure data from the Rover Environmental Monitoring Station (REMS) in Gale Crater, we detect approximately 200 convective vortices during the first 583 sols of the Mars Science Lab (MSL) mission. Most of these events do not have corresponding decreases in UV flux, which suggests that they are mainly dustless. Pressure drop magnitudes for the detections range from 0.31 - 2.86 pascals and 0.037 - 0.330% of ambient pressure. A rough approximation of the pressure drop required to lift dust can be made by assuming the vortices are in cyclostrophic balance (Sinclair, J. Atmos. Sci. 30, 1599, 1973) and that the tangential wind velocity threshold for particle lifting on Mars is between

12 and 40 m/s depending on particle size (Greeley et al., JGR 108, 5041, 2003). We estimate that under the right meteorological conditions at Gale Crater, the very smallest pressure drop that could lift particles is around ~ 2 pascals, suggesting that the majority of our detections are not strong enough for significant lifting. Further investigation of the local climate and drivers of convection within Gale Crater could explain why these vortices are relatively dustless and weak in magnitude.

Pochou Su; Electrical & Computer Engineering, NMSU

A Configurable Cache Performance Model for Monte Carlo Processor Model

Over decades, researchers have been developing different microprocessor architectures to increase the performance while reducing power consumption. The use of simulation and performance prediction models is the fastest, and the most cost-effective way to exploit various design spaces before actual implementation. Detailed cycle-accurate simulator is the most popular method among others due to the fact that it can produce numerous and accurate insights. However, with the advance of modern complex and realistic workloads, the simulation often takes weeks and sometimes even months when evaluating multiple design points. To alleviate this problem, researchers have proposed using Monte Carlo Method to model modern microprocessor performance to drastically reduce the simulation time, while retain the accuracy and robustness of the microprocessor modeled.

While these Monte Carlo processor models are able to provide fast and accurate processor performance prediction, the cache component of the model has not been thoroughly studied. Inaccurate cache model can increase the inaccuracy of the processor model by various degrees depending on different workloads. As a solution, we propose a fast and accurate cache performance model to predict the cache miss rate, by utilizing memory address references and combining the effects of different cache management mechanisms which encompass various ranges of cache configurations, such as cache line size, associativity, replacement policies and coherence protocols, for exploiting different cache design points considering both private and shared cache. This proposed work will provide a more flexible and accurate cache model for the existing Monte Carlo processor model, hence increases the accuracy and the flexibility of the Monte Carlo processor model.

Jessica Tabacca & Karina Fonseca; Industrial Engineering, NMSU

Grocery Shopper Characteristics and their Impact on Produce Purchases

New Mexico suffers from high obesity rates and undesirable eating habits in part due to the poor food choices shoppers make at their local grocery stores. Low-nutritional snack foods like soda and chips often dominate fruit and vegetable purchases. Data collection using video footage from an El Paso grocery store identified shopper characteristics (gender, approximate age and BMI, etc.) and their produce purchasing behaviors (shopper movement through the produce section and the items selected). The research problem is two-fold: how can shopper behavior be analyzed to identify the influencing factors that lead to healthier food choices, and can we develop and model strategies to target these influencing factors to increase fruit and vegetable purchases?

This study focuses on an exploratory analysis to identify factors associated with individual grocery shoppers to better understand the grocery shopper population. Statistical tests and regression analysis will determine which factors are strongly correlated to produce purchases in order to produce purchasing behavior. Through future consideration of the significant factors, strategies can be developed addressing those factors that lead to increased produce purchases. Future modeling efforts will test these strategies with the aim of simulating shoppers buying more produce for a healthier lifestyle as a possible reality. This study is an ongoing effort with concluding analysis scheduled for May 2016.

Gaurav Thapa; Geography, NMSU

Internship Program at the United Nations Office at Nairobi: Building a National Urban Policy Database for United Nations Human Settlements Programme (UNHabitat)

United Nations Human Settlements Programme (UN-Habitat) headquarters is located inside the United Nations (UN) complex in Nairobi, Kenya. This UN complex continues to be the only UN headquarters to be placed beyond the boundaries of the developed world. Being placed in sub-Saharan Africa allows the UN offices housed there to provide unique challenges and opportunities for students participating in an internship program. One of these opportunities is to witness the rapid rate of urbanization taking place in the developing world and observe how the developing world meets the need to dictate the process of urbanization and not be dictated by it. The enormity of the challenge in terms of numbers lies in the fact that there will be a further 2.45 billion urban dwellers in the next forty years and most of them will be from Asia and Africa. The UN-Habitat now views National Urban Policy as the most important tool to address this challenge however; very little research has been done to assess the validity of this tool. The project to create a National Urban Policy database came about to highlight how almost every country now views urbanization not through a rural versus urban dichotomy or as a sole prerogative of cities but as a national challenge. Most importantly a dynamic National Urban Policy database was created to provide an ever expanding knowledge library required to place UN-Habitat at the forefront of integrating spatial analysis with economic geography while promoting National Urban Policies in various countries.

Sasi Prabhakaran Viswanathan, Amit Sanyal, & Maziar Izadi; Mechanical & Aerospace Engineering, NMSU

Mechatronics Architecture of Smartphone-Based Spacecraft ADCS using VSCMG Actuators

Hardware and software architecture of a novel spacecraft Attitude Determination and Control System (ADCS) based on smartphones using Variable Speed Control Moment Gyroscope (VSCMG) as actuator is proposed here. A spacecraft ground simulator testbed for Hardware-in-the-loop (HIL) attitude estimation and control with VSCMG is also described. The sensor breakouts with independent micro-controller units are used in the conventional ADCS units, which are replaced by a single integrated off-the-shelf smartphone. On-board sensing, data acquisition, data up-link/downlink, state estimation and real-time feedback control objectives can be performed using this novel spacecraft ADCS. The attitude control and attitude determination (estimation) schemes have appeared in prior publications, but are presented in brief here. Experimental results from running the attitude estimation (filtering) scheme with the “onboard” sensors of the smartphone in the HIL simulator are given. These results, obtained in the Spacecraft Guidance, Navigation and Control Laboratory at NMSU, demonstrate the excellent performance of this estimation scheme with the noisy raw data from the smartphone sensors.

Zhihua Yang; Chemical Engineering, NMSU

Measuring Cell Populations Expressing GFP/GFP- dCit and iRFPs with Different Fluorescence Lifetime by Time-resolved Flow Cytometry

The fluorescence lifetime of any fluorescent molecule is a very useful photo physical trait that is widely implemented in cellular studies and biological assays. For example, cell experiments that use genetically encoded fluorescent proteins might benefit from the lifetime measurement in order to separate groups of intracellular fluorescence proteins that have similar emission spectra. The fluorescence lifetime of fluorescent proteins is unique to the protein, and also might shift if the protein yield changes or if the protein is transferring energy to other fluorescence molecules. In our laboratory we are developing ways to measure the fluorescence lifetime using high-throughput flow cytometry. We are also implementing approaches to add the fluorescence lifetime measurements to a flow cytometer so that we can sort single cells based on this time-resolved parameter. Some of the longer term goals for lifetime-based sorting include separating single cells that express a variety of different fluorescent proteins. The cells that we measure might range from mammalian, to bacterial, to yeast. We believe that a new time-resolved cell sorter will increase the signal to noise ratio over standard cytometry measurements and enable isolation of cells expressing variants of fluorescent proteins in order to study cell signaling or to simply enrich fluorescent proteins having a higher quantum yield.

Tara M. Young, Michael J. Marks, Yuliana Zaikman, & Jacqueline Zeiber; Psychology, NMSU
Situational Influences on Condom Purchasing

Despite the well-documented importance of condoms and safe sex, there are still many people that do not use condoms (U.S. Department of Health and Human Services, 1986). Embarrassment and other negative emotions that occur while personally purchasing condoms is arguably one of the most compromising factors in consistent condom use. It is important to look at how situational differences can affect emotions and behavior related to purchasing condoms (Dahl et al., 2001). The present study examines the influence of different condom purchasing methods on emotions felt while hypothetically purchasing condoms, and on the overall decision of whether or not to purchase condoms in a hypothetical situation. Participants read and imagined one of three scenarios: anonymously purchasing condoms at a self-checkout counter, non-anonymously purchasing condoms at a regular checkout counter, or asking for condoms from a locked display and then non-anonymously purchasing them at a regular checkout counter. No previous studies have examined the situational context of condom purchasing and how it effects their feelings about purchasing condoms or the likelihood of purchasing them. . Results indicate that women reported more negative emotion than men when imagining purchasing condoms from the hypothetical situations, and that women reported more negative emotions than men in the self-checkout condition and in the locked display condition. There were no sex differences in the regular checkout condition. Women also reported being less likely to purchase condoms from the hypothetical scenarios in real life.

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Gender Role Violations and Sexual Double Standard

The sexual double standard (SDS) is the notion that women are evaluated negatively and men positively for engaging in similar sexual behaviors. According to social role theory, the sexual double standard exists due to the structure of gender roles. Consequentially, the SDS can be viewed as arising due to perceived violation of sexual behavior of women. In addition to gender role violations of sexual behavior, there are two additional violations of gender roles: heterosexuality norms and gender role characteristics. The goals of the study are: a) to investigate whether the SDS persists to homosexual and gender role characteristics violating targets and b) to examine which of three gender role violations influences people's evaluations of others' sexual behavior. A US-sample of 483 participants evaluated a target individual who was either female/male, heterosexual/homosexual, feminine/masculine and reported having 1/12 sexual partners. Results indicate that SDS persists for gender role violating targets; however, is exhibited differently for targets violating heterosexuality norms and targets violating gender role characteristics.

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Homonegativity, Traditional Gender Roles, and the Sexual Double Standard

The sexual double standard (SDS), the notion that women are stigmatized for sexual acts while men are not, has seen a resurgence of research in the last decade. According to the functional approach of attitudes toward homosexuals, homosexuality is a symbolic attitude that violates societal norms for sexuality; because those who adhere to traditional gender roles tend to hold symbolic attitudes, this research aims to address whether homonegativity (negative attitudes about homosexuality) and adherence to traditional gender roles serve as moderators for the SDS. Seventy participants from New Mexico State University completed a survey assessing their degree of homonegativity, adherence to traditional gender roles, and endorsement of the SDS. Results revealed that as adherence to traditional gender roles increases with endorsement of the SDS but there was no relationship between homonegativity and endorsement of the SDS. These results suggest that while traditional gender roles may play a role in the SDS, homonegativity does not. Following the Pilot Study, two hundred and forty participants completed a survey assessing their degree of homonegativity, adherence to traditional gender roles, and behavioral intentions regarding a hetero/homosexual male/female target person with 1/12 sexual partners. Preliminary analyses reveal that homonegativity is a predictor of their behavioral intentions towards a target person. However, adherence to traditional gender roles does not predict behavioral intentions. Main study results suggest that while a person's adherence to traditional gender roles may not serve as a moderator for their behavioral intentions regarding a target person, their degree of homonegativity does.