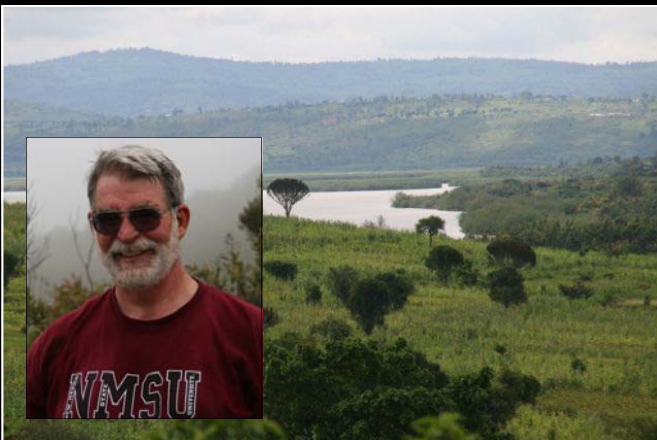
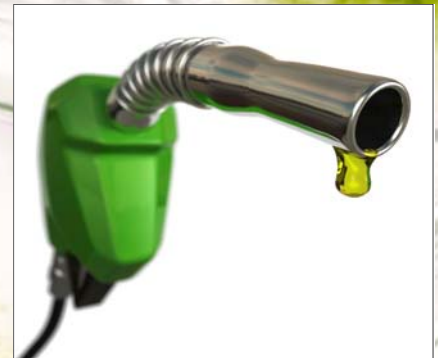


NMSU RESEARCH NEWS

Newsletter of the Office of the VP for Research, Graduate Studies, and International Programs

NMSU Researchers Part of \$44 Million Consortium for Biofuels Research

We are on our way to establishing New Mexico as the national leader in Biofuels



NMSU Researcher, Mick O'Neill, Helps Improving Farming in Africa, page 4

To submit research-related news please visit research.nmsu.edu/news or send email to hamid@nmsu.edu

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NMSU RESEARCHERS PART OF \$44 MILLION RESEARCH CONSORTIUM FOR ADVANCED BIOFUELS AND BIOPRODUCTS

By Hamid M. Rad



As part of a new prestigious consortium, National Alliance for Advanced Biofuels and Bioproducts (NAABB), NMSU researchers have been funded to create sustainable fuels from algae. The \$44 million funding for the consortium comes from the Department of Energy's stimulus budget for creation of clean domestic fuels.

The NAABB consortium comprises universities and research institutions utilizing their resources to study different aspects of biofuel research, development, and commercialization. NMSU is a founding member of the consortium, with NMSU's Vice President for Research Graduate Studies and International Programs, Dr. Vimal Chaitanya, serving on its Board of Directors. Other members of the NAABB include Los Alamos National Laboratory, Donald Danforth Plant Science Center, University of Arizona, Texas A & M, and Pacific Northwest National Laboratory.

The funding to establish the NAABB was awarded through a Department of Energy competitive request for proposals in the summer of 2009. "It was exciting to work on the proposal," says Sudha Murthy, Director of the Office of Strategic Initiatives.

NMSU Team Members

Wiebke J. Boeing

College of Agricultural, Consumer and Environmental Sciences
wboeing@nmsu.edu

Dr. Boeing specializes in aquatic ecology, including freshwater, inland saltwater, and marine ecosystems. She is familiar with every trophic level of the food web including bacteria, algae, and zooplankton. She studies impacts of environmental parameters on aquatic organisms, population dynamics, and predator-prey interactions and is versed in statistical analy-



ses. For the NAABB project, Dr. Boeing will observe the aquatic community and population dynamics in the New Mexico production system, with the goal of making the observation process more efficient. She will be conducting manual counts, spectrophotometry, turbidity measures, flow-cytometry, and image processing software. She will also study environmental conditions (pH, salinity, nutrients, temperature) that enhance lipid accumulation in *Nannochloropsis* while limiting undesired organisms (predators, competitors, disease).

Shuguang Deng

College of Engineering
sdeng@nmsu.edu

Dr. Deng, a professor in the Chemical Engineering Department, has worked on biodiesel production from different feedstocks including *Jatropha curcas*, *Pongamia glabra* (Karanja), *Camelina sativa*, corn and canola oils, and microalgae. His group will conduct research to evaluate innovative conversion technologies, based in microwave heating and supercritical CO₂-extraction processes, as energy-efficient options for converting lipids, hydrocarbons, and biomass residues into useful fuels.



Shanna Ivey

College of Agricultural, Consumer and Environmental Sciences
sivey@nmsu.edu

Dr. Ivey is a ruminant nutritionist/rumen microbiologist in the Department of Animal and Range Science. She has conducted research evaluating the usefulness of biofuel coproducts and other pharmaceutical compounds for



enhancing ruminant animal productivity. Dr. Ivey, along with her collaborators Clint Loest and Sergio Soto will provide understanding of the value of co-products and of algal biomass through their research on co-product utilization by ruminants; the economic value of this high-protein algal biomass is compelling, and because it can be developed quickly it will be an early co-product and accelerate creation of this industry.

Nirmala Khandan
College of Engineering
nkhandan@nmsu.edu

Dr. Khandan has been a professor at NMSU's Department of Civil Engineering since 1989. His areas of research include sustainable energy technologies, bioenergy-biohydrogen, algal biodiesel, and desalination. He was featured in Esquire Magazine's Genius Issue (December 2008) for his invention for desalination of brackish water in rural areas. For the NAABB project, Dr. Khandan will develop novel algal bioreactor configurations for maximizing CO₂ fixation, algal growth, and lipid accumulation. His project activities will include prototype development and demonstration; mathematical process model development, calibration, and validation; and finally development of simple methods to assess lipid yield.



Tanner Schaub
College of Agricultural, Consumer and Env. Sciences
tsschaub@nmsu.edu

Dr. Tanner Schaub is a chemist with NMSU's Chemical Analysis and Instrumentation Laboratory. He will conduct compositional analysis of project derived biofuel and algae extracts. Collaborating with engineers, biologists, managers and scientists of numerous backgrounds, his work provides feedback on the individual components of algae derived samples by means of advanced mass spectrometry.



Meghan Starbuck
College of Business
starbuck@nmsu.edu

Dr. Starbuck is an environmental economist with NMSU's College of Business. Prior to joining NMSU, she worked at University of Georgia working on a nation-wide project involving forest valuation for the US Forest Service. During the NAABB project, she will study sustain-



ability and economic viability of algal biofuels, and coordinate NMSU's effort in the consortium.

Adrian Unc
College of Agricultural, Consumer and Env. Sciences
aunc@nmsu.edu

Plant and Environmental Sciences Professor Dr. Adrian Unc will investigate environmental quality, water, and contaminant microbiology. He will assess the growth patterns for selected algal species and strains grown in selected waters of different sources and chemistries, focusing on wastewater as a potential feedstock. He will also explore the associated toxicological parameters, as well as fecal biological contamination risks for algal cultivation and by-products manufacturing systems, where residual wastewaters are used as nutrient source.



Wayne Van Voorhies
College of Arts and Sciences
wvanvoor@nmsu.edu

Dr. Van Voorhies is a molecular biologist studying metabolic functions in algae for the NAABB project. To provide a global assay of the metabolic flux in algae, CO₂/O₂ flux, electron flux, growth rates, and energy content will be measured in algal cultures grown under a variety of environmental conditions. He will be studying the effects of variables such as nutrient regimes, photo-period, temperatures, and salinities in algal metabolic processes. His work will provide the basis for optimizing environmental conditions and strains that maximize algal growth.



"We have already spent hundreds of years researching how to best grow crops like corn, rice, and wheat but have only just started to study how to sustainably grow large amounts of algae," says Dr. Van Voorhies. "Such knowledge is essential if algal biofuels are going to provide a viable alternative to fossil fuels," he adds.

"We are on our way to establishing New Mexico as the national leader in Biofuels," emphasizes Dr. Chaitanya. As a member of the Board of Directors, Dr. Chaitanya will be actively involved in the management of NAABB.

For additional information about this project, contact VPRGI@NMSU.Edu

DEVELOPING AN IRRIGATION MASTER PLAN IN RWANDA: NMSU RESEARCHER HELPS IMPROVING FARMING IN AFRICA

By Hamid M. Rad

Rwanda is up in the highlands. It's called the Switzerland of Africa. They have a lot of lakes, streams and ponds, but they are all on the slopes, as a result there are issues with water management, not just simply water storage.

After spending six months in Kenya and Rwanda to oversee the development of an irrigation master plan for those countries, Dr. Mick O'Neill, superintendant of NMSU's Agricultural Science Center at Farmington, has returned to New Mexico.

As a senior scientist, agronomist and agroforester, Dr. O'Neill has spent more than 20 years conducting agricultural research and development in both West and East Africa. Before joining NMSU, he spent 10 years in Kenya working in soil and water conservation, development of fodder trees/shrubs, and fruit trees improvement for the International Centre for Research in Agroforestry (ICRAF).

"Rwanda is in the East African highlands and is called the Switzerland of Africa," says Dr. O'Neill. "There are lots of lakes, streams and ponds, but they are surrounded by sloping fields; as a result there are major issues with water management, not just simply water storage," he adds.

The practice of rainwater harvesting for farms involves the creation of water runoff areas, collection ponds where rainwater can be stored, and small agroforestry gardens irrigated with water diverted from these ponds. From 2006 to 2008, the ICRAF trained Rwandan farmers and soil and water conservation technicians about rainwater harvesting and constructed more than 100 rainwater collection ponds and agroforestry gardens.

In 2009, during his sabbatical, Dr. O'Neill spent six months in Africa working along with his team of collaborators on developing an irrigation master plan for Rwanda. They were initially based in Nairobi, frequently travelling to

Rwanda for their work. This master plan will be used as a tool for the Rwandan Ministry of Agriculture and Livestock Resources (MINIAGRI) for their long-term strategic plan to facilitate irrigation to the rural population. "Rwanda has the highest population density on the continent – 450 people per square kilometer – which is mostly a rural population," says Dr. O'Neill.

During Phase I, the team was looking for regions appropriate for irrigation with contiguous areas of up to 200 hectares. Initially, they were looking for suitable areas with slopes of up to 60%. This was later reduced to sloping areas of less than 15%. During these initial visits, the areas that the team focused on

included Kigali, Bugasera, Nyagatera, and Gitarama Districts.

Based on his work in Africa, Dr. O'Neill along with one of his colleagues from Australia have submitted a proposal to the National Science Foundation's Basic Research to Enable Agricultural Development (BREAD) program. In addition he





Rainwater harvesting collection pond in Rwanda

has written several peer-reviewed articles, authored or co-authored five posters during the 2009 World Agroforestry Congress in Kenya, and organized educational workshops while in Kenya.

“There are opportunities for collaboration between ICRAF and NMSU,” emphasized Dr. O’Neill in his recent colloquium at the College of Agricultural, Consumer and Environmental Sciences. As he explains it, both NMSU and ICRAF scientists conduct research dealing with irrigation, rain-fed agriculture, wildlife issues, and rangeland management. Since the ICRAF’s involvement spans Africa, Southeast Asia, China, India, and Latin America, it deals with border issues as well. As a result ICRAF would be a suitable partner for NMSU researchers working in other areas such as agriculture, environmental and the social sciences.

“ICRAF and NMSU could pursue a scientist exchange program, where all of our departments could participate,” suggests Dr. O’Neill.

Student internships are another avenue of collaboration that can be pursued between NMSU and ICRAF. Dr. O’Neill’s work has already provided an internship opportunity for one of his students, Owen Cortner. In 2009, he, along with Dr. Rich Phillips, Director for Programs for the College of Agricultural, Consumer and Environmental Sciences, participated in the second World Congress for Agroforestry, hosted by ICRAF, in Nairobi, Kenya, and as part of his internship in Africa Mr. Cortner will join ICRAF in a research attachment position during the Summer of 2010.

Asked to comment about ethnic troubles in that part of Africa, Dr. O’Neill said that those problems are caused by poverty. “Fortunately there are a number of organizations in the world trying to do something about it,” he added.

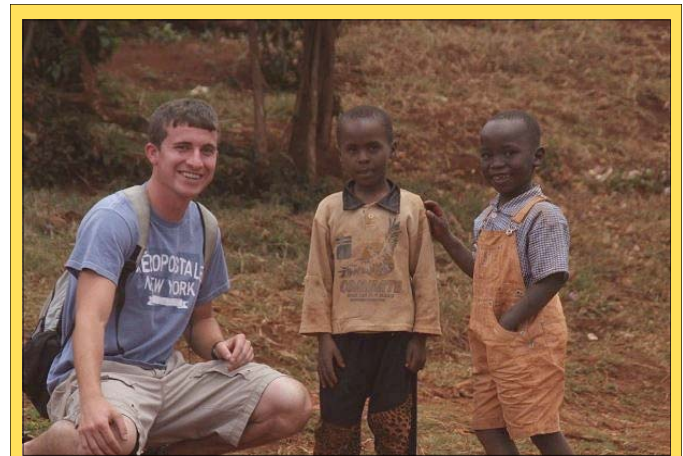
Dr. O’Neill holds a Ph.D. in Agronomy and Plant Genetics from the University of Arizona. He has published more than 46 peer-reviewed articles and technical reports. He joined NMSU in 1999. He and his wife, Amy, also a former Peace Corps volunteer, have lived in Africa for many years and their



Dr. O’Neill and Maimbo Malesu, ICRAF (World Agroforestry Centre)’s water programs coordinator and manager of the Rwanda Irrigation Master Plan team.

two sons, Casey and Kyle, grew up in Kenya speaking Ki-Swahili and English.

Dr. O’Neill can be reached at moneill@nmsu.edu

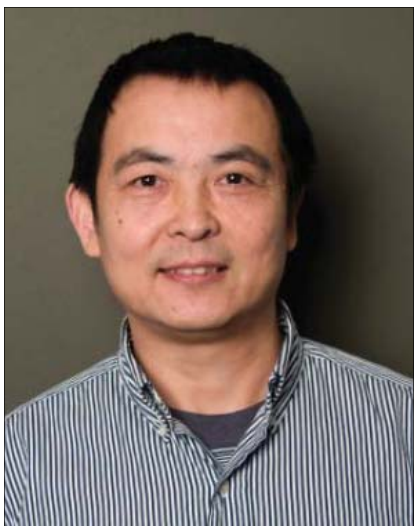


Owen Cortner NMSU’s Plant and Environmental Sciences student in Kenya.

Facilitated by the efforts of Dr. Mick O’Neill, Owen has applied for a student attachment position with the Watershed Management Program of research at the World Agroforestry Centre in Kenya. During the summer he will research how rainwater harvesting can enhance irrigation water supplies for small rural farmers.

NMSU Faculty Awarded \$1.68 Million NSF Grant to Develop Reduced Gravity Simulation Technology for Astronaut Training and Biomechanics Research

By Helen Stork, Mechanical and Aerospace Engineering



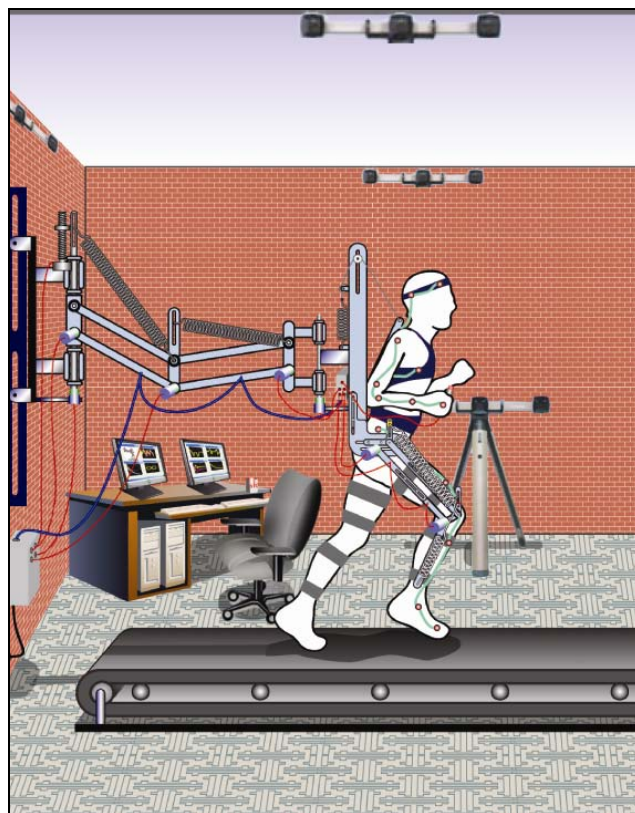
Dr. Ou Ma, professor of Mechanical and Aerospace Engineering

Professor Ou Ma of the Mechanical and Aerospace Engineering (MAE) Department has been awarded a \$1.68 million grant over the next four years from the National Science Foundation (NSF) to develop new reduced-gravity simulation technology for astronaut training and biomechanics research, and a facility to house it. He is leading the efforts of a multidisciplinary team of investigators (Robert Paz, Electrical Engineering; Son Tran, Computer Science; Ed Pines, Industrial Engineering; and Ma's student research team) to create an innovative design for a reduced gravity simulator. The research has potential for increased information about human-body dynamics, particularly as related to neuro-rehabilitation of those with walking disabilities, while also benefitting the MAE focus on aerospace and manned-space exploration. The simulator design, based on robotics and passive gravity compensation technologies, could offload any amount of a person's body weight.

Ma was supported early in the concept development by a small NASA EPSCoR award (\$50K) from NMSGC and a NASA graduate fellowship to his student Jesse McAvoy, which have led to a well developed concept for this large NSF award. Robotics and controls is Ma's field of research, backed by over ten years of aerospace industry experience before he entered academia in 2002. Paz's ex-

perience in electrical and control engineering is essential for developing the auto-adaptation capability which allows the simulator to automatically adapt to different individuals, Tran's field covers software and database development, and Pines will provide expertise and experience in the areas of ergonomics and human factors.

The funding allows for the hire of a full-time research engineer, support two graduate students and at least two undergraduate students to work on the project, and will provide Ma and Paz with more research time in their schedules. A new laboratory will be created in Jett Hall, which will be equipped with state-of-the-art instrumentation for biomechanics and human performance research. This unique lab will help the investigators to propose and conduct several cross-disciplinary research topics. It will also provide our students with more hands-on experience in biomechanics and aerospace sciences.



A mock-up of the proposed facilities

NMSU Researchers Secure \$11.5 Million of Stimulus Funds to Support Their Projects

By Hamid M. Rad

As of February, 2010 NMSU researchers have successfully secured \$11.5 million from American Recovery and Reinvestment Act (ARRA) funds. Five of these awards were funded by the National Science Foundation (NSF) totaling \$7.6 million. Department of Health and Human Services (DHHS) funded 11 awards amounting to \$2.6 million. One of the awards (\$270,000) came from Department of Energy and about \$6 million was funded by Brown University, University of Texas at Austin, and Commodity Credit Corporation (USDA). Below are the names of our principal investigators, their projects, and funding organizations:

Jeffrey Arterburn, jarterbu@nmsu.edu

Department of Chemistry and Biochemistry

- *NM IDEa Networks of Biomedical Research Excellence* (DHHS)

Nancy Baptiste, baptiste@nmsu.edu

Department of Early Childhood

- *Dona Ana County Head Start Program*
- *La Vida Fiscal Year 2010* (DHHS)

Sukumar Brahma, sbrahma@nmsu.edu

Klipsch School of Elec. & Comp. Eng.

- *Investigating Short Circuit Models for Wind Turbine Generators* (Department of Energy)

Chunpei Cai, ccai@nmsu.edu

Department of Mechanical Engineering

- *Hybrid Gaskinetic Computation Scheme for Flows with Multi-Scales and Multi-Physics* (NSF)

Tim Darden, tdarden@nmsu.edu

NMDA Feed Seed and Fert Bureau

- *Aquaculture Grant Program* (U.S. Department of Agriculture/Commodity Credit Corporation)

Aravamudan Gopalan, agopalan@nmsu.edu

Department of Chem. and Biochemistry

- *Chelators for Iron (III) for Therapeutic Uses and Probing Cellular Iron Transport* (DHHS)

Kathryn Hanley, khanley@nmsu.edu

Department of Biology

- *Does Deng Virus Suppress RNA Interference in its mosquito vector?* (DHHS)

Glenn Kuehn, gkuehn@nmsu.edu

Department of Chemistry and Biochemistry

- *SCORE Program at NMSU* (DHHS)
- *Role of Polyamine Oxidase in Apoptosis Studies with RNA Interference* (DHHS)
- *Bridges to the Baccalaureate at New Mexico State University* (DHHS)

Young Lee, younglee@nmsu.edu

Department of Engineering

- *Global/Local System Identification of Strongly Nonlinear Dynamical Systems* (NSF)

Ou Ma, oma@nmsu.edu

Department of Mechanical Engineering

- *Development of an Adaptive Reduced-Gravity Simulator for Aerospace and biomechanics Research* (NSF)

Bernard McNamara, bmcnamar@nmsu.edu

Department of Astronomy

- *A PAARE Program between NMSU, the National Solar Observatory and the Air Force Research Laboratory* (NSF)

Patrick Morandi, pmorandi@nmsu.edu

Department of Mathematical Sciences

- *Mathematically Connected Communities - Leadership Institute for Teachers* (NSF)

Michele Nishiguchi, nish@nmsu.edu

Department of Biology

- *Selection of host specific genes in environmentally transmitted mutualism* (DHHS)

Mary O'Connell, moconnel@nmsu.edu

Department of Plant and Env. Sciences

- *Minority Biospecimen/Biobanking-Geographic Management Program (BMAP) Plan* (National Cancer Institute/DHHS)

Debra Peters, debpeter@nmsu.edu

Department of Biology

- *Precipitation Controls of Carbon and Nitrogen Cycles in Arid-Semiarid Ecosystems* (Brown University)

Elba Serrano, serrano@nmsu.edu

Department of Biology

- *Systems Biology of Cell Decision Processes* (Massachusetts Institute of Technology)

Graciela Unquez, gunquez@nmsu.edu

Department of Biology

- *Evolution of Sodium Channel Genes* (University of Texas at Austin)

For additional information about the projects please contact the faculty via the email addresses provided.

Associate Professor of History Awarded Fellowship with Harvard



Dr. Liz Horodowich, Associate Professor of History

Associate professor of history Dr. Liz Horodowich has been awarded a fellowship with Harvard University at the Villa I Tatti in Florence, Italy for the 2010-2011 academic year. The Villa I Tatti in Florence offers up to fifteen fellowships each academic year for advanced research in any aspect of the Italian Renaissance.

Fellows are selected by an international committee of senior scholars in Italian Renaissance studies, representing such fields as literature, history, fine arts, music, philosophy, the history of science, and the history of ideas. Half of the applicants accepted each year come from Europe, and the other half from North America. The selection committee looks for demonstrable scholarly excellence and promise and requires a project of intellectual importance.

Dr. Horodowich will use her fellowship to continue research on a book entitled "Armchair Travelers and the Venetian Discovery of the New World." While the Venetians did not participate in the actual exploration or conquest of the New World, through the city's numerous printing presses, Venice instead became the main site from which European knowledge of the New World was transmitted. By looking at Venetian cosmographies, maps, costume books, and texts about the Americas, Horodowich will explore how Venetians as "armchair travelers" taught Europeans about the New World discoveries. Her research will demonstrate how editors, artists, and mapmakers in the lagoon city used images of the Americas to assuage their insecurities about their lack of participation in the New World discoveries. Venetians also curiously saw reflections of themselves in the New

World; many writers and printmakers, for instance, compared the watery cities of Venice and Tenochtitlan (Mexico City). Horodowich will use her fellowship at Harvard's Villa I Tatti to investigate how Venetians explored their own identity through the images of the New World that they produced and transmitted.

Dr. Horodowich can be reached at lizh@nmsu.edu

The Mercy Papers: NMSU Department of English Faculty Member Receives Recognition for Her Book



Robin Romm, professor of English

Robin Romm, a new professor in the MFA Program in Creative Writing (English Dept), has received a number of national accolades for her memoir, *The Mercy Papers*, published in 2009. The book is a very close look at the last three weeks of her mother's life (Jackie Romm, a trial attorney, died of cancer in 2004). The book was named a New York Times Notable Book of the Year, a San Francisco Chronicle Best Book of the Year, and a Top Five Book of the Year by Entertainment Weekly. It has just come out in paperback and is available online at Amazon.com. Romm recently received a MacDowell Fellowship from the prestigious MacDowell Colony. She currently reviews books for The New York Times Book Review and The San Francisco Chronicle.

Robin Romm can be reached at romm@nmsu.edu.

What Caused the American Civil War?

Photo by Catherine Pitcaithley



Dr. Pitcaithley, professor, Department of History

Dr. Dwight T. Pitcaithley is three years into a research/writing project on the secession of eleven slave states on the eve of the American Civil War. His goal is to determine why these Southern states believed they needed to leave the Union. Instead of asking the traditional question “What caused the Civil War?” he began his project by asking a different set of questions. “When the elected officials of this country gathered to discuss the problems facing the Union, what did they talk about? When they argued about the crisis of the Union, what did they argue about? When they debated secession, what issues were at the heart of that debate? When they suggested solutions to the problems they saw, what do their proposals tell us about the issues surrounding secession and the coming of the war?”

To answer those questions Dr. Pitcaithley has examined in detail the published journals of the eleven secession conventions, the legislative records of Tennessee and Kentucky, the Congressional debates recorded in the Congressional Globe, and the journal of the Washington Peace Convention. The latter was called by Virginia’s General Assembly and attended by delegates from twenty-one states in the hope of developing some sort of compromise solution that would prevent additional states from seceding and possibly entice already seceded states to return. The primary source records that document the secession of the South totals almost eight thousand pages.

Reading those thousands of pages of testimony was much like having a front row seat in the debate over secession. The published record of the conversations that occurred in Washington, D.C., Tallahassee, Austin, Jefferson City, Jackson, Columbia, and seven other state capitols throughout the South, reveal the extent to which the slave-owning South was concerned over the election of an anti-slavery Republican – Abraham Lincoln – to the office of president. These records clearly document the nature of the political discussion on the eve of the war. In every state secession convention, in Congress, and in the Washington Peace Convention the question was the same: how should the South protect the institution of slavery from an incoming Republican administration bent on destroying its economic engine? In short, one cannot read these journals without coming to the conclusion that the South seceded to protect its interest in slavery.

The surprise hidden in these thousands of pages of testimony was the dozens and dozens (almost sixty) proposals to solve the national crisis by amending the Constitution of the United States. These proposed amendments and the debates surrounding them provide clear insights into the issues confronting the country one hundred and fifty years ago through the words and beliefs of the participants themselves. Their arguments clearly express their fears – and their hopes – on the eve of the incoming Republican administration. The assembled members of Congress and the delegates to the state secession conventions where the secession arguments occurred were well-educated, informed, and articulate. They knew that the Union of the states was being threatened and offered solutions to the perceived problems. White Southerners, in particular, believed that their right to own slaves was threatened by the Republican Party. As they saw it, their options were to submit to the “abolitionist” North, amend the Constitution to protect slavery, or secede. While they ultimately chose secession, their multiple proposals at compromise by amending the Constitution tell us much about the relationship between slavery, the territories, and constitutional rights as the country rushed toward secession and civil war. With very few exceptions, the suggested amendments to the Constitution were designed to protect the institution of slavery throughout the United States.

I believe I am the first scholar to examine these records sequentially in an effort to answer the “enduring” question: **What caused secession and the Civil War?** While the answer is complicated, in 1861, the political leaders of the South would have answered with one voice: “**We must secede to protect our property in slaves!**”

Dwight T. Pitcaithley
dwightp@nmsu.edu

NMSU Research News is a bimonthly newsletter published by the Office of the Vice President for Research, Graduate Studies, and International Programs. Comments are always appreciated. Please submit your research-related news or announcements online at

<http://research.nmsu.edu/news>

For additional information about this newsletter or to request hard copies, please contact Hamid M. Rad at (575) 646-6429 or via email at hamid@nmsu.edu

OFFICE OF THE VICE PRESIDENT FOR RESEARCH, GRADUATE STUDIES,
AND INTERNATIONAL PROGRAMS

MSC 3RES
ANDERSON HALL
NEW MEXICO STATE UNIVERSITY
P.O. BOX 30001
LAS CRUCES, N.M. 88003-8001
PHONE: (575) 646-2481
FAX: (575) 646-5717
EMAIL: VPRGI@NMSU.EDU



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