The saying "forewarned is forearmed" could be a subtitle for the recently released study entitled "Climate Change and Its Implications for New Mexico's Water Resources and Economic Opportunities." The study was a joint effort of Brian Hurd and Julie Coonrod of New Mexico State University and the University of New Mexico, respectively. Hurd is an associate professor in the Agricultural Economics and Agricultural Business Department at NMSU, and Coonrod is a civil engineering professor in the Engineering Department at UNM.

Climate change scenarios were developed from the results of several general circulation models (GCMs), which climatologists use to understand the behavior of the global atmosphere and oceans. Coonrod and her team of graduate students used these scenarios to project the effects of climate changes on streamflow hydrology. Among the key findings is a likely shift from snow to rain in the mountains resulting in less snowpack. Additionally, warmer temperatures will bring about an earlier snowmelt and earlier peak runoff, as well as increased evaporation. Together, these effects combine to reduce total streamflows throughout the Rio Grande Valley, even in the event of a potential rise in precipitation.

Using the streamflow and evaporation projections, Hurd assessed the economic impact of the predicted changes. He estimated direct and indirect economic losses ranging between $13 million and $115 million by the year 2030 and from $21 million to more than $300 million by 2080.

Hurd, who has studied climate change and its economic effects for over a decade, believes that the study is a starting point for planning for the future of New Mexico's water use. "Acting proactively may be our best course of action. Forming and transforming policies, planning, and partnerships that are appropriate to the range of anticipated changes may well serve to be the difference between a truly disastrous result and one much less severe."

Articles about this joint research effort have appeared in the Albuquerque Journal, the Santa Fe New Mexican, the Daily Lobo and The New York Times online.
Single Multicultural Planet Seeks Environmentally-Responsible Population

Jim Conca, Director of NMSU’s Carlsbad Environmental Monitoring and Research Center (CEMRC) has co-authored an unusual primer on energy for the public and policymakers, one that combines socioeconomics, science and politics that is written in laymen’s terms. The GeoPolitics of Energy: Achieving a Just and Sustainable Energy Distribution by 2040 by Dr. Judith Wright and Dr. James Conca not only raises awareness of the issues surrounding energy consumption, production and global warming, but provides concrete solutions. The GeoPolitics of Energy picks up where Al Gore’s An Inconvenient Truth leaves off. Citizens and policymakers now have a succinct introduction to assist them in making rational decisions and formulating advanced protocols regarding complex global problems of energy production and consumption, environmental effects including CO2 emissions and climate change, and the socioeconomic and political pressures underlying these concerns. This book also exposes our Ameri-centric view of the world as flawed and dangerous. Consider the following:

- In 2005, 70,000 new supermarkets opened in China.
- In 2006, China became the number three car manufacturer in the world.
- Over the next five years, China will build the equivalent of three Manhattan Islands.
- China completes construction of a new coal-fired power plant every other day, without even the most basic scrubbing of emissions. By the end of this month, China will pass the U.S. in CO2 emissions, smog emissions, deaths from smoking, deaths associated with coal use (300,000 per year), and industrial worker deaths.

Unlike the previous century, China, India, Brazil, Indonesia, and other countries are having a greater effect on energy consumption than the U.S. This does not result from the 1 billion people already using vast amounts of electricity or the 1 billion already using modest amounts of electricity, but rather from the 1.6 billion people that do not have any access to electricity, the 2.6 billion that have little access to electricity, and the 3 billion new people that will be born by 2040 who will also need electricity.

The biggest role that the U.S. can play is in global leadership, technological development, and economic incentives. One unusual calculation shows that to end poverty, war and terrorism requires every human to have about 3,000 kW-hrs per person per year, which is, interestingly, about the average energy use of a nobleman in 17th-century Europe. That the U.S. averages 16,000 kW-hrs per person per year while England averages 7,000 kW-hrs per person per year is telling. The quality of life is about equal in each country.

What this study shows is the social and peripheral issues are more important than the technical and scientific ones. Socioeconomic and political pressures are forcing the developing world, especially China, India, sub-Saharan Africa, Brazil and Indonesia, in various directions in energy production without addressing critical issues such as the environment, peak oil, health issues surrounding expanded coal production, and other problems. Taking a close, retrospective look at nuclear and solar power, as well as the more recently developed renewables.

Conca and Wright propose a rational energy mix that can be achieved by 2040 with sufficient political and economic will by the entire world community. That mix is one-third fossil fuel, one-third renewables and one-third nuclear energy, each providing about 10 trillion kW-hrs per year worldwide.

The World must achieve one-third fossil fuel, one-third renewables and one-third nuclear energy, each providing about 10 trillion kW-hrs per year worldwide.

Continued on page 4
The Role of Frontal Pole in Controlled Retrieval from Memory

Understanding how humans are able to think about and solve complex problems has become a question for the cognitive neurosciences, now that it is possible to observe the brain at work. Dr. James Kroger in the NMSU Department of Psychology employs fMRI and EEG in collaboration with researchers at NIH in Bethesda, Maryland, and at the MIND Institute, in Albuquerque to investigate the specific function of the newest part of cortex, called the frontal pole. This region, located directly behind the forehead, is the only cortical region to have evolved significantly relative to higher primates; is the last cortical region to mature—typically in the early 20s; and in people with high IQ, can mature years later. Unlike other parts of the cortex that are highly interconnected, this area only interacts with three other high-level regions, suggesting an integrative, top-of-the-hierarchy role.

In collaboration with Dr. Tie Quang-Li at the Advanced MRI section of National Institutes of Neurological Disease and Stroke and with NMSU postdoc Doerte Spring and Ph.D. student Chobok Kim, Dr. Kroger is conducting a study of the role of frontal pole in controlled retrieval from memory. Some theorists feel the frontal pole is not participating in the retrieval, but informing other regions in advance about the kind of retrieval to perform. Preliminary results from six subjects, to be presented at the Magnetic Resonance Imaging in Medicine conference, make clear that the constraints frontal pole places on retrieval occur at the time of retrieval, rather than in anticipation of it, indicating frontal pole does not play a "supervisory" role over other cortex. This work is performed on the NIH 7-Tesla MRI scanner, only a few of which exist in the world, and which enables resolution rivaling histological views.

In a combined fMRI and EEG study, frontal pole was observed in the fMRI data to respond not when complex information is maintained, but when it is manipulated. EEG data reveals the precise timing of this activity. In a second fMRI/EEG study, frontal pole activated when participants suddenly had to substitute one plan of action for another, but only when the most important task-defining attribute was altered, not when other task elements changed. This work is an NIH-funded collaboration with Dr. Vince Clark and Dr. Vince Calhoun at the Mental Illness and Neurological Disease Institute in Albuquerque and Dr. Joe Lakey in NMSU Mathematical Sciences. fMRI and EEG data is collected by Dr. Kroger and Ph.D. student Chobok Kim in Albuquerque. Six additional studies are funded, and will be carried out through the spring.

In the Mind and Brain Laboratory in the Department of Psychology, Dr. Kroger has conducted an EEG study of analogical reasoning in collaboration with Dr. Ann Speed of Sandia National Laboratories. Results reveal increased frontal activation as the complexity of problems increases. The Sandia-funded work will continue for a second year with an EEG study of the interaction between control of attention and structured problem solving.

Dr. Kroger and Dr. Kwong Ng in Electrical Engineering collaborate with Dr. John George at Los Alamos Laboratory on brain-computer interfaces to allow thought control of devices. This Los Alamos-NMSU-funded work has produced two novel algorithms for detecting mental "commands" in EEG data and a new "beamformer" approach to localizing the source of scalp EEG activity within the cortex.

From left: Dr. Kroger and Psychology students Jamie Posey and Holly Archer

Brain activity underlying controlled memory retrieval
NMSU Awarded Grant From the Strategic Studies Institute of the US Army War College

Dr. Yosef Lapid and Dr. Jason Ackleson of the Government Department at New Mexico State University have been awarded a prestigious $65,000 grant (potentially renewable for 5 years) by the Strategic Studies Institute (SSI) of the U.S. Army War College. The grant will sponsor a major academic colloquium in 2008 on the theme “Borders, Technology, and Security: Strategic Responses to New Challenges.” The colloquium will bring together a network of prominent international scholars in the areas of security, borders, and technology in a dialogue with senior practitioners in the US defense establishment, homeland security agencies, and other strategic leaders.

The Strategic Studies Institute is the U.S. Army’s institute for geostrategic and national security research and analysis. The SSI publishes studies that are distributed to leaders in the Army and Department of Defense, the military educational system, Congress, the media, other think tanks and defense institutes, and major colleges and universities. It also sponsors academic research colloquia with some of the most prestigious universities in the country. NMSU now joins recent colloquia partners including Georgetown, Princeton, Harvard, MIT, Columbia, University of Chicago, Stanford, Georgia Tech, and Johns Hopkins.

Department of Government, the College of Arts and Sciences, and the new International Relations Institute provided support for this initiative. In particular, Sudha Murthy, Director of NMSU’s Strategic Initiatives in the Office of the Vice President for Research provided sustained support for the proposal and colloquium development.

“NMSU Scientist Addresses the Energy Crisis at Just the Right Level” continued from page 2

what is even dreamed of, but the alternative is devastating economically as well as environmentally.

Conca knows from where he speaks with respect to nuclear and alternatives. NMSU’s CEMRC facility, part of the Institute for Energy and the Environment in the College of Engineering, is the only independent monitor of the only deep geologic nuclear waste repository in the world, the DOE’s WIPP site, right here in New Mexico. Unknown to most, WIPP has been operating since 1999, having disposed of over 250,000 55-gallon drum equivalents of nuclear waste, mainly for Pu, without incident. And NMSU’s CEMRC has been monitoring the people, air, water and soil in a 100-mile radius of WIPP for radiological and other contaminants from 1993 to the present, and no effects can be seen from WIPP. The fact that all the nuclear waste in the world in history would fit in our own Aggie Memorial Stadium should cause us to question our biased view of nuclear energy and compare it to environmental effects of the billions of tons of hazardous waste we produce annually. This and other very relevant facts are the subject of this book and their understanding is critical if the United States is to make the right choices for our energy future in the coming seven years - that is the time span beyond which we will have little control over what happens.

Source: United Nations Development Program; Mckinley 2006
New Mexico State University to Lead Mathematic Reform Research

The National Science Foundation has awarded New Mexico State University, in partnership with Las Cruces Public School district, a $1.5 million discovery research grant to begin building a research model that will improve mathematics achievement in teaching and student learning.

The grant, titled Scaling Up Mathematics Achievement (SUMA) is a research project designed to provide research staff and district personnel with qualitative and quantitative data that can help them increase mathematic achievement in grades K-8. Karin Wiburg, a co-principal investigator of SUMA and Associate Dean for Research at the College of Education at NMSU, said fewer students in America are going into Science, Technology, Engineering, and Mathematics (STEM) related fields partly because they are unprepared in mathematics.

"Across the country it is an issue," said Cathy Kinzer, SUMA’s principal investigator and Assistant Professor of Curriculum and Instruction at NMSU. "School districts are looking for effective ways to improve mathematics teaching and learning."

SUMA could help school districts by using a form of research called "design-based research." SUMA will be able to provide iterative feedback to the district while they continue to conduct further research. The mathematics program being implemented then can be continuously redesigned and improved. Liz Marruffo is the elementary curriculum director in the Las Cruces Public Schools and is a co-principle investigator in this partnership research grant.

Top math experts from around the nation will be involved with SUMA’s research from NMSU, University of Michigan, University of Illinois, University of New Mexico, Rutgers, University of Colorado, and University of Miami. They will meet at NMSU for the first SUMA advisory board meeting this December.

The grant was awarded to NMSU researchers in September based on prior evidence of the success of Mathematically Connected Communities (MC2) and a related project implemented at the Gasden Independent School District in New Mexico.

"In our partner districts, we were able to lessen the achievement gap and raise the student achievement scores in mathematics," said Wiburg. "The grant will help us see if the successes we had in changing mathematics teaching and learning could be adapted or useful in a larger, more diverse school district," according to Kinzer.

This problem solving math approach involves relational understanding and moves away from only focusing on procedural math that has been taught traditionally in many districts around the nation, which requires students to do more memorizing than making sense of the mathematics. It involves a deeper understanding of the math concepts. Students need to be making connections and making sense of the math so they can actually apply it in their lives.

The main difference between the mathematics model researched by SUMA and other attempts to reform mathematic achievement is that it is designed to work with an entire school district, not just trying to improve achievement with a small number of teachers and children. It is necessary to research and learn through the district in terms of how math is taught to provide access for all children to learn a richer, engaging and challenging mathematics curriculum.
Evaluation of Sampling Designs and Analysis of Data Collected by the Greater Yellowstone Network Vital Signs Monitoring Program

Dr. Bill Gould was selected to work for the National Park Service (NPS) during the fall of 2007 on a project entitled “Evaluation of sampling designs and analysis of data collected by the Greater Yellowstone Network Vital Signs Monitoring Program.” The Greater Yellowstone Network (GRYN) consists of Yellowstone National Park, Grand Teton National Park and the Bighorn Canyon National Recreation Area. Vital Signs Monitoring Program has been developing, testing, and implementing monitoring protocols since 2005 when the Vital Signs Monitoring Plan was first approved by the NPS National Inventory and Monitoring Program. A key component of the monitoring program is having scientifically sound and defensible sampling designs and analysis plans that are well documented in monitoring protocols. Dr. Bill Gould, New Mexico State University (NMSU) is an expert on sampling design and animal population modeling and for this reason was selected to help the Network achieve its desired goal and ensure scientific reliability and defensibility of the program.

Dr. Gould has been evaluating the efficacy of the current sample design, data analysis methods, and interpretation of occupancy data collected on amphibians through the Vital Signs Monitoring Program. The most predominant amphibian species within the GRYN include the Columbia spotted frog, boreal chorus frog, and tiger salamander, although boreal toads are also of interest. Occupancy modeling is a relatively new methodological development that is being used to assess the status and trends of many terrestrial and aquatic species throughout the world. Dr. Gould attended an occupancy modeling workshop last year, supported by faculty development funds from NMSU. This project has enabled him to put this knowledge to use by coupling his statistical background with his interests in animal population dynamics. As a result, the GRYN has gained greater familiarity with the analytical tools used in modeling occupancy and estimating detection functions and the theory underlying information theoretic approaches to model building and selection. He has also advised the National Park Service on other current projects involving soil and springs monitoring.

“My Country is Alive” An Oral History with Marge Jackson, First Nations Elder

Dr. Beth O’Leary, Assistant College Professor of Anthropology, recently returned from the Yukon, Canada where she was invited by the Government of Yukon Minister of Tourism and Women’s Directorate and the Yukon Archives to present a series of lectures on the book she has completed with Marge Jackson, a Southern Tutchone First Nations elder. Their book is entitled “My Country is Alive” and is an oral history of Marge’s life as a Northern Athapaskan woman who was born in a remote village in the Yukon in 1919.

Dr. O’Leary also opened a photo exhibit on Jackson’s life at the Yukon Archives in Whitehorse, which she had created in May 2007 for the Women’s Studies Program at NMSU. In August she received a grant from the Yukon Foundation to continue her ethnographic and linguistic work with Ms. Jackson. They will be making a CD together called “Songs and Stories from My Country.” Dr. O’Leary will be working on her project in the Yukon in May of 2008.
Can there be a therapeutic relationship between humans and horses? Dr. Wanda Whittlesey-Jerome, Ph.D., LMSW, assistant professor of NMSU School of Social Work at Albuquerque, is conducting research to find the answer.

Across the United States, equine-assisted therapies, including psychotherapy, are under study as cost-effective alternatives to traditional cognitive therapies, and Dr. Whittlesey-Jerome is especially interested in the treatment of childhood autism, PTSD in returning veterans, and adolescents with social and emotional impairment. She has planned a one-year research project to include qualitative and quantitative phases that will begin in January 2008 with interviews of key informants along the I-25 corridor in New Mexico, culminating in Las Cruces. Dr. Whittlesey-Jerome’s graduate research students in the Master of Social Work Program at Albuquerque will participate in the data collection and analysis for the equine project, aptly named, “Manes ‘N Tales.” The data generated from the initial qualitative phase will provide grounded theory to test with subsequent research. The quantitative phase of the project will then test the effects of equine-facilitated psychotherapy on adolescents suffering from social and emotional impairment. These young people between the ages of 12 and 17 are failing out of traditional “talk therapy” and Dr. Whittlesey-Jerome believes horses can help.

The intervention will place at Cloud Dancers of the Southwest, Inc., a North America Riding for the Handicapped Association organization in Albuquerque during a 12-week intensive treatment period. Dr. Whittlesey-Jerome hopes to learn more about the therapeutic relationship between horses and humans. In her words, “Today’s horses need a job! They have been partners with us as a species for a very long time. We have used them to carry us into battle and plow our fields. Today, many horses are simply not busy or busy enough.”

Add to this that we have children, adolescents, and adults who need to learn about relationship and how to build one based on respect and trust. Horses do that for us— they are very open and honest with their behaviors. There is no denying the presence of a horse in the therapeutic setting. They are typically larger and stronger. They greet us with open and inquisitive sensitivity. Importantly, horses are also prey animals, and their flight response is trigger-quick.

They almost immediately size us up and know instinctively who we are—even when we don’t! By generating new data about the technical and clinical experience of those involved in delivering and experiencing equine-assisted psychotherapy, and by studying adolescents who are receiving this treatment, Dr. Whittlesey-Jerome plans to add to the growing body of literature that suggests equine-assisted psychotherapy may be a brief and cost-effective alternative of choice to more traditional cognitive-behavioral therapies.
NMSU Chemistry and Biochemistry Professor Recipient of Distinguished Undergraduate Institution Mentor Award

Dr. Glenn Kuehn was presented with the Distinguished Undergraduate Institution Mentor Award for his dedication to excellence in science, mentoring, and teaching. The award was presented to Dr. Kuehn in a special award ceremony by the Society for Advancement of Chicanos and Native Americans in Science (SACNAS) at their national conference in October in Kansas City, Missouri.

Dr. Kuehn is a Regents Professor in the Department of Chemistry and Biochemistry at NMSU. He joined NMSU in 1975 and since then has served as a program director and principal investigator of the Minorities Biomedical Research Support Program. The program has successfully supported 90 minority Ph.D. Scientists, 71 M.S. degree, and 420 B.S. degree recipients. Dr. Kuehn is the program director and principal investigator of the “Bridge to the Future: Associate to the Baccalaureate Program for American Indian Students,” which supports biomedical training of American Indian students from regional community colleges in New Mexico and Arizona. In addition, Dr. Kuehn is the director of the NIH-SCORE Program (Continuous Support for Research Excellence). For more information about the NIH supported SCORE program visit: http://research.nmsu.edu/score.

From Page to Stage

After three years of research Dr. Tom Smith recently completed a book on improvisation entitled “The Other Blocking.” The book focuses on both theoretical and practical applications of performance-based improvisation and includes interviews with practitioners from around the country. He will present a chapter of it as a paper at the 2008 Mid-America Theatre Conference.

Dr. Smith also recently produced a cutting of his play “The Complete History of Las Cruces Abridged” for Las Cruces’s Centennial Celebration. The full-length screwball comedy explores the major events in Las Cruces history from the Permian period through the natives people, the incorporation of the city and the 20th and 21st century. The play will be presented in its world premiere at “No Strings Theatre Company” in April 2008.

Dr. Smith’s play “Fremont” will play for two years at Enrichment Works, a Los Angeles-based theatre presenting curriculum-based plays to LA Public Schools. Fremont is a historically accurate look at the life of famed explorer John Charles Fremont, known as “The Pathfinder” because of his many explorations seeking the best route for the railroad west.

Left: Dr. Smith’s workshop on improvisation at Dresden, Germany July 2005

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