



DIVINING ROD

NEW MEXICO WATER RESOURCES RESEARCH INSTITUTE

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March 2003

48th Annual New Mexico Water Conference

November 5-6, 2003

Hyatt Regency Tamaya
Santa Ana Pueblo

Featuring the
2003 Albert E. Utton Memorial
Water Lecture

to be presented by

Ambassador Alberto Székely

Ambassador Székely is a Career Ambassador to the Mexican Foreign Service, Advisor to the Mexican Minister of Foreign Affairs for Special International Legal Issues; Environmental and Natural Resources Arbitrator at the Permanent Court of International Arbitration at The Hague; Research Director of the Utton Transboundary Resources Center at the University of New Mexico School of Law and author of numerous books and articles on international legal issues.

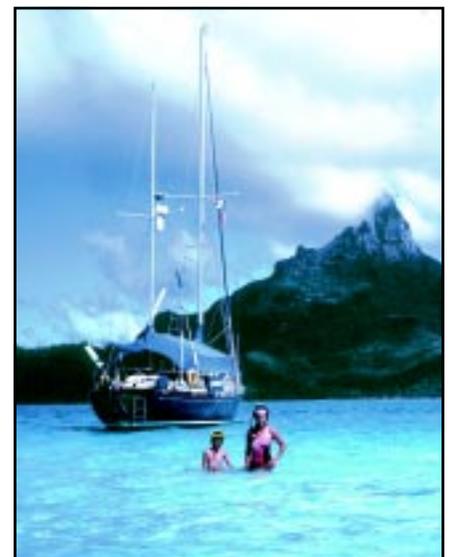
The Professional Geologist recognizes NM Tech graduate student

Laura Jean Wilcox says her passion for hydrology began at age six when she departed on a 42-foot sailboat with her parents to circumnavigate the globe. The adventure introduced her to 54 countries and lasted six years. During that time she was exposed to the inadequate water resources that exist in many of the developing nations of the world.

Laura recently discussed her research at New Mexico Tech in an article that appeared in the January/February 2003 *The Professional Geologist*, Student Issue.

Following her return from sailing the seas, Laura attended high school in Falmouth, Maine. Afterward she began studies at Colby College majoring in biology, but decided by the end of her sophomore year that geology was her discipline of choice, with an emphasis in environmental science. Laura spent a couple of summers during college working at the Lawrence Livermore National Laboratory Environmental Restoration Division in Livermore, California. This experience provided her with opportunities "to practice real-world hydrology on real-world problems." It was then that she decided to continue her education in graduate school focusing on hydrology.

New Mexico Tech offered Laura what she was looking for in graduate school: a small school with a low student-advisor ratio as well as a large enough university



Another day of snorkeling under the sun in Bora Bora, French Polynesia. Photo by John Wilcox, 1988.

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that could offer excellent laboratories, equipment, and support for student research. And the school was located in the middle of a beautiful state with 10,000-ft peaks only minutes away. An avid hiker, Laura was eager to spend more time in the West.

New Mexico Tech professor Rob Bowman advises Laura on her current research involving the study of surface water and groundwater interactions between the shallow aquifer and the Rio Grande along a 50-mile reach of the river. In her first year at Tech, she was exposed to some of the driest conditions the state has seen since the 1950s. This 50-mile reach of the Rio Grande loses a large amount of water that remains unaccounted for.

Laura indicates that the drought has emphasized the importance of her role in the project. She is constructing a model of a six-mile reach of the river that is losing an unusually high amount of water (up to 23 cfs/mile as determined from previous seepage runs done in

2000 and 2001). This small-scale simulation will aid in calibrating an existing larger scale model that will ultimately be used to help determine the water budget for New Mexico.

“This project is especially fascinating because it not only incorporates many aspects of hydrology and geology, but also covers many political issues such as water rights, land ownership, and wildlife issues,” according to Laura.

After obtaining a master’s degree in hydrology from Tech, Laura would like to find a job where she can apply her skills on an international level. “I’d like to return to the locations that I visited as a child in hopes of improving global water quality,” she said.

Besides devoting herself to her graduate studies, Laura trains for triathlons and in the fall completed her first Ironman competition in Madison, Wisconsin. She also manages to teach a triathlon class and is involved in several music groups.



Measuring water quality variables in the Rio Grande. Photo by Christian Krueger, February 2002.

Upcoming Meetings

- April 11-13, 2003 Heating Up: Coming to Terms with Climate Change in the Southwest, The Center for the Southwest, Albuquerque (<http://www.unm.edu/~amerwest/cawhome.htm>)
- April 30-May 2, 2003 Aquatic Resources in Arid Lands Conference, Corbett Center, New Mexico State University, College of Agriculture and Home Economics, New Mexico State University (<http://leopold.nmsu.edu/dcowley/>)
- April 30-May 1, 2003 Technology Transfer Workshop, *Membrane Technologies: Water, Wastewater, or Both*, Hilton Garden Inn, Pittsburgh/Southpoint, PA, American Membrane Technology Association (amtaorg@aol.com)
- May 1-2, 2003 Local Approaches to Resolving Water Resource Issues: What’s Working, What Hasn’t Worked, and Building on Existing Efforts, Arizona’s Water Resources Research Center, Prescott Resort (<http://ag.arizona.edu/AZWATER/announcements/annc.html>)
- May 3, 2003 Annual Assembly and Regional Forum, Middle Rio Grande Water Assembly, (<http://www.waterassembly.org/>)
- May 12-14, 2003 Agricultural Hydrology and Water Quality, American Water Research Association Spring Specialty Conference, Kansas City (www.awra.org/meetings/Kansas2003)
- August 12, 2003** *New Mexico Symposium on Hydrologic Modeling*, Macey Center, New Mexico Tech (<http://wrri.nmsu.edu>)
- September 17-19, 2003 Second International Conference on the Impact of Environmental Factors on Health, Catania, Italy (<http://www.wessex.ac.uk/conferences/2003/healthrisk2003/>)
- October 17-18, 2003 *Water: Our Future Our Legacy*, Xeriscape Conference, Xeriscape Council, Albuquerque Convention Center (<http://www.xeriscapenm.com>)
- October 20-22, 2003 8th Annual New Mexico Environmental Health Conference, Sheraton Old Town Hotel, Albuquerque (www.nmehc.org)
- November 5-6, 2003** **48th Annual New Mexico Water Conference, Hyatt Regency Tamaya, Santa Ana Pueblo, New Mexico (<http://wrri.nmsu.edu>)**



Research focuses on drought-tolerant grass

Here in the arid southwest, it's visually refreshing to see the lush green acres of our golf courses, but you can't help wondering whether it's worth all that watering, especially during times of drought. And in contrast during these same periods, many once green soccer and football fields lower on the list of priorities turn to dust as cities are forced to limit outdoor watering. Wouldn't it be great if we could have our green grass and water too, we wonder. Well, this best-of-both-worlds dream is the goal of NMSU turfgrass specialist Bernd Leinauer's research, as he seeks to develop drought tolerant grasses that can thrive in New Mexico.

Dr. Leinauer presented his work at last year's New Mexico Water Research Symposium. The Symposium, coordinated by the WRRI, was co-sponsored by many

organizations including Sandia National Laboratories and Los Alamos National Laboratory. The next technical symposium is slated for August 12, 2003 and is entitled "New Mexico Symposium on Hydrologic Modeling" (see page 5 for information on this year's symposium). The following abstract was prepared for the 2002 symposium by Dr. Leinauer.

Currently, Dr. Leinauer and Dr. Rick Huff of the U.S. Geological Survey are developing a proposal for the U.S. Geological Survey FY 2003 National Competitive Grant Program for a study entitled, *Effects of Salinity Level and Irrigation Type on the Establishment Rate, Winter Survival and Quality of Several Warm and Cool Season Turfgrasses*.

SELECTING TURFGRASSES FOR NEW MEXICO - A CLIMATIC DILEMMA

Bernd Leinauer, Robert Flynn, Leonard Lariault, and Rex Kirksey
New Mexico State University, Las Cruces, NM 88003

Water is the biggest concern in turf management in New Mexico, as in most regions where its availability is limited. During times of water shortage, priority is given to water uses that are deemed more essential to human society. As a result, growing attention is being focused on the amount of water used to irrigate landscape and recreational areas such as home lawns, parks, golf courses and athletic fields.

Turfgrasses can be divided into two major groups, the cool season and the warm season grasses. Cool season grasses need considerably more water, are less drought and salt tolerant, and have a darker green color compared to warm season grasses. Warm season grasses go dormant and lose color during the winter, and use water more efficiently. In most parts of New Mexico, the climate is semiarid, and daily seasonal temperatures can fluctuate widely, due to the high altitude. This creates a dilemma as to which turfgrass species are the most suitable. On the one hand, low precipitation suggests that warm season grasses are more appropriate. On the other hand, low temperatures, particularly in the winter, due to high elevations make cool season grasses the better choice. Selecting adapted turfgrass

species in the respective areas of New Mexico, especially improved cold tolerant warm season grasses, would not only lead to an overall quality improvement of the turf areas, but would also help reduce quantities irrigation water used.

To determine which turfgrasses are best suited for the many different climatic areas in New Mexico, turfgrass screening trials were established in Las Cruces, Tucumcari, Artesia, Los Lunas, and at the Santa Ana Pueblo near Albuquerque. The turfgrass trials at the respective locations include up to 36 grasses. Some of the grasses were introduced to the turf market only a few years ago and have never been tested under New Mexico climatic conditions. First years' results revealed that all grasses established well in Tucumcari and Las Cruces under proper irrigation and fertilization conditions. At the end of August, three months after seeding, almost all plots showed ground coverage of 75 percent or higher. At the end of the growing period (beginning of November), all turfgrass plots showed complete coverage, with the exception of crested hairgrass. Even after five months of establishment, plots seeded with crested hairgrass cv. 'Barleria' averaged only 80 percent of coverage.



NMSU's 5-by-5 foot experimental turf plots are designed to be big enough so that a person can see how recently developed salt-and drought-tolerant grasses for New Mexico would look in their backyards. Photo by Victor Espinosa (NMSU Agricultural Communications)



Meet the Researcher

Bernd Leinauer

Assistant Professor and Extension Turfgrass Specialist
New Mexico State University

Research Focus

Turfgrass rootzones, turfgrass irrigation efficiency, water issues related to turfgrass management practices in desert climates, turfgrass species and cultivars

Education

Ph.D. natural sciences, Department of Crop Production and Grassland Science, Hohenheim University, Stuttgart, Germany, 1997, Dissertation entitled *Influence of Irrigation Methods on Water Use, Drought Stress Tolerance, and Recuperative Ability of Several Turfgrasses*
M.S. agricultural biology, Hohenheim University, 1990

Experience

2000-Present: Assistant Professor, Turfgrass Specialist, Extension Service, New Mexico State University
1997-2000: Research Associate, Department of Crop and Soil Sciences, Michigan State University
1996-1997: Instructor, University of Göttingen, Germany
1991-1997: Instructor, DEULA-Lehranstalt Rheinland - Nord, Kempen, Germany
1992: Consultant, Bayern Munich professional soccer organization

Current Projects

Turfgrass screening trials at Fabian Garcia research center in Las Cruces, at Agricultural Science Centers in Tucumcari, Artesia, and Los Lunas,

and at a municipal golf course in Gallup. Trials will also be established at the Agricultural Science Center in Alcalde in Spring 2003. Trials include 36 grasses including cultivars of Bermudagrass, Blue Grama, Buffalograss, Seashore paspalum, Zoysiagrass, Alkaligrass, Crested Hairgrass and others.

Effect of repeated applications of soil surfactants on water retention and soil physical properties in hydrophobic and hydrophilic root zones (greenhouse study).

Planning and construction of a 42,000 square-foot area at the Fabian Garcia Research Center. This project is to investigate the effect of greens type, irrigation type and root zone material on irrigation efficiency, turfgrass quality and water use on putting greens in the southwest.

Planning and construction of a 14,000 ft² research area at the NMSU golf course. This project is to investigate the effect of salinity level and irrigation type on the establishment rate, winter survival and quality of several warm and cool season turfgrasses.

Recent Publications

Leinauer, B. 2002. Wetting Agents and their impact on water retention of turfgrass root zones. *Australian Turfgrass Management*. Volume 4.1 (February - March 2002).
Leinauer, B. 2002. All wet. *Grounds Maintenance*. April 2002. Golf 1-3.

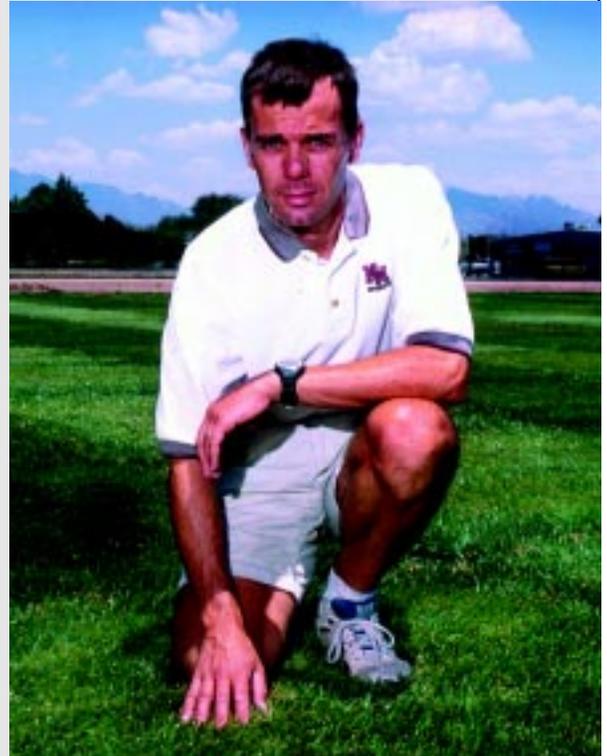


Photo by Victor Espinosa

Leinauer, B., P.E. Rieke, D. Van-Leeuwen, R. Sallenave, J. Makk, and E. Johnson. 2001 Effects of Soil Surfactants on Water Retention in Turfgrass Rootzones. *International Turfgrass Society Research Journal*. 9:542-547.

Leinauer, B., P. Rieke, and J. Crum. 2001. Retaining Moisture in USGA Putting Greens. *Golf Course Management*. July 2001. pp. 65-69.



New Mexico Symposium on Hydrologic Modeling

One-day technical symposium
Macey Center, New Mexico Tech
August 12, 2003

Plan to join us on August 12 when researchers will share their knowledge on the latest information on a wide variety of modeling work being done in New Mexico. Those interested in presenting a talk or poster are urged to submit an abstract. Abstracts must be submitted online via the WRRI's homepage at <http://wrii.nmsu.edu>.

Examples of topics to be discussed at the symposium:

- surface water modeling
- groundwater flow modeling
- surface and groundwater interaction modeling
- atmospheric modeling
- geologic framework modeling
- geomorphic modeling
- new technologies in modeling
- modeling of geothermal/hydrothermal systems
- GIS applications in water modeling
- economic and policy modeling
- water quality modeling
- solute transport modeling
- geochemical/hydrochemical modeling



Dates to Remember:

Abstract Deadline: July 1, 2003

Notification of acceptance: July 18, 2003

Registration deadline: July 31, 2003

Symposium Date: August 12, 2003

The symposium is a joint effort with Sandia National Laboratories, Los Alamos National Laboratory, University of New Mexico, New Mexico Tech, New Mexico State University, New Mexico Office of the State Engineer, New Mexico Interstate Stream Commission and the American Water Resources Association - New Mexico Section.

Proceedings 47th Annual New Mexico Water Conference

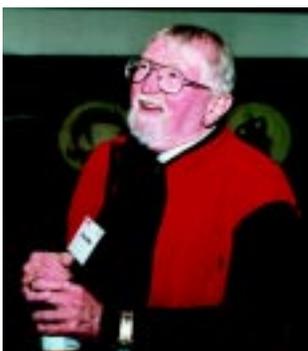
There's No Doubt, We're in a Drought!



Proceedings are at the printer

Conference participants should receive the proceedings on CD in April. Those interested in reviewing the papers presented at the 47th Annual New Mexico Water Conference held in Ruidoso in October 2002 should go to the WRRI web site at <http://wrii.nmsu.edu/publish/watcon/proc/proc47>. A limited number of hard copies will be available for purchase.

Ernie Mills 1927-2003



Longtime news reporter Ernie Mills recently died after a bout with pneumonia. The New Mexico Water Resources Research Institute was privileged to have Ernie Mills moderate panel discussions at the 45th and 46th annual New Mexico water conferences. Ernie was able to speak knowledgeably and eloquently on any topic concerning New Mexico. He had a relaxed, friendly style that brought forth candid

comments from those he interviewed while always focusing on the most pertinent topics needing discussion. Ernie was the consummate professional who arrived at our conferences well prepared for his role.

New Mexico State University recognized Ernie Mills in the Fall of 1997 when it awarded him an honorary doctorate.

The WRRI staff sends their condolences to his family and friends.



USGS recent publications

The U.S. Geological Survey has recently published several reports of interest to New Mexico water experts. Copies are available for inspection at the USGS District Office in Albuquerque (5338 Montgomery Blvd NE, Suite 400; 505-830-7923). The Water Resources Research Institute library also has the reports on file. They may be ordered from the USGS, Federal Center, Box 25286, MS 517, Denver, CO 80225. You may call 1-888-ASK-USGS for price information or go to <http://www.usgs.gov>



USGS Fact Sheets

Ground-Water Resources of the Middle Rio Grande Basin - This Fact Sheet is a brief summary of the USGS Circular 1222 *Ground-water resources of the Middle Rio Grande Basin, New Mexico* by J.R. Bartolino and J.C. Cole, 2002 (088-02, September 2002) - see following description of study

Municipal Stormwater Sampling Program, Metropolitan Area, Albuquerque, New Mexico – Summary of Sampling, 1992-2002 (005-03, January 2003)

Effects of wildfire on the hydrology of Frijoles and Capulin Canyons in and near Bandelier National Monument, New Mexico (141-02, November 2002)



USGS Circular Report

Assessing Ground-Water Vulnerability to Contamination: Providing Scientifically Defensible Information for Decision Makers by M.J. Focazio, T.E. Reilly, M.G. Rupert, D.R. Helsel (USGS Circular 1224, 2002). This report provides an overview of some of the common approaches used to scientifically determine the important factors controlling the vulnerability of ground-water resources to contamination. In addition, the report discusses the strengths and weaknesses of the various approaches as sources of scientifically defensible information for the water-resource management decision-making process. Description of scientifically defensible methods are supported by example studies that have been conducted by the USGS often in cooperation with local, state, and regional water-resources agencies.

Ground-Water Resources of the Middle Rio Grande Basin, New Mexico by J.R. Bartolino and J.C. Cole (Circular 1222, 2002). Key findings from a six-year study of ground-water resources in the Middle Rio Grande Basin are contained in this circular. Initiated in the mid-1900s, the “Middle Rio Grande Basin Study” was conducted by the USGS in cooperation with the City of Albuquerque, the New Mexico Office of the State Engineer and other state and local partners. The study examined the complex ground-water system that stretches from Cochiti Lake to San Acacia and covers more than 3,000 square miles. “Approximately 39 percent of New Mexico’s population resides in the Middle Rio Grande Basin, and the water for municipal and domestic supply comes almost exclusively from ground water,” said USGS scientist Jim Bartolino, project chief for the study. Central to the study has been the development of a new, state-of-the-art ground-water-flow model that simulates the operation of an actual ground-water system through the use of a mathematical model. The ground-water model is a tool that can integrate complex interactions within an aquifer and provide scientists and others with a representation of the geologic and hydrologic processes in the basin. It can simulate many historically measured trends in flow and water levels. USGS scientists also conducted studies on a number of other topics including ground-water chemistry, geophysical properties of the aquifer, interaction between the Rio Grande and the aquifer, mountain-front recharge to the aquifer and land surface subsidence potential. A six-page summary of the report is available (USGS Fact Sheet 088-02, September 2002).



USGS Investigations Reports

Simulation of ground-water flow in the Middle Rio Grande Basin between Cochiti and San Acacia, New Mexico by D.P. McAda and P. Barroll (WRIR 02-4200). This report was prepared in cooperation with the New Mexico Office of the State Engineer and the City of Albuquerque Public Works Department. This report describes a ground-water-flow model of the Middle Rio Grande Basin that integrates newly available geohydrologic data with data and results from previous studies. The objectives of the ground-water-flow model are to (1) integrate the components of the ground-water-flow-system, including the hydrologic interaction between the surface-water systems in the basin, (2) better understand the geohydrology of the basin, and (3) provide a tool to help water managers plan for and administer the use of basin water resources.

(continued on page 7)



Estimation of Alluvial-Fill Thickness in the Mimbres Ground-Water Basin, New Mexico, from Interpretation of Isostatic Residual Gravity Anomalies by C.E. Heywood (WRIR 02-4007) In 1989, the USGS in cooperation with the NM Office of the State Engineer, began this investigation using gravity measurements to study alluvial-basin aquifer systems. A gravity database was developed to enable interpretation of shallow crustal geologic structure throughout New Mexico. This report provides an estimation of the thickness of the alluvial-fill aquifer, the principal water supply, in various areas within the Mimbres Basin in the United States.

Twentieth Century Arroyo Changes in Chaco Culture National Historical Park by A.C. Gellis (WRIR 01-4251). Prepared in cooperation with the National Park Service, this report summarizes the changes in Chaco Wash from 1935 to 2000. Changes in arroyo channel geometry for the entire arroyo and for the inner channel were compared from 1934 to 1973 and for selected years from the 1970s to 2000.

Spatial and Temporal Variations in Streamflow, Dissolved Solids, Nutrients, and Suspended Sediment in the Rio Grande Valley Study Unit, Colorado, New Mexico, and Texas, 1993-95 by S.J. Moore and S.K. Anderholm (WRIR 02-4224). This report describes the spatial and temporal variations in streamflow and water quality in the Rio Grande from Del Norte, Colorado, to El Paso, Texas. Streamflow and selected water-quality data for 12 sites in the Rio Grande Valley study unit of the National

Water-Quality Assessment (NAWQA) Program are presented and discussed. Selected water-quality constituents described in this report are dissolved solids, dissolved nitrite plus nitrate as nitrogen, total phosphorus, and suspended sediment. A multivariate linear regression model was used to estimate loads for selected constituents.

Chemistry and Age of Ground Water in the Southwestern Hueco Bolson, New Mexico and Texas by S.K. Anderholm and C.E. Heywood (WRIR 02-4237). This report, prepared in cooperation with El Paso Water Utilities, presents the results of an investigation to determine the chemistry and age of ground water on the southwestern side of the Hueco Bolson. The radioactive isotope carbon-14 was used to estimate the length of time that water from wells has been isolated from the atmosphere, which is the modern carbon-14 reservoir. Nine wells on the southwestern side of the Hueco Bolson were sampled for analysis of common constituents, nutrients, total organic carbon, trace elements, stable isotopes, and radioactive isotopes.

Simulated Ground-Water Flow in the Hueco Bolson, an Alluvial-Basin Aquifer System near El Paso, Texas by C.E. Heywood and R.M. Yager (WRIR 02-4108). This report describes the hydrogeology of the Hueco Bolson and documents a transient ground-water flow model of the Hueco Bolson. The model, developed in cooperation with El Paso Water Utilities and the U.S. Army at Fort Bliss, is needed by the EPWU to evaluate strategies for obtaining the most beneficial use of the Hueco Bolson aquifer system.

Research Foundation has \$12M for drinking water projects in 2003

The American Water Works Association Research Foundation has nearly \$12 million for water-related research projects and is seeking proposals from entities interested in accessing the funds for projects launched this year. The AWWARF will fund up to 30 projects dealing with a wide range of topics related to the drinking water community. Requests for proposal (RFPs) for the projects will be available on their website on March 14. This year's project agenda focuses on four strategic goal areas:

- efficient and customer-responsive organization
- environmental leadership
- high-quality water
- infrastructure reliability

Proposals must be postmarked by either May 5 or July 15, as specified in each RFP, and all projects must include 25 percent of the total project budget as in-kind contribution. For details go to <http://www.awwarf.com/>



New Mexico Tech doctoral candidate receives AGU Horton Research Grant

David F. Boutt, a doctoral candidate in New Mexico Tech's nationally renowned hydrology program, recently was named the 2002-2003 recipient of the American Geophysical Union's (AGU) Horton Research Grant.

The Horton Research Grant, named in honor of Robert Elmer Horton (considered by many to be the father of modern hydrology), was established to provide financial support to Ph.D. candidates involved with hydrology or water resources research projects.

Boutt was selected for the prestigious award from a field of several top science and engineering doctoral candidates from around the world on the basis of his demonstrated academic excellence and research work.

Boutt's current research for his doctoral dissertation examines the role of fluids in the mechanics of the Earth's shallow crust, with particular emphases on temporal and spatial scales of fluid transport and the mitigation of fluid pressures in the subsurface.

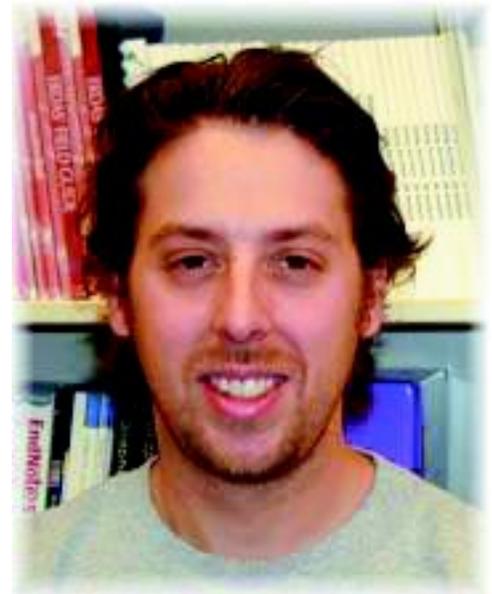
"My research work has implications to the genesis of fractures in the subsurface, along with any type of strain localization, such as fault zones," he explains.

Boutt, who earned both his bachelor and master's degrees at Michigan State University, currently works as a laboratory associate in the New Mexico Tech Rock Mechanics Laboratory, measuring rock mechanical and fluid-flow properties, and also as a student intern at Sandia National Laboratories.

"My work at Sandia Labs roughly overlaps with my dissertation work, with the additional wrinkle that we are investigating the coupled fluid-solid mechanics of near well-bore regions in oil and gas wells," Boutt relates.

This semester Boutt is co-teaching a graduate-level course at New Mexico Tech, titled "Hydrogeologic Processes," along with Tech hydrology professor Fred Phillips.

"New Mexico Tech is a great place for graduate studies," Boutt says. "There



are so many people doing great research here: and, it is hard not to get excited about your own research. Together with the outstanding number of opportunities for grad students, the excellent and enthusiastic faculty make Tech a first-rate institution."

Story and photo by George Zamora, NMTEch Public Information Office

The *Divining Rod* is published by the New Mexico Water Resources Research Institute.

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