2009

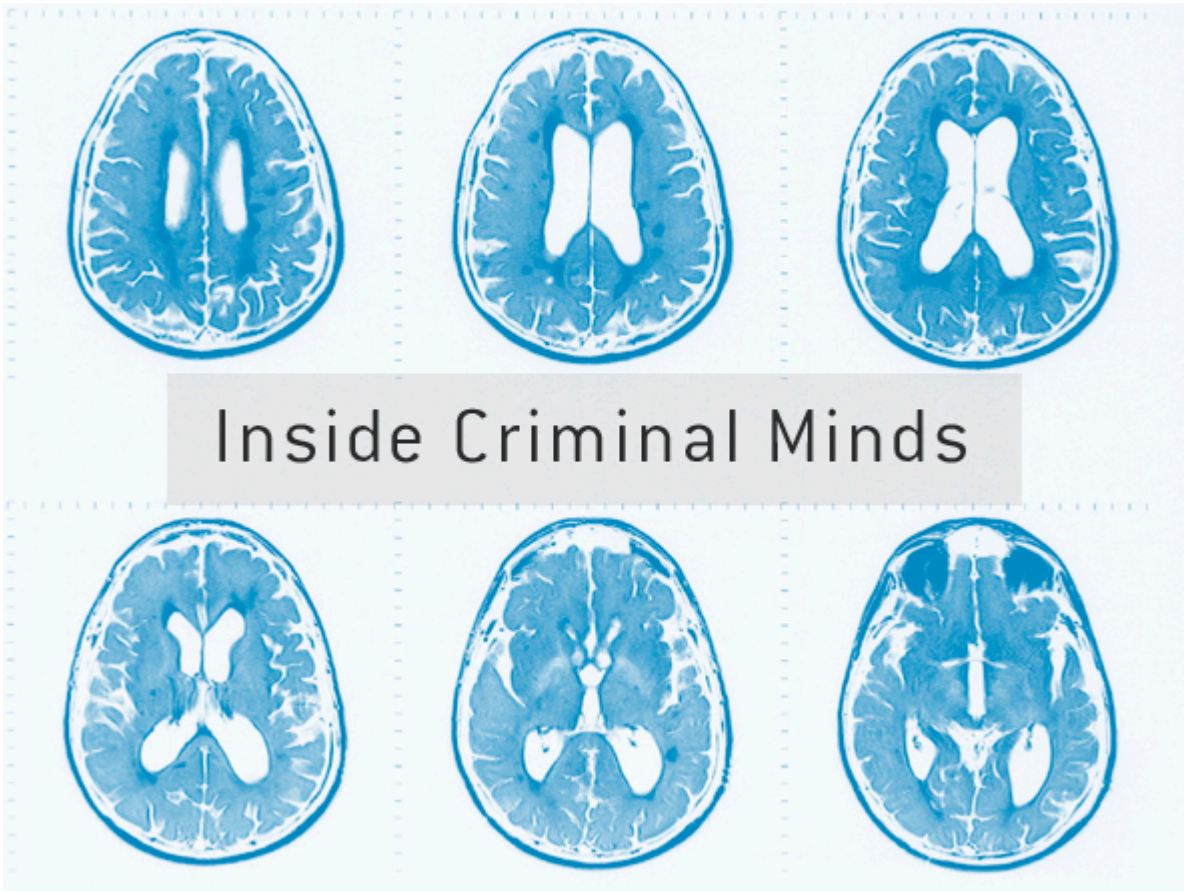
Quantum: Research, Scholarship & Creative Works at the University of New Mexico, 2009

Office of the Vice President for Research

Quantum 2009

Research, Scholarship & Creative Works

in this issue:



Neuroscientist Kent Kiehl uses imaging technology to study the brains of criminals.

by Luke Frank

Perhaps the most notorious psychopath in modern time is serial killer Ted Bundy, a cunning, remorseless mass murderer from the Pacific Northwest who struck for at least a decade in the 1970s. Bundy's modus operandi was so deviant from normal human social behavior – so very violent and depraved – that it lured a young Kent Kiehl into the neurosciences.

There was another compelling hook for Kiehl's interest. He and Bundy grew up in the same neighborhood in Tacoma, Washington, although a generation apart. Kiehl just couldn't reconcile how somebody with whom he had shared similar socio-economic environments could take such a bizarre and horrible turn. And what effects might these environmental sets have had on Kiehl himself?

Bundy is long gone, and believe it or not, Kiehl is in prison. About two days a month he travels to New Mexico Correctional facilities, mostly in Grants and Albuquerque, interviewing inmates with a history of psychopathic behaviors – with their full consent. His team also is out there six days a week collecting and organizing as much data as possible.

The road trips involve tugging a 30-ton trailer fully loaded with an fMRI scanner and all of its accoutrements. Kiehl helped custom-build the $2.3-million rig that resides at the Mind Research Network (MRN, or the Mind) at the UNM Health Sciences Center.

Inside the Mind

The Mind is a remarkable imaging center loaded with MR and MEG / EEG cores, as well as a specially designed MEG apparatus for children, called the BabySQUID, housed in the same building with UNM's Biomedical Research and Integrative Neuroscience (BraIN) Center.

All of this imaging technology is the very nucleus of Mind. From there, its network expands through in-house neuroinformatics and neurogenetics cores, then outward to UNM's departments of psychiatry and neurology and onward to engineering and psychology on the UNM Main Campus. The network further expands to Sandia and Los Alamos national labs, the University of Minnesota, Massachusetts General Hospital, UC Irvine, and further outward from there.

Kiehl is director of MRN's Mobile Imaging Core and Clinical Cognitive Neuroscience Program and Associate Professor of Psychology and Neuroscience at UNM. Also a principal investigator, Kiehl believes that aberrations in human brain circuitry can be identified through the Mind's intricate network of neuroscience capabilities.. More specifically, he wants to know where the circuitry goes wrong in a psychopath, so he goes looking for them in New Mexico prisons.

With support from the National Institutes of Health and the John T. and Catherine D. MacArthur Foundation, Kiehl and his team spend hours interviewing each subject, assessing him for psychopathic tendencies, substance abuse, and other mental health problems. They employ functional and structural MRI to record neural activity during various tasks, and collect anatomical images of the brain. DNA samples are collected to search for genetic risk factors.

What's it like working with violent offenders? "I've been doing this for awhile now," says Kiehl. "You get to know the social dynamics inside." Most inmates welcome the diversion of people from the outside. If you deal with inmate "leadership," you run the risk of winning the approval of the entire group or alienating them all.

What Is a Psychopath?

Psychopaths are individuals – male, female; young and old – who exhibit a host of the following behavioral characteristics: glibness and superficial charm; a grandiose sense of self-worth; pathological lying; cunning and manipulative behavior; lack of empathy, remorse, or guilt; a failure to accept responsibility; and promiscuous behavior.

Other characteristics include: a need for stimulation/proneness to boredom; poor behavioral control; a lack of realistic, long-term goals; impulsivity and irresponsibility; juvenile delinquency; short-term marital relationships; and criminal versatility.

The first MRI studies of psychopaths, published less than 10 years ago, indicated reduced amygdala activity buried deep in the brain tissue of psychopathic criminals in response to emotionally charged words. Kiehl was the primary author in that study, but has taken a wider view, observing the entire paralimbic network in the temporal and frontal lobes of the brain.

Ultimately, Kiehl is looking for the combinations of behavioral and personality traits more common in violent criminals that also are indicators of repeat offenses. “The societal cost of crime is estimated at more than a trillion dollars annually,” Kiehl offers. “Consider the scope of various impacts associated with prevention or treatment answers to psychopathy. Such impacts could be enormous.”

Law professors Antoinette Sedillo Lopez and Gloria Valencia-Webber examine powerful immigrations stories and try to help people reframe these stories in light of underlying realities.

by Benson Hendrix

After September 11, 2001, the United States government began tightening rules on immigration into the United States, primarily on the U.S.-Mexico border. However, while immigration rules were examined and strengthened, several root causes were left out of the equation. Reasons people immigrate to the United States from Mexico, stories they heard of a better life up north, and travel of indigenous peoples whose homelands straddle the U.S.-Mexico border are some of the overlooked issues.

Two University of New Mexico School of Law professors, Antoinette Sedillo Lopez and Gloria Valencia-Weber examined some of these root causes and the impact of a post-September 11 worldview on these groups. The two colleagues began by studying the impact of stories of success and heartbreak as told by people who crossed the U.S.-Mexican border. This initial topic led the two professors to look at different aspects of immigration reform in the Southwest.

His name was Pablo Lewis.

He graduated from high school in Arizona, joined the U.S. Army, served with the Second Armored Division in Germany during World War II, came back to the U.S., and worked for the federal government before retiring.

When Lewis applied for Social Security benefits, he could not prove he was a citizen because he was born

on the Tohono O'odham reservation south of the U.S.-Mexico border. He had no birth certificate.

Valencia-Weber wants to know why this happened, and how to keep it from happening to members of other tribes whose homeland spans the borders of the United States and either Mexico or Canada.

When the United States government worked on new immigration rules post-9/11, a topic not addressed was the impact of these rules on groups already crossing both borders into the United States, members of "transnational" tribes.

"From the point of view of indigenous sovereigns, the border lines were arbitrarily drawn and don't match the historic relationship and homeland borders of these people," Valencia-Weber says.

The political relationship between these transnational tribes and the United States can be tracked to treaties. For Native American tribes on the U.S. and Canadian border the Jay Treaty, signed in 1794, guaranteed the rights of tribal members to pass across the U.S.- Canada border.

A similar treaty exists between the United States and Mexico, the Treaty of Guadalupe Hidalgo.

"Guadalupe Hidalgo is the core treaty to preserving the rights of tribes throughout the Southwest," Valencia-Weber explains. "Hidalgo is key because it incorporates the agreements with Spain and Mexico as well, who agreed to recognize the sovereignty of the tribes."

After 9/11, the new United States Department of Homeland Security's Western Hemisphere Travel Initiative (WHTI) began tightening travel restrictions not only for U.S. citizens, but also for members of the 25 tribes spanning both borders, and the almost 50 additional tribes that share commonality with those tribes and who also had free travel rights. New rules require everyone to have a passport to enter at the U.S. border.

Federal courts have said the relationship between tribes and the U.S. is "trust" based, that the U.S. is acting in trust to provide for the tribe, like a trustee responsible for a ward. Lipan Apache Dr. Eloisa G. Tamez challenged Homeland Security's travel restrictions and the construction of a wall at the U.S.-Mexico border in Texas. A recent court decision determined that the federal government did not act in good faith.

After the recent court ruling, Valencia-Weber is waiting to see if the Department of Homeland Security will consult and work with transnational tribes to develop an agreement to address Homeland Security's concerns with the life, customs, and travel needs of the tribes.

"No one wants lawbreakers, smugglers, and terrorists to use tribal homelands to get into the United States," Valencia-Weber says. "But these tribes do want to ensure that tribal members will be respected in their political right to travel their homelands."

"The term 'illegal immigration' conjures up issues of criminality, while displacement of communities describes what is happening to many Mexican villages and towns," Professor Sedillo Lopez says. "I think that framing the issues around family unity, cross-border communities, cross-border environmentalism, and Mexico/U.S. collaboration can help people see the many complexities of the issue."

As research, Sedillo Lopez read articles in news outlets while directing a summer law school program in Guanajuato, Mexico, and examined how the articles were framed and how that view affected the emotional response of the readers. Stories in Mexican newspapers about life in small villages carried a tremendous impact on their readers.

These stories portrayed small villages as ghost towns, dying off and leaving a population primarily made up of women, children, and the elderly, with the men leaving to find their fortunes in larger cities or in the

United States. With the men gone, the tax base of these villages where reported to be devastated, unable to collect money to repair roads, and provide clean water or utilities.

“The articles are sounding a warning to Mexican officials, and to would-be migrants, making an appeal for them to stay in Mexico,” Sedillo Lopez says. “But how an article is framed may show Mexicans that the only way to make their fortune is in the United States.”

According to Sedillo Lopez, her goal is to analyze the framing of migration stories from Mexico and try to help people reframe these stories and look at them in light of underlying realities, such as the historical context, the data, lived experiences, and their underlying values.

Researchers are studying the dynamics of New Mexico river ecosystems to aid projects in river restoration.

by Sari Krosinsky

Man-made interventions like dams disrupt a river's natural flow. Restoration strategies aim to return the delivery of water to reflect its natural pattern and course. While in some areas it is desirable to prevent erosion, in others it's better to encourage erosion to allow the flooding necessary to support some native vegetation, like cottonwoods.

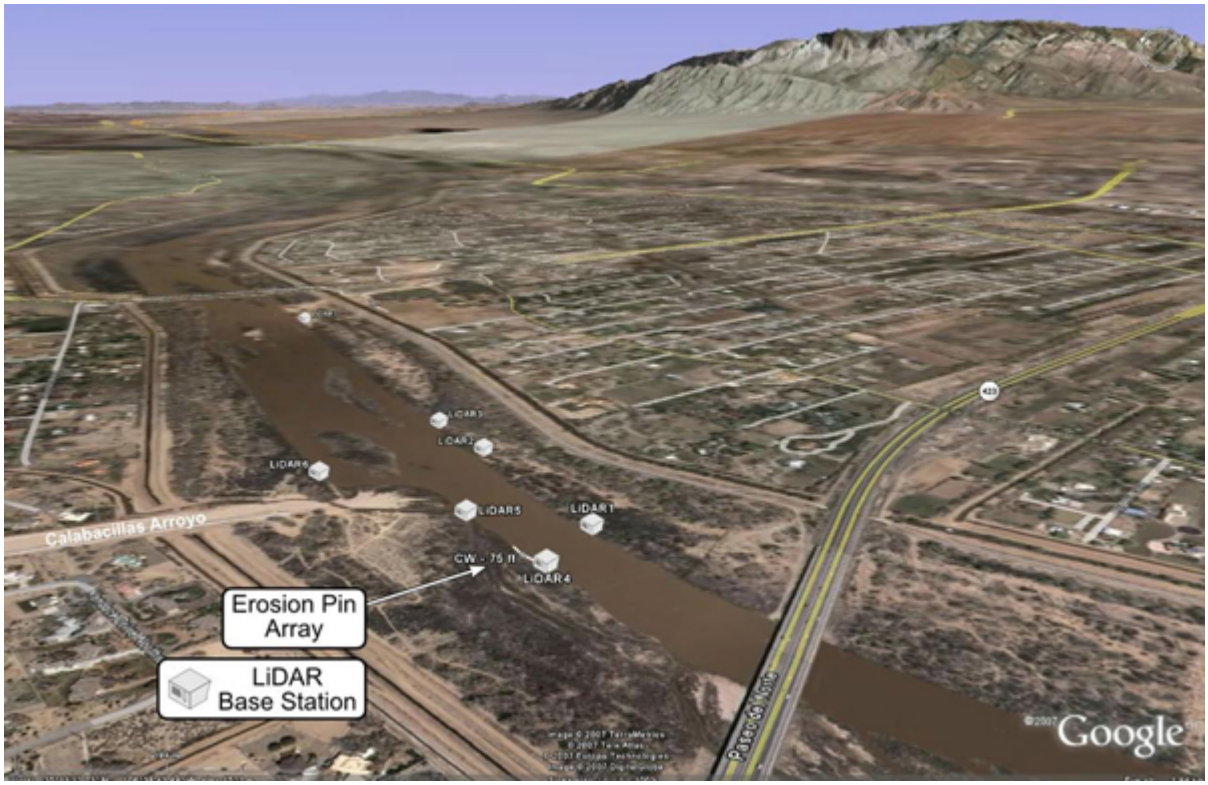
The U.S. Army Corps of Engineers conducts river restoration projects locally to encourage native vegetation and control erosion and flooding. And, in a collaborative effort, researchers in UNM's Departments of Civil Engineering, Biology, and Earth and Planetary Sciences are studying the dynamics of river ecosystems in New Mexico to help effectively direct the corps' restoration efforts.

Civil Engineering Professors Julie Coonrod and John Stormont and Earth and Planetary Sciences Professor Tim Wawrzyniec and Research Scientist Jed Frechette are investigating riverbank erosion. A better understanding of bank erosion can help predict how different river restoration strategies will work.

The researchers are using multiple methods to monitor bank stability. One method, Light Detection and Ranging, or LiDAR, is a laser imaging technique capable of resolution up to 1 millimeter. Another method involves placing erosion pins in sets above and below water surfaces. Erosion is determined by measuring how much of the pin is exposed over time. Additionally, the researchers are using a submerged jet apparatus to measure how much different soil types erode.

Stormont says LiDAR gives a more detailed picture and provides more data than the erosion pin method, but it creates a huge data analysis challenge. Periodic LiDAR scans from the same position reveal changes in the riverbank geometry over time, measuring migration as small as a centimeter. Scans are being conducted at five locations around Albuquerque where there has been human intervention. Coonrod says that for the most part, banks around Albuquerque are relatively stable unless people have done something to change them, like removing vegetation as is done with some restoration projects.

At the Calabacillas Arroyo site, LiDAR images taken before, shortly after, and a year after a storm on July 31, 2006, show that during the storm the arroyo dumped sediment into the river, leading to a buildup which halved the distance between banks, forcing the water to flow harder and faster. Over time, the sediment buildup has shifted downstream.



Another site in the study is the Albuquerque/Bernalillo County Water Utility Authority Dam in the North Valley. The dam, which will divert part of the river for tap water, remains below the surface until it's inflated. Early results during the trial phase show that when the gates were lowered on the west side, the banks on that side were eroded by about half a meter.

To further look at changes along riverbanks and islands, Earth and Planetary Sciences Research Assistant Ben Swanson and Professor Grant Meyer have done aerial photographic analysis combined with the hydrologic record. Swanson is able to document geomorphic changes in response to both anthropogenic and hydrologic events. Combining the geomorphic and erosion studies allows for identifying target areas for restoration or vegetation management projects.

Stormont, Coonrod, and Biology Research Professor Emeritus Cliff Crawford are studying how the diversion dam will affect groundwater-surface water interactions and the health of riparian (riverside) vegetation. Civil Engineering Graduate Assistant Kelly Issacson is developing a model to predict groundwater level as a function of flow rate, to help sustainability management in different areas of the Bosque.

The flow of river water is connected with the depth of groundwater, which is in turn connected with vegetation on the banks. Cottonwoods, for example, need the water table to be no deeper than about three meters, or approximately 10 feet, for most of the year in order get enough water to survive.

Groundwater monitoring wells bracket the diversion dam at four sites, directly upstream, and downstream of the dam and on each side of the river. Measurements were taken before the dam was built, during construction, and during trial operations to determine how the dam influences groundwater levels. Biology Research Scientist Christian LeJeune records and analyzes these ongoing groundwater measurements.

The groundwater levels respond almost instantaneously to the river level. As river levels are raised upstream of the dam, groundwater levels are also raised. Similarly, downstream of the dam, the river levels and groundwater levels are lowered. It's still too early in the research to determine how much the

dam's operation and corresponding changes in groundwater will effect Bosque vegetation.

Another aspect of the research looks at soil properties and soil moisture. The soil is made up of layers ranging from sand to clay, with layer composition varying greatly, even among different samples from the same well site.

The researchers are also measuring leaf and woody litter fall and vegetation cover as indicators of ecological health of the Bosque.

The monitoring wells serve as educational as well as research sites. Elementary, middle, and high school students participating in the Bosque Ecosystem Monitoring Program (BEMP) "track aspects of environmental change that we think are fundamental to the functioning and health of the Bosque ecosystem" under the supervision of teachers and UNM student interns, Crawford says. BEMP, founded in 1997, is a partnership between the UNM Department of Biology and the Bosque School, a private school active in Bosque studies.

A new BEMP site was added at the Albuquerque BioPark wetlands about a year ago, where researchers are studying the groundwater dynamics between the riparian forest, the river, a pond, and a marsh. The research could reveal ways to recreate wetlands along other parts of the Bosque.

Biology Professor Cliff Dahm, Research Scientist Jim Thibault, and Research Assistant Professors James Cleverly and Kristin Vanderbilt are mapping the amount of water released into the air from the plants and soil along the river, a process called evapotranspiration. As part of the research they are exploring the effects of a wildfire in Albuquerque's South Valley during a drought in 2006.

The researchers have been monitoring the site since 2000. The human-caused wildfire burned the area south of the monitoring tower, providing an opportunity to study the fire's effects on evapotranspiration.

When the study began, the vegetation was dominated by dense native cottonwood forest with a nonnative saltcedar and Russian olive understory. A restoration project was conducted from 2002 through 2004 to remove non-native vegetation in the hope of reducing water use and fire risk. Evapotranspiration decreased after the restoration, but increased again as non-native plants regrew. Cleverly says that damage from the 2006 fire would probably have been much greater before the restoration.

After the fire, evapotranspiration decreased and temperature increased. Annual plants grew thickly in the sunny spots left between the burnt trees, sucking moisture from the soil.

Coonrod says the data collected from these and other projects will help determine the best sites and methods for restoration efforts.

Larry Sklar works in scientific teams crossing multiple disciplines to answer important research questions and create innovative tools to make discoveries about the world around us.

by Luke Frank

UNM Regents Professor of Pathology Larry Sklar stepped up to the podium last spring to deliver his lecture, "Team Science: Partnerships for Innovation, Discovery, and Translation."

This was a very special presentation for Sklar indeed, as he was selected to dispense UNM's 53rd Annual Research Lecture, one of the highest honors the University of New Mexico bestows on its faculty members. The lectureship is intended to encourage research and creative work on the university campus.

"Teamwork" and "partnerships" are words echoed increasingly in federal grant submissions and research corridors throughout academia. Sklar can certainly speak to the issue – he works as part of several teams, as Director of the NIEHS Biotechnology Core and Biotechnology Integration and Associate Director of Basic Research for UNM's School of Medicine, Director of Cancer Biotechnology at UNM's Cancer Center, principal investigator of W.M. Keck-UNM Shared Animal Imaging Resource, and Director of the New Mexico Molecular Libraries Screening Center.

The Power of Collaboration

According to Sklar, scientific teams crossing multiple scientific disciplines are now being assembled to answer important research questions. These scientific teams can work together to create innovative scientific tools and use these new tools to make discoveries about the world around us. Some of this innovation and discovery can be translated into opportunities for health diagnostics and therapeutics, as well as economic development.

Perhaps the greatest examples of "team science" in the U.S. are the Manhattan Project or the modern-day Human Genome Project, but Sklar offers his personal example of collaboration and innovation.

Drug discovery today depends upon the rapid analysis of molecular libraries. Researchers use cytometers to test hundreds of different cell and other molecular targets against potential drug candidates. Cytometers have enhanced cell research, but only one sample at a time.

Sklar and colleague Bruce Edwards, a co-researcher and professor at UNM's Health Sciences Center, along with numerous other team members, have developed High-Throughput Flow Cytometer technology that is leading to new molecular discoveries and ultimately new diagnoses and treatments. This innovative system performs cell analysis 5-20 times faster than standard cytometers.

Another Team Science Project

Team science is further being cultivated by the National Institutes of Health's (NIH's) National Roadmap for Medical Research, its approach to accelerated fundamental discovery, and translation of that knowledge into effective prevention strategies and new treatments. Roadmap strategic initiatives are designed to synergize the work of numerous NIH Institutes and Centers, and collectively represent a unique effort that no single or group of institutes can accomplish. The three primary initiatives for NIH funding are New Pathways to Discovery, Research Teams of the Future and Re-engineering the Clinical Enterprise.

"Scientific Teams can attack big problems employing several different science disciplines, multi-disciplinary groups and multi-collaborative groups," Sklar asserts. "These teams can more efficiently help science fill the gaps between what we know and don't know."

UNM Selected As National Molecular Discovery Center

In 2008, the National Institutes of Health (NIH) selected the University of New Mexico as one of only nine national molecular discovery centers in the U.S. with a six-year, $15.5 million grant.

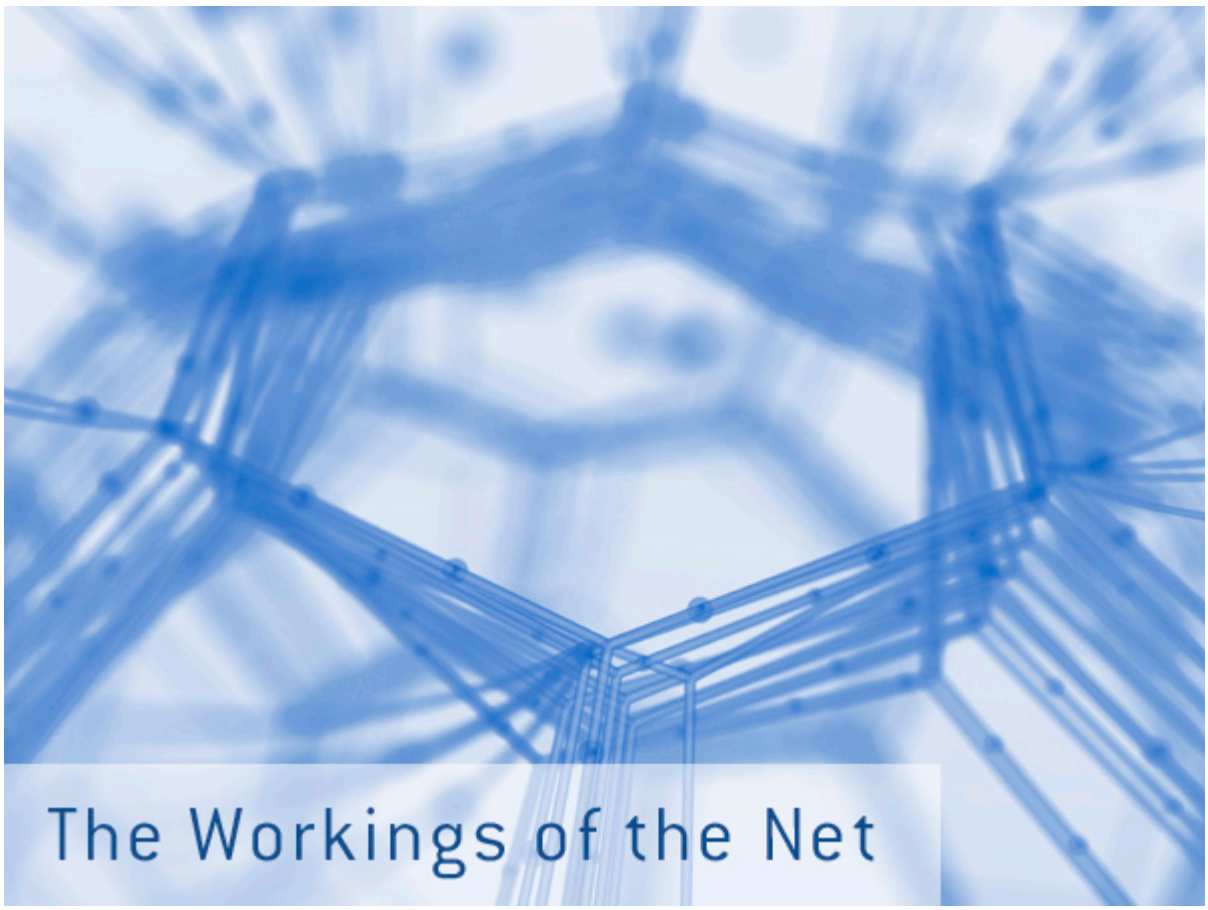
Part of the NIH Roadmap Molecular Libraries Initiative, the UNM Center for Molecular Discovery will operate as a biological screening center effecting and monitoring the interactions of small molecules and proteins that can regulate biological processes.

Among other things, the center will function as a discovery center aimed at identifying small molecules that can be used as chemical probes and as leads for drug discovery. These capabilities have tremendous potential for economic development in New Mexico. Discoveries at the molecular level can have pharmaceutical, clinical and research applications.

"We have a great team that we've been building for years," remarks Larry Sklar, UNM Regents Professor and discovery center director. "We've even developed and patented, with Bruce Edwards as co-inventor, some of our own technology to dramatically accelerate the process of molecular discovery."

"The UNM Center for Molecular Discovery has been in pilot phase for about three years," adds Richard Larson, Vice President for Translational Research and Senior Associate Dean for Research at UNM's School of Medicine. "Now we can move into the production phase."

The NIH Molecular Libraries Program offers public sector biomedical researchers access to the large-scale screening capacity necessary to identify small molecules that can be optimized as chemical probes to study the functions of genes, cells and biochemical pathways. This will lead to new ways of exploring the functions of genes and signaling pathways in health and disease, according to the NIH.



Computer science works on challenges of Internet routing and censorship.

by Karen Wentworth

The Internet we use daily was built by millions of people reacting and adapting to each other on a seemingly endless number of networks, servers, routers, and other back-end systems. As a consequence, no one can precisely know how electronic data will move as it travels, and if the data will move without incident. The UNM Computer Science Department works on a variety of projects that explore the way data is routed, re-routed, and censored.

Policing the Flow of Traffic

UNM graduate student Josh Karlin is intrigued with the way Internet traffic moves and what happens when it is routed in unexpected ways. He says that usually, Internet data reaches its intended destination, but occasionally someone may redirect traffic (intentionally or accidentally), causing service disruptions for Internet service providers (ISPs) and users.

Karlin and his advisor, Professor of Computer Science Stephanie Forrest, developed a watchdog for Internet routing disruptions with the help of a National Science Foundation grant. The watchdog is software that automatically warns ISP, when their traffic is routed to another destination. It is a free service called the Internet Alert Registry, or IAR, and can be found at http://iar.cs.unm.edu

When suspicious activity occurs, the IAR sends an alert to the affected ISPs. They can look at the alert and react if it appears that their traffic is improperly routed. Karlin and Forrest are now taking the next step by building software that will automatically delay the adoption of suspicious routes so that ISPs can respond to them before they propagate.

China Eyes on the Internet

How does a country or a company censor the information people receive over their Internet connections?

That is the question UNM Assistant Professor Jedidiah Crandall and his students are investigating. They had an unusual opportunity to explore the question this summer as they tried to move keywords through Internet routes into China before and during the 2008 Summer Olympics.

When journalists arrived in Beijing before the Olympics, they immediately began to protest the censorship of some Internet addresses and Chinese authorities removed those blocks, but Crandall says they left in place more subtle forms of censorship. He says two major goals of the censors is to prevent access to sensitive topics and to stop protests from forming, so his group tried word combinations like “hunger strike,” “petition,” “dissident,” “persecution,” and “suppression.”

What they found was far more complex than simple blocking of banned words. The results of the probing suggested that the government reduced censorship, but not for all keywords in all places. Some keywords remained blocked in some places. Websites that use a blacklisted key word are blocked, but the blockage isn’t perfect because of the way Internet data travels through a variety of routes in and out of the country.

Certain words traveling one router might be blocked, but the same words traveling through different routers might go through, especially during times of heavy Internet traffic. Crandall believes that would explain why reporters in some Beijing hotels were unable to access some Web sites, while other reporters in the same hotel were able to reach those same sites.

Crandall says the Chinese authorities make good use of reports that certain words or Web sites are banned to encourage Internet users to self-censor by avoiding those sites or phrases, capitalizing on the ambiguity of what is or isn’t acceptable communication.

His research group is now examining free anti-censorship tools that are available. Crandall says they are finding that at least some of the tools are falsely detected as malicious Trojan horses, worms, or backdoors for some anti-virus products. This finding makes it much more problematic for people trying to navigate the complex problems of Internet censorship.

The Measurement Astrophysics Research Group works on enhancing ground-based astronomy measurements.

by Steve Carr

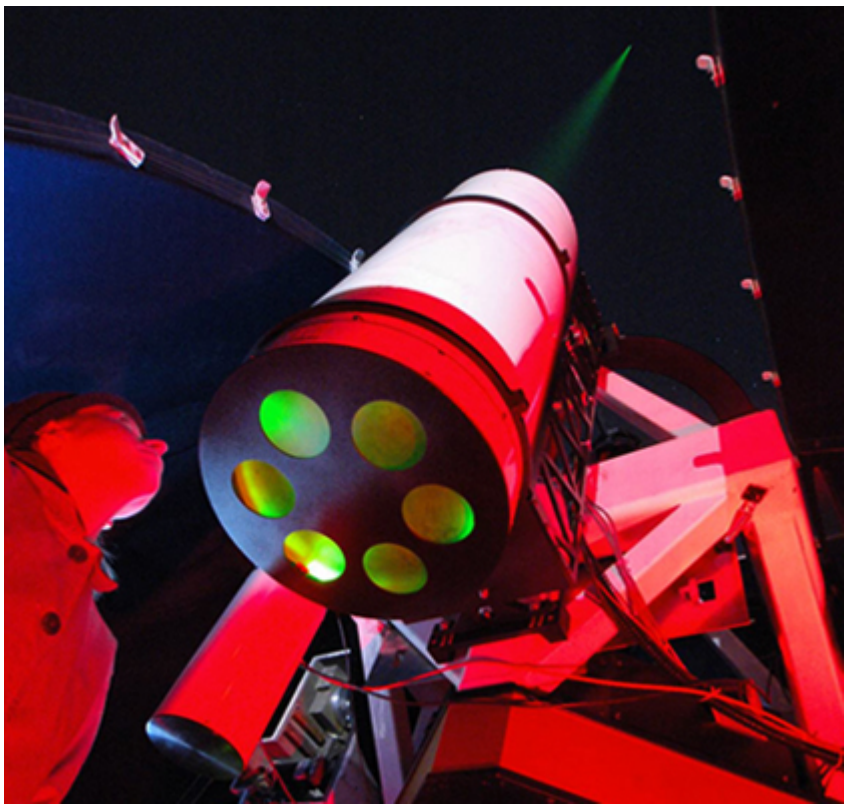
In a unique collaboration that utilizes ground-based astronomy measurements, researchers from the University of New Mexico Measurement Astrophysics (MAP) Research Group and Georgia Tech are developing techniques using an atmospheric diagnostic tool that could revolutionize the precision of ground-based astronomical measurements.

ALE, or Atmospheric LiDAR for Extinction, an instrument funded by the National Science Foundation, is enabling astronomers to measure quantitatively the fraction of light from astronomical objects lost as it travels through Earth's atmosphere.

"Light from distant galaxies travels towards Earth-based telescopes for millions of years, and in the last millisecond of its trip about 20 percent of that valuable light, which carries information about the very structure of the universe, is lost as it traverses our atmosphere," says principal investigator and UNM Professor of Physics and Astronomy John McGraw.

"For centuries, astronomers have looked *through* the atmosphere with their telescopes, but have seldom looked *at* the atmosphere in an effort to precisely correct for this lost light," he says.

ALE works by transmitting rapid pulses of eye-safe laser light into the atmosphere, which are scattered back to two detectors providing a distance-resolved profile of gas, particles and clouds, allowing astronomers to calculate precisely the amount of light lost in traversing the atmosphere.



At its “first light” celebration at the UNM Campus Observatory last February, NSF Astronomy Division Director G.W. Van Citters activated ALE. A green laser light produced a beam that illuminated the night against a backdrop of cloudy skies. Within a minute, ALE was providing data on the features of the atmosphere at that particular time that might affect astronomical observations.

“The main goal of ALE is to determine extinction through the atmosphere,” says Julie Smith, one of the many graduate students working on research leading to a Ph.D. or M.S. in physics and astronomy or optics. “Extinction is caused by clouds and molecules and particles of dust and things like that which scatter and absorb light.

“With the telescope we shoot the laser up and collect all the backscattered light and from that information we can back out extinction coefficients. By doing so, we can apply that information to the photometric data we get from the main telescope, and we can correct our photometric images for the light loss in the atmosphere,” she says.

The result is a precision profile of the structure of Earth’s atmosphere. While Lidar technology is not new, ALE is the first instrument to be applied to precision astronomical measurements.

ALE is now in routine operation and has already provided valuable insight about the “astronomical atmosphere,” the atmosphere through which ground-based telescopes must observe. Even the clearest of nights show layers of light absorbing and light scattering materials for which astronomers need to make corrections if they are to make the most precise possible observations.

The Child Health Initiative for Lifelong Eating and Exercise study seeks to encourage children at a young age to take this message to heart.

by Lauren Cruse

Eat healthy and exercise regularly is a message heard almost daily, but sometimes easier said than done. Knowing how hard it can be as an adult to live by these words, communicating this message to 1,600 three- and four-year-olds from rural communities throughout New Mexico is a challenge.

That's the challenge taken on by Sally Davis and her research team, who are currently in the third year of a National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) funded, five-year study called Child Health Initiative for Lifelong Eating and Exercise (CHILE).

Davis is a professor and chief of the UNM Department of Pediatrics' Division of Prevention and Population Sciences and is the director of the UNM Prevention Research Center (PRC). She and her team of prevention researchers have been working for the last two years on developing an intensive, multidisciplinary, trans-community obesity prevention program for three and four-year-old American Indian and Hispanic children from 16 Head Start programs in rural New Mexico.

For this third year, the research team is implementing the CHILE program at Head Start schools and evaluating the effectiveness of early intervention by conducting interviews and measurements, such as the heights and weights of each child.

The 16 Head Start programs are located throughout New Mexico, including Estancia, Llano Quemado, Santa Rosa, Tucumcari, West Las Vegas, Isleta, Laguna, Taos, Adelino, Bernalillo, Espanola, Mora, Socorro, Acoma, San Felipe, and Santo Domingo.

Head Start is a federally funded preschool program for low-income families and was established to serve children from birth to four years of age in recognition of the mounting evidence that the earliest years matter a great deal to children's growth and development.

Davis says in the past, studies like CHILE have focused on children in elementary school and have found they would benefit more from the health initiatives if approached even earlier.

"We are seeing more and more children with type 2 diabetes, which was previously only seen in adults," says Davis. "We need to determine what the best early interventions are to prevent this from happening. Prevention research is very important and early childhood intervention is extremely important to reducing disease."

The study is straightforward in its message and uses several key points to illustrate evidence-supported healthy choices, including increasing fruits and vegetables, increasing whole grains, reducing high-fat food, reducing sugar, instituting portion control, exercising one hour a day, and reducing time spent in front of the television and computer screen.

For these messages to have an impact on children, the CHILE team is involving the families, Head Start teachers and staff, grocery store owners, health care providers, and other adults from the communities by providing trainings, curricula, ideas for at-home activities, family nights, and community events.

With the grocery store component, each local grocery store is displaying labels to identify food recommended by CHILE nutritionists and recipes to help families prepare healthy meals at home.

"Our goal in providing these opportunities like the grocery store food sections is that it will make it easier for the communities to sustain a healthy lifestyle that is attainable and affordable," says Davis. "We would like each community to continue the program even after the research is completed."

The heights and weights of each child will be recorded for the last time in May 2010 and other data will be evaluated for final results. Once the study is completed, Davis says the CHILE program will have an opportunity to become a dissemination project through the PRC where other states and Head Start programs can use CHILE as a health initiative model.

Davis has more than 30 years experience conducting prevention research in partnership with under-represented populations, especially in rural communities. She says that working with rural communities is her passion since these communities are often overlooked.

"If we're going to improve quality of life and reduce health disparities, we need research that will show us what interventions work best, in what circumstances and how to sustain those programs over time," says Davis. "It is exciting to know that we are contributing to a small, but growing body of knowledge of 'what works' in obesity prevention."

STC.UNM Provides funding for promising technology at UNM.

by Karen Wentworth

UNM Investment in Faculty Research Brings Technology Closer to Market
When a university owned non-profit corporation invests cash to support research, it's the strongest indication that researchers are creating something interesting. This year STC.UNM gave three groups of researchers $25,000 each to refine their technology so it can be licensed for manufacture.

A research group from UNM's Chemical and Nuclear Engineering Department and the Health Science Center's Department of Pathology are consolidating a decade's worth of research into a biosensor that may be the next great technology to come from UNM. The biosensor can read multiple viral pathogens almost instantly.

Is your illness a particular strain of flu? This sensor would be capable of giving your doctor an immediate answer. The basic research has been done but the question is: what happens next?

Associate Professor of Chemical and Nuclear Engineering Plamen Atanassov says, "We would like to see this technology be taken further because it has practically reached maturity. It is an eight channel immunosensor that can designate eight different strains of flu." The researchers are not interested in staring their own company to manufacture the devices, so STC.UNM is looking for a company to license the technology from UNM.

This technology is unusually versatile. It can be configured to detect viral or bacterial pathogens in the blood; perform diagnostic tests in search of autoimmune diseases such as lupus or rheumatic arthritis; search for pathogens in food such as salmonella, e-coli, campylobacter or lysteria; and look for hanta virus infection in mice or people.

The principal investigators include Atanassov, Professor of Chemistry and Chemical and Nuclear Engineering Gabriel Lopez, Research Professor of Chemical and Nuclear Engineering Dmitri Ivnitski, Research Assistant Professor of Chemical and Nuclear Engineering Ravil Sitdikov and Research Associate Professor in Pathology at the UNM School of Medicine Stephen Young.

Using Nature to Balance a Devastating Disease

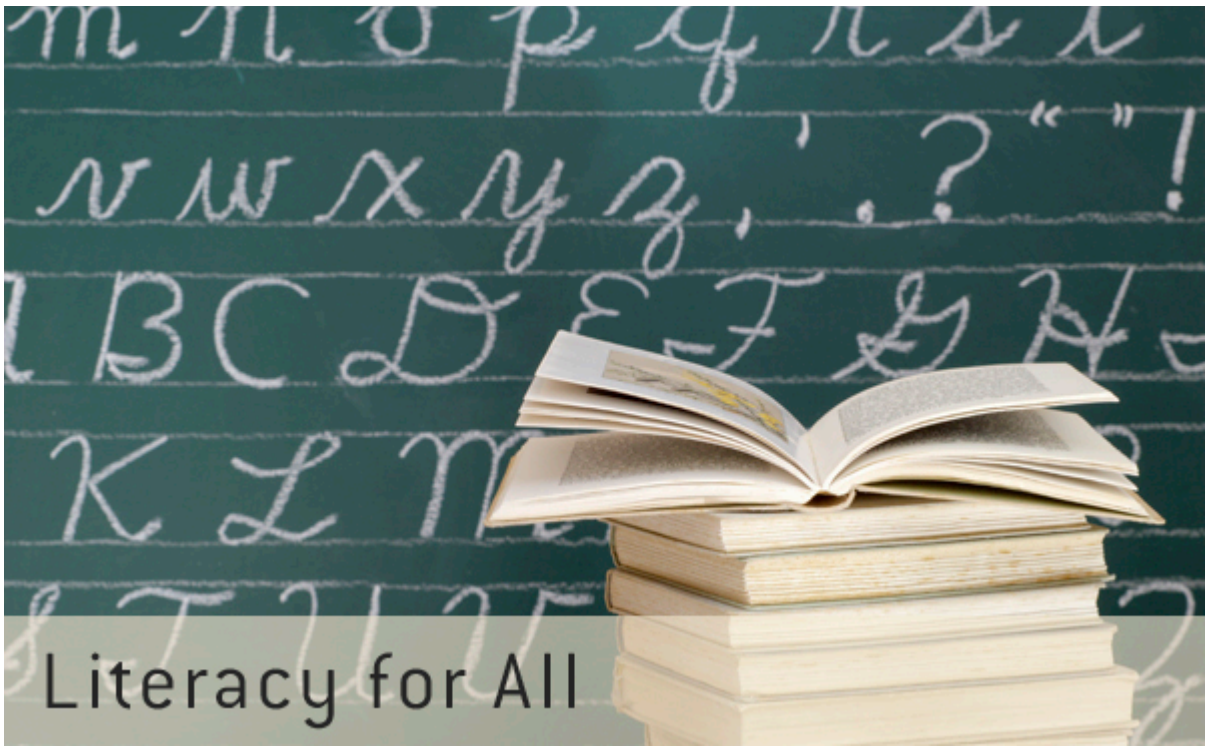
When Vallabh Shah, associate professor in Biochemistry, Molecular Biology and Internal Medicine at UNM's Health Sciences Center skinned his knee as a small boy, his mother would mix a paste of curcumin and water to put on the wound to hasten the healing.

Now he and David VanderJagt, professor of Biochemistry and Molecular Biology and Loraine Deck professor of Chemistry are testing curcumin, an ingredient in turmeric, to determine whether it might be effective in preventing a serious health problem.

Kidney patients who are on dialysis find their white blood cells are exposed to a cascade of oxidative and inflammatory stresses as the blood is pumped out, filtered, and returned to the body. The stress from dialysis can activate genes that promote oxidative stress and inflammation. Once a patient has inflammation, he becomes much more vulnerable to a range of pathologies. Their goal is to stop the dialysis-induced development of inflammation so that patients, who may undergo dialysis three or four times each week, are protected from this repeated pro-inflammatory stress.

The UNM research group wants to use curcumin or a related compound to try to dampen oxidative stress during dialysis and keep inflammation at bay. They believe an appropriate anti-inflammatory agent such as curcumin could be placed directly into the dialysis media to protect blood cells from activation during the dialysis procedure.

Funded by STC.UNM, the project is still in the exploratory stage as the investigators work on gathering enough data to obtain a grant from the National Institute of Health to do research in preparation for human trials. Shah says they must be able to show a promising investigative path to move their research into the next phase. If they are able to prove the anti-inflammatory properties of curcumin in this clinical setting, they may be able to make a big improvement in quality of life for kidney patients at a critical stage of their disease.



Professors at the College of Education work on educating teachers on facilitating the language and literacy development of English language learners.

by Steve Carr

One of the greatest challenges faced by educators today is assuring academic success for children whose second language is English. Last year, the College of Education at the University of New Mexico received a five-year, $1.5 million federal grant from the U.S. Department of Education designed to meet this challenge by educating secondary teachers on facilitating the language and literacy development of English language learners, ELLs, at the same time that they are teaching academic content.

The grant will fund the Academic Literacy for All (ALA) project, which will work with the Los Lunas and Albuquerque Public School Districts and the Secondary Teacher Education program in the College of Education to meet this challenge.

“The emphasis for the ALA project is on the secondary level because many ELLs develop oral language English proficiency in elementary school, but they have not achieved sufficient academic literacy to succeed in secondary school,” says Holbrook Mahn, associate professor of Language, Literacy, and Sociocultural Studies (LLSS) in the College of Education.

Mahn is the project director for the grant and co-principal investigator with Leroy Ortiz, associate professor, LLSS and director of the Multicultural Education Center.

“While the number of ELL’s has increased, the number of teachers at the secondary level who have received professional development in effective instructional strategies to meet their needs has not. The goal of the ALA project is to meet this need,” Mahn adds. “ELLs need language and literacy development in their science, math, social studies, and language arts classes, but their content teachers have not

necessarily been educated in ways to help them," Mahn says. "A comprehensive and integrated effort is needed to address this problem."

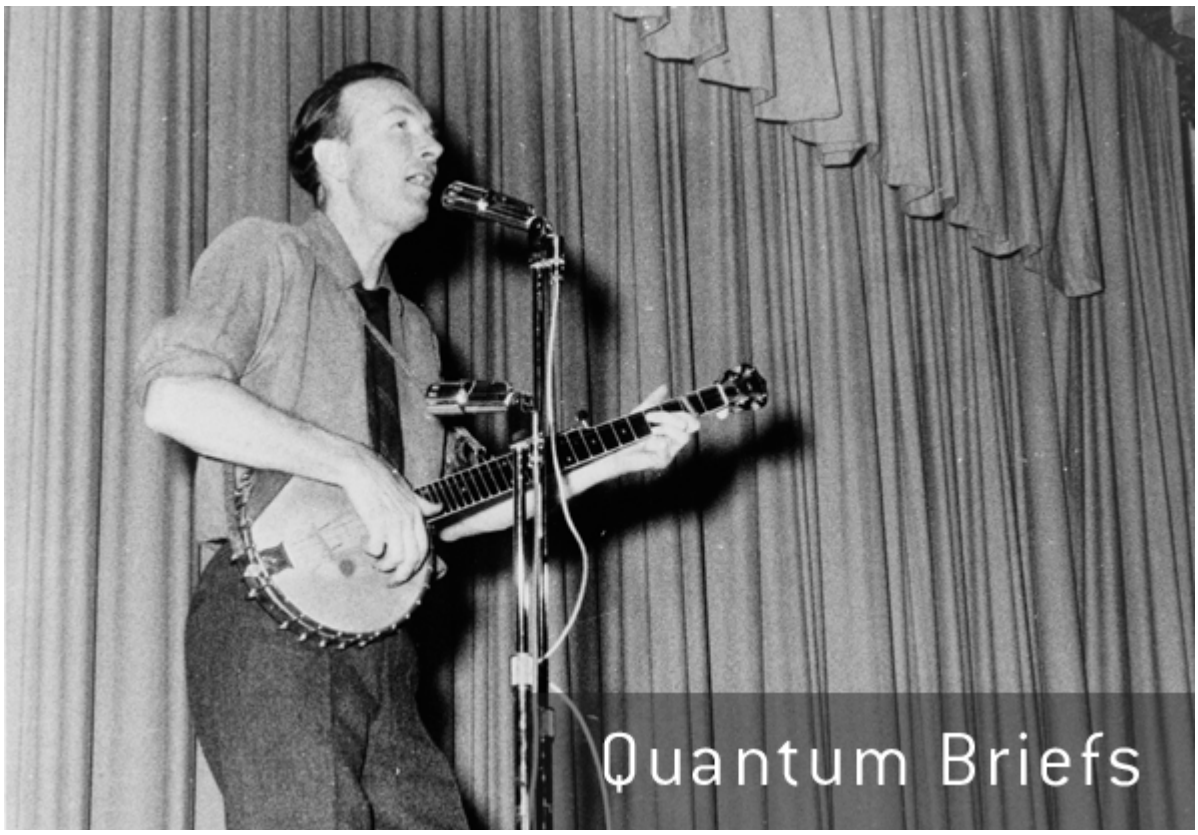
The ALA project includes five different comprehensive initiatives: the creation of a professional development summer institute for UNM faculty, Albuquerque Public Schools (APS) and Los Lunas Schools (LLS) classroom teachers and administrators; the development of curricula in UNM programs involved in educating teachers; the creation of professional development teams in APS middle and high schools to assist teachers in fostering ELL's language and literacy development as they learn content; creation of an Academic Literacy for All web site; and collection of training assessments and data on ALA project initiatives' influence on APS and LLS ELLs' academic achievement. Each initiative is designed to build long-term capacity.

During the first year of the grant, 20 teachers from 10 middle and high schools in Los Lunas and Albuquerque participated in a UNM seminar that prepared them to become teacher educators who will conduct professional development at their school sites to help their staffs teach academic literacy to ELLs.

In the summer of 2008 these teachers joined with seven professors and instructors from UNM's Secondary Teacher Education program in a two-week institute. During the institute, the UNM faculty discussed how they could help prepare pre-service teachers to meet the needs of ELLs. The public school teachers drew on the UNM faculty's expertise in teaching content matter and on conducting professional development at the school site.

Over the duration of the five-year grant, Mahn estimates that 35-40 UNM professors will attend the ALA summer institute and nearly 1,000 teacher education students will take courses influenced by the ALA project.

Approximately 90-100 APS and LLS teachers will become experienced ALA team leaders for on-site professional development, more than 500 teachers will participate in ALA activities, and several thousand ELL's will have taken classes taught by ALA-trained teachers.



Tuning a New Ear to Seeger

by Carolyn Gonzales

In a 1971 interview folk singer Pete Seeger said he uses songs to illustrate a story and dialogue between songs to carry the story forward. David King Dunaway, UNM professor of English, carries Seeger's message further.

Dunaway received $15,000 from the National Endowment for the Arts' Arts on Radio and Television advisory panel to produce three one-hour radio documentaries on Seeger.

Dunaway created, "Pete Seeger and American Folk Music Revivals," which aired on international public radio stations (PRI). His interviews have resulted in journal articles, archives, books, and radio interviews.

A 2007 film, "Pete Seeger: The Power of Song," by filmmaker Jim Brown is another format where Dunaway used his interviews. Dunaway even has a cameo or two in the film.

Dunaway authored, "How Do I Keep From Singing: Pete Seeger," by McGraw Hill in 1981, and he recently updated the biography.

"I discovered that a great deal of the material that I compiled and transcribed from my interviews would never be in the book, would never be found. So I am publishing a book of oral histories on Seeger, based on the interviews," Dunaway says. He notes that two graduate students from the Department of English, Molly Beer and Felicia Karas, are co-authors on the book.

Dunaway was the only academic at a Seeger symposium and delivered the keynote. The event honored Seeger's family. Pete's father, Charles Seeger, was an ethnomusicologist. Dunaway presented 2,000 pages of transcribed Seeger interviews at the symposium. "They have been digitized, indexed, and made an accessible collection within the folk life archive at the Library of Congress," Dunaway says.

Dunaway's connection to Seeger goes way back. "I met Seeger when I was four. He was a family friend. As I grew up in the 50s and 60s, I saw Seeger as one of the few American dissidents who didn't bow his head low in anti-Communist campaigns," Dunaway says.

Charting Health and Development

By Luke Frank

How do air and water quality in a given community affect the development and health of its children growing up? What about local plant life and wildlife habitat? Are there specific genetic trends or predispositions within a geographic area? And what of a community's food staples and opportunities for activity?

These are some of the questions UNM HSC's Department of Pediatrics will be answering in its part of the massive 26-year NIH National Children's Study. The study's first phase - a five-year, $12.3 million research contract - partners UNM with the people of Valencia County.

Because of factors like birth rate, urban and rural characteristics, ethnicity, health care accessibility, and more, 1,000 pregnant Valencia County women will be recruited and enrolled. Their newborn children will be regularly examined from birth to age 21, to better understand the multiple environmental and genetic influences on their health and development. Researchers will examine how these elements interact with one another across several U.S. sites.

"This is an extraordinary study involving 100,000 pregnant women and their children nationally, the likes of which we haven't seen in the U.S.," says principal investigator Robert Annett. "And the potential benefits to the health of New Mexicans and communities in Valencia County are equally large."

UNM Health Sciences Center's Clinical and Translation Science Center also will partner in the research. For more information on the National Children's Study, visit www.nationalchildrensstudy.gov or http://hsc.unm.edu/research/ or call 505/272-3679.

Dispensing History

By Carolyn Gonzales

The University of New Mexico College of Pharmacy educates the modern pharmacist while cherishing the history of the practice and the college. The college currently houses, in very tight quarters, memorabilia from the profession and the professionals who have served communities statewide.

John Pieper, dean and professor, College of Pharmacy, took several pharmacy students and a U-Haul to Hobbs where they picked up wood and glass apothecary cabinets replete with current and classic chemical concoctions that belonged to Curtis Lindersmith, Jr.., a 50-year pharmacist who owned and operated Nizhoni Pharmacy in Gallup for 30 years.

One small room in the College is dedicated to housing the museum. A traditional medicine display, photos of the college's early leaders, and a pre-statehood pharmacist's license vie for space in the tiny room among other objects.

A small case at next to the College's entrance also features a number of items including the original metal College of Pharmacy sign. The college's first home, from 1948 through 1975, was in what is now the Biology Annex, designed by John Gaw Meem.

The Biology Annex bears evidence of its earlier role. Murals depicting traditional and modern medicines were painted in 1950. When the Biology Department took over the building in 1975, the murals were painted over; however, remnants of them remain above the dropped ceiling.

"Pharmacy is the oldest health professional education program at UNM. The college's first 30 years were in that building. We would like to reclaim a piece of our history and expose the mural remnants to show our heritage to the UNM community," Pieper says.

Researchers discover the true age of the Grand Canyon through information hidden inside.

by Steve Carr

Up until recently, it was thought the Grand Canyon was approximately six million years old. Researchers in the Earth and Planetary Sciences at the University of New Mexico have recently contradicted this and discovered otherwise.

Using a technique called uranium-lead isotope (U-Pb) dating of water table-type speleothems or cave formations, researchers Victor Polyak, Carol Hill, and Yemane Asmerom, were able to determine the western portion of the Grand Canyon actually began to form some 17 million years ago.

That revelation, or “eureka moment” as Asmerom calls it, essentially proves the Grand Canyon to be three times older than originally thought.

The research, which began more than nine years ago, is funded by a grant from the National Science Foundation for $250,000 and was published recently in the journal *Science*. The discovery was enabled by the realization that certain cave formations, such as mammillary coatings that form near groundwater tables, provided the opportunity for researchers to date both parts of the canyon radiometrically accurately for the first time.

“The fact that many Grand Canyon caves contain mammillary speleothems has allowed us to take advantage of advances in U-Pb and U-series analytical techniques in an effort to make the long sought chronology possible,” says Polyak.

As it turned out, the caves and cave deposits, which are located throughout the Grand Canyon, were ideal in that the researchers found both pre-existing and chemical sediments deposited before, during, and after the incision of the canyon.

Naturally, the caves preserved and protected the deposits from weathering. With sufficient uranium lead ratios and yield U-Pb dates, the mammillary coatings place the water table within the canyon at a particular place and at an absolute time. The mammillary coatings allow for the incision history of the Grand Canyon to be reconstructed.

“We knew if we could successfully determine the age of these coatings, we could position a pre-existing water table at a certain place in the canyon at a particular time,” says Polyak.

The core data, which included 57 analyses, came from nine mammillary coatings from throughout the canyon, both east and west. The results from the eastern Grand Canyon displayed faster water table descent rates than data from the western Grand Canyon which showed stable, slow drops in the water table. The data showed a slower incision rate in the western portion than the eastern.

The resulting data provided a record of water table deposits as the Colorado River cut through the canyon over millions and millions of years – approximately 17 million for the western portion.

“Based on uranium-lead dates of these deposits and the positions of these deposits throughout the canyon, that the western Grand Canyon is much older than what most scientists have thought,” says Polyak.

“Normally what you’d expect is for the area around the headwaters to be older than what they call the ‘tail of the river,’ explains Asmerom. “Here, essentially, you have a 10 million year old pre-history of the western Grand Canyon before the Colorado River became a though-flowing river to the Gulf of California.”

The research may provide further information that could eventually offer the possible reconstruction of the canyon's history.

"These results were achievable by the convergence of new technical capabilities achieved in our Radiogenic Isotope Laboratory, the conceptual breakthrough in connecting the mammillary to the water table and having samples that had sufficient uranium for dating," says Asmerom.

For more information on the Radiogenic Isotope Laboratory at UNM visit: http://asmerom.unm.edu.

Land Arts of the American West encourages students to use the outdoors as their laboratory to explore and create.

by Valerie Roybal

In the late 1960, the practice of Land Arts or Earthworks emerged in the United States as a response to the commercialization and commodification of art. Land Art is made on site, often isolated, involving the land itself as not only location, but inspiration, material, and collaborator. Land Art exists in open space, outside the confines of a gallery or museum, and beyond the realms of a price tag or market value. It can be ephemeral and impermanent under the forces of nature, and it can be as enduring and seemingly indestructible as any mountain or landscape feature created by nature itself.

Since 2000, UNM is the home of Land Arts of the American West, a dynamic and progressive program providing students with a significant earth art experience. It is designed to take art students outside the boundaries of traditional classroom learning and studio practice and give them the unique landscape of the southwest as their laboratory to explore and create.

“We engage the communities and environments of the southwest, provide students with continuous, uninterrupted time in which to work, and surround them with a community of fellow voyageurs in the hope that the experience will be a catalyst for their work and a jump start for their careers,” says Program Director and Professor of Art and Art History Bill Gilbert.

With this idea to provide a field-based art educational experience at UNM, Gilbert founded Land Arts with John Wenger, retired professor of art at UNM, and Chris Taylor, formerly of the University of Texas at Austin. Funded by the Lannan Foundation, the program has been successful on a number of levels. “We started with an interest in the history of Land Art made by Native American, Hispanic, and Anglo cultures. As the program has developed, we have defined a set of contemporary issues on which to focus that build upon these historic cultural roots,” says Gilbert.

To take Land Arts to the next level, Gilbert is creating alliances with other educational institutions in the United States and abroad to expand into a network of field-based art programs. Partners include Chris Taylor, now teaching Architecture at Texas Tech University; former Land Arts student and instructor Erika Osborne, now at the University of West Virginia; Nathan Lynch at the California College of Art in San Francisco; and John Reid at Australia National University in Canberra.

And, as part of the program's growth, Gilbert is developing the Land Arts Mobile Research Center to support research and publication of program participants. "One of the real benefits of the Land Arts program has come from the interactions in the field we provide for our students with professional artists, creative writers, and scholars. The Mobile Research Center would allow us to offer semester long residencies to these guests to continue their field based research at UNM and to interact with UNM students at sites in the field and on campus," says Gilbert.

The Center would also provide post-MFAs grants to Land Arts graduates to pursue their research. "Post Docs are very common in the scientific disciplines and serve the important function of providing graduates with a year of two of support while they establish their credentials in the field. We need a similar model in the arts. The Center would provide a base from which our students could reengage the sites they first visited in the program and develop a body of work for publication/exhibition," says Gilbert.

Over the years, the Land Arts curriculum has changed to reflect emerging interests in art and ecology and will continue to change in the years ahead. Concludes Gilbert, "it's important to stay fluid and let our ongoing practice and research define where we need to focus next. We are in a period of great change in our culture and in our universities as a result. As the rigid walls between disciplines dissolve, a flexible approach that rapidly incorporates the results of each year's experiments in essential."