

divining rod

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New Mexico Water Resources Research Institute

Fall/Winter 1991

Tech researcher looking at three-dimensional method to determine aquifer characteristics

By Denise Monette, New Mexico Tech Public Information Office

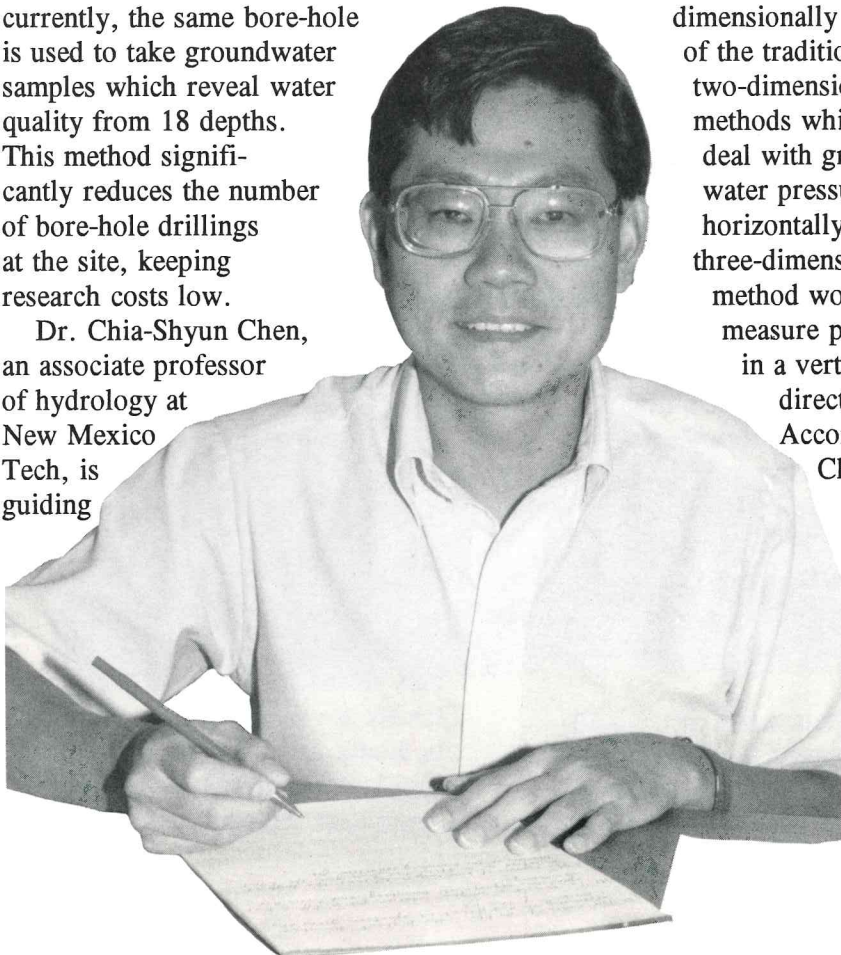
Groundwater samplers developed at New Mexico Tech are helping scientists investigate new, three-dimensional methods of determining aquifer characteristics. The samplers allow researchers to take water pressure data from at least seven depths using one bore-hole. Concurrently, the same bore-hole is used to take groundwater samples which reveal water quality from 18 depths. This method significantly reduces the number of bore-hole drillings at the site, keeping research costs low.

Dr. Chia-Shyun Chen, an associate professor of hydrology at New Mexico Tech, is guiding

the research project at the Sevilleta National Wildlife Refuge, 20 miles north of Socorro. The purpose of Chen's project, "Three-Dimensional Pump Tests for Determining Aquifer Permeability Anisotropy," is to find a way to estimate an aquifer's hydraulic properties three-dimensionally instead of the traditional two-dimensional methods which only deal with groundwater pressure horizontally. A three-dimensional method would also measure pressure in a vertical direction. According to Chen the

traditional testing procedures have too many theoretical methods of investigating groundwater problems and there are insufficient data to validate the adequacy of those methods.

Chen's WRRRI-sponsored project is in its second year.



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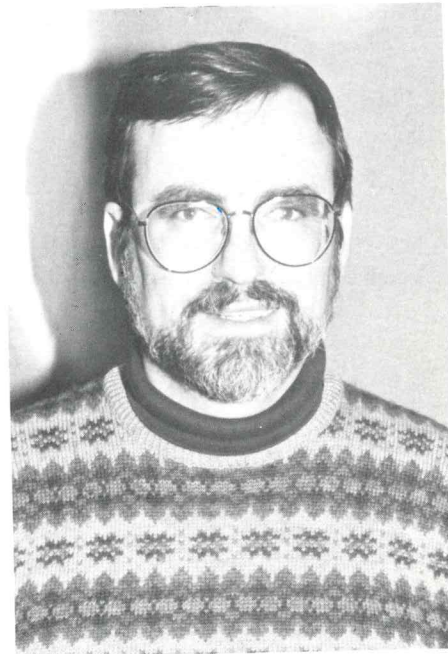
Wilson honored by AGWSE

By George Zamora, New Mexico Tech Public Information Service

Dr. John L. Wilson, coordinator of the hydrology program at New Mexico Tech and member of the WRII Program Development and Review Board, recently was named the 1992 Henry Darcy Distinguished Lecturer by the Association of Ground Water Scientists and Engineers.

The Henry Darcy Distinguished Lecture series honors Darcy's 1856 discovery of the basic law governing water flow. AGWSE presents the HDDL series annually to colleges, universities, and national laboratories to foster academic interest and excellence in groundwater research.

For the 1992 lecture series, Wilson will present "Visualization of Ground Water Flow and Transport Through a Microscope." His lectures will include results from a variety of experiments using special tools, such as etched glass micro-models to visualize flow and transport phenomena which occur in the saturated and vadose zones of groundwater systems. Wilson recently returned from a sabbatical at the Waterloo Centre for Groundwater Research at Canada's University of Waterloo, which is collaborating with Tech on well-head protection field experiments aimed at defining pumping well capture zones.



Water research news from other states

Radon found in Ogallala

James Bartolino, from Texas Tech University in Lubbock, recently completed an investigation for radon contamination beneath the Anton Lake basin in the Texas panhandle. The geologic layers underlying the basin include a 25-ft. thick zone with detectable uranium mineralization. As the uranium slowly decays to radium and then to radon, the radon gas can dissolve into surrounding aquifer materials.

Bartolino's study found radon activity at many wells in the study area to be above the proposed EPA drinking water standard of 300 picocuries per liter (pCi/L). Out of a sampling of 50 wells, he found levels of Radon-222 in the range of 100-2512 pCi/L. The average radon in water activity is 760.1 pCi/L,

while the median is 448.5 pCi/L.

Bartolino believes that the contaminant source is a postulated volcanic ash containing small amounts of uranium in the basin. Previous findings of widespread volcanic ash, which may often be enriched in uranium, have been reported in the Southern High Plains. When this ash occurs in lacustrine sediments beneath a playa lake, infiltrating recharge can oxidize and mobilize the uranium and carry it or its decay products into the Ogallala.

*Water Resources Center Newsletter
Texas Tech University*

Pollens used for siting landfills in Ohio study

Searching for ways to protect water near landfills from contami-

nation has lead Ohio geologist Julie Weatherington-Rice to study tiny, ancient pollens in the soil. The pollens, trapped in buried layers of soil provide an accurate record of an area's vegetation for the past two million years. These records can tell researchers where ancient forests, grasslands or lakes were; how porous the soil surrounding the landfill may be; and indicate how the groundwater quality could change if a landfill were placed in the area.

An ancient forest is distinguished by an abundance of pollens in an area. In addition to pollens, the only remnants left of the ancient forests are small holes or pathways in the land which were once occupied by tree roots, burrowing

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Happy 75th Elephant Butte!



Building the 'Butte - These photos taken during the construction of Elephant Butte Dam (1911-1915) are courtesy of the Rio Grande Historical Collection, New Mexico State University Library.

This year marks the 75th birthday of Elephant Butte Dam. Started in 1911 and completed in 1915, the dam cost \$5 million and was the world's largest reservoir at the time of its construction.

A dramatic increase in farming in Colorado's San Luis Valley during the mid-1800s greatly decreased the Rio Grande's flows. By 1880 the flows were so greatly diminished, many ditches were abandoned in the Mesilla Valley. Not only were Mesilla Valley residents dissatisfied, but the City of El Paso and the Mexican government were complaining about the amount of water they received as well. An 1877 riot in El Paso over salt deposits brought the area's water war national attention.

El Pasoans sought the help of Colonel Anson Mills who suggested an international dam be built three miles north of El Paso. This would have ruined the Mesilla Valley for farming, however, and valley residents maintained since cultivated land in that area was ten times that farmed in the El Paso area, the dam should be built above Mesilla. In 1893 the Rio Grande Dam and Irrigation Company was formed to build the largest reservoir in the world at Elephant Butte. Secretary of Interior Hoke Smith approved the dam site in 1895, but stipulated the dam must be constructed within five years.

Mills continued pushing for an international dam at El Paso and recommended the U.S. halt construction of a dam at Elephant Butte, which he thought was "utterly impractical," maintaining that too much water would evaporate before the Rio Grande reached El Paso. He received support from the

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Gila focus of new Western Network publication

The Gila Basin and the Waters of Southern Arizona by John Folk-Williams will be available soon from Western Network (1215 Paseo de Peralta, Santa Fe, NM 87501) for \$15 plus \$1 postage and handling. The publication describes water use and management in the Gila Basin and critical policy questions facing this region. The study highlights efforts to resolve disputes involving Indian water rights and summarizes the history and present extent of water use and associated policy questions in the mainstem Gila and its major tributaries: the Salt-Verde system, the Santa Cruz and the San Pedro.



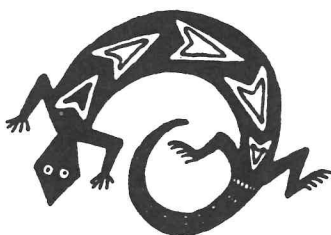
Arid lands directory update available

The third edition of *Arid Lands Research Institutions: A World Directory* is now available from Allerton Press, 150 Fifth Ave., New York, NY 10011 for \$24.50 plus \$2.50 postage and handling. Compiled by the Office of Arid Land Studies at the University of Arizona, *Arid Lands Research Institutions*, is the result of a survey of 600 institutions worldwide. It now lists 278 major institutions in 64 countries with two-thirds of the entries in English and one-third in French or Spanish. The directory includes a 12-page index of institutions and a 4-page subject index.

Water books abound

SEO, NMED collaborate on homeowner's guide

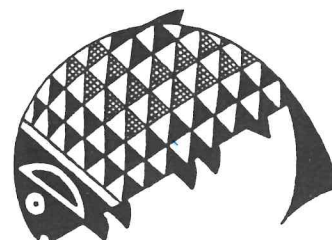
The Rural Homeowner's Water Guide is a new booklet published by the New Mexico State Engineer Office and the New Mexico Environment Department to help current and prospective landowners find the information they need to make wise choices about water supply, water rights, well drilling, sewage disposal, water testing, acequias, and flood protection. Written and designed by Alice Darilek Grisham of the SEO, the 41-page booklet also discusses how to prevent groundwater pollution and discusses well and septic tank siting, and contains a number of helpful charts and illustrations. For a copy, call the SEO library (505-827-6110) or the NMED's Ground Water Bureau (505-827-2917).



NRLC announces new papers

University of Colorado's Natural Resources Law Center has released two new papers in its series on western water policy: *Using Water Naturally* by Holmes Rolston III and *Implementing Winter's Doctrine Indian Reserved Water Rights: Producing Indian Water and Economic Development without Injuring Non-Indian Water Users* by Reid Payton Chambers and John Ecohawk. For copies contact Lawrence MacDonnell, Natural Resources Law Center,

Campus Box 401, Boulder, CO 80309-0401; (303) 492-1286.



For lawmakers

The National Conference of State Legislatures (1560 Broadway, Suite 700, Denver, CO 80202) has several new water-related and environmental publications available:

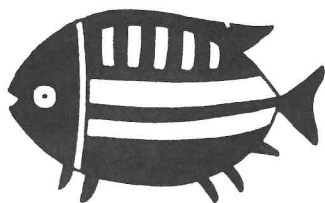
- *Proposed Congressional Groundwater Legislation 1989-1990: An Assessment of State Impacts* - Discusses federal groundwater legislation that could require state statute amendments for compliance. 11 pages; \$10.
- *Wetlands Protection and the States* - A primer to wetlands policies; explains government regs, acquisition, tax incentives, cooperative agreements, conservation programs and Section 401 certification. 26 pages; \$10.
- *Developing Recycling Markets and Industries* - 41 pages; \$10.
- *Jurisdiction over Nuclear Waste Transportation on Indian Tribal Lands: State-Tribal Relationships* - 11 pages; \$5.

Environmental ethics topic of new book

David Feldman with the University of Tennessee Water Resources Research Center recently authored *Water Resources Management* -
continued on page 5

Books, continued

ment: In Search of An Environmental Ethic, challenging governments, interest groups, party platforms, and elected officials to begin the search for an environmental ethic. Feldman argues that decision makers have traditionally made policies favoring development and economic efficiency over fairness, environmental protection and concern for future generations. The book is available from Johns Hopkins University Press (701 W. 40th St., Baltimore, MD 21211) for \$38.50.



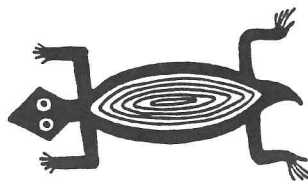
Irrigation management strategies outlined

A comprehensive guide to agricultural irrigation management has been recently published by the American Society of Agricultural Engineers. *Management of Farm Irrigation Systems* (authored by T. Howell of the USDA/ARS at Bushland, TX, G. Hoffman from University of Nebraska, and K. Solomon at California State University, Fresno) includes information on evapotranspiration, irrigation efficiency and scheduling, measuring the amount of water to be supplied, and other topics. Call the ASAE at (616) 429-0030 for more information.

Border issues discussed
The Integrated Environmental Plan for the U.S.-Mexico Border Area describes water quality and the environment along the U.S.-Mexico border, and outlines steps to improve these problems. The plan recommends that cooperative enforcement strategies be developed between Mexican and American water quality and environmental agencies, and that transboundary standards for acceptable pollutant levels be established. The report is available by calling (201) 260-1383 or writing EPA, International Activities Office, 401 M St. SW, Washington, DC 20460.

Bibliography updated

A fifth edition of *Geraghty & Miller's Groundwater Bibliography* compiled by Frits van der Leeden is now available for \$69.95 plus \$2 handling from the Water Information Center, Inc., 125 E. Bethpage Rd., Plainview, NY 11803; (516) 249-7634.



Indexed guide for electronic media published

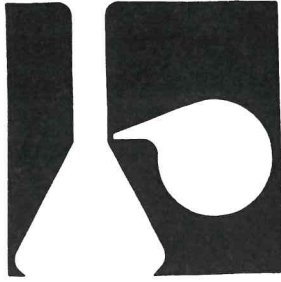
Business Resources Group has produced a keyword index guide to find government databases, services, books, and electronic bulletin boards dealing with statistics on climate, soils, water, pesticides, toxicology, and agricultural production. Cost for the bibliography is \$125 and is available from BRG, 7910 Longbranch Parkway, Tacoma Park, MD 20912.

NM handbook revised
The New Mexico Environmental Law Handbook, 2nd edition, is available from Government Institutes, Inc. (4 Research Place, Suite 200, Rockville, MD 20850). Written by attorneys from the environmental law section of Rodey, Dickason, Sloan, Akin & Robb, the handbook discusses air and water quality management; solid waste, hazardous waste, and underground storage tank management; NM environmental common law and environmental management by Indian tribes and pueblos. Cost is \$74.

DOE program for undergrads

Numerous studies have revealed a dramatic decrease in the number of students pursuing advanced degrees in science and engineering. Many institutions have begun involving undergraduates in research to help stimulate student interest in these areas. To help in this effort, the Department of Energy (DOE) is making the resources of its national laboratories available for academic-year internships.

The DOE Science and Engineering Research Semester (SERS) provides juniors and seniors with an opportunity to participate at one of six DOE laboratories: Argonne, Brookhaven, Lawrence Berkeley, Los Alamos, Oak Ridge and Pacific Northwest. To learn more about SERS, call (202) 488-2426 or write: Science and Engineering Research Semester; 901 D Street SW, Suite 201A; Washington, DC 20024.



Water quality correspondence courses offered

The Water Resources Research Institute continues to offer two correspondence training courses for water and wastewater analysis, emphasizing proper and safe use of standard laboratory equipment and procedures. *Basic Laboratory Skills* was designed for individuals wishing to acquire an introductory knowledge of the subject, but who have not had formal training in laboratory skills. It covers general techniques regarding working with glass, incubators, autoclaves, chemical reagents and bacteriological media as well as using various measuring weights and volumes. It provides one continuing education credit and costs \$40.

Microbiological Skills provides a good foundation in the correct use of microbiological materials and techniques and assumes competency with the topics covered in *Basic Laboratory Skills*. It covers media and reagents, working with microorganisms, membrane filtration, and quality assurance as well as laboratory safety. It provides 1.5 continuing education units and costs \$45.

To enroll in the courses, contact the New Mexico Water Resources Research Institute, Box 30001 - Dept. 3167, Las Cruces, NM 88003.

Elephant Butte Dam, continued

Mexican minister, Matias Romero, who protested the construction, citing years of Mexican suffering because Coloradoans and New Mexicans had been illegally appropriating water from the Rio Grande.

The Rio Grande Dam and Irrigation Company lost its rights to build the dam when construction was not completed within a five-year period. Representative John Stephens and Senator Charles Culberson, both Texans, introduced bills which appropriated \$2.5 million for construction of the international dam and went so far as to prohibit Colorado and New Mexico from using Rio Grande water for irrigation. The international dam was not without opposition, however.

In 1904, Secretary of State John Hay, suggested to Secretary of Interior Ethan Allen Hitchcock that perhaps the newly formed Reclamation Service could study the situation. The Reclamation Service completed a report by November 1904 when the National Irrigation Congress met in El Paso. The Reclamation Service supported a dam at Elephant Butte to provide sufficient water to New Mexico, Texas, and Mexico, and found it to be less costly than the dam proposed at El Paso.

The U.S. and Mexico then entered a treaty whereby the Americans would furnish Mexico 60,000 AF of water per year with the understanding that the Mexican government would waive all outstanding claims against the U.S. Thus, constructing the dam at Elephant Butte avoided impairing New Mexico's economic growth and saved the U.S. from a major international rift.

Information for this story was taken from: History of the Elephant Butte Irrigation District by Paul A. Lester and from "The Elephant Butte Controversy" by Ira G. Clark in The Journal of American History, Vol. LXI, No. 4.

Puerco River study published

In June 1988, the U.S. Geological Survey began a five-year study of the occurrence and movement of radionuclides and other trace metals in groundwater and surface water in the Puerco River basin in northeastern Arizona and northwestern New Mexico. According to Laurie Wirt, senior author of a recently published report resulting from the study, mining operations enhanced the release of radionuclides and other trace minerals naturally occurring in water, rock and sediments through the region. Additionally, the failure of a tailings pond dike near the Puerco River headwaters in 1979 resulted in the largest known single release of water contaminated by uranium tailings in the U.S. *Historical water-quality data, Puerco River basin, Arizona and New Mexico*, USGS Open-File Report 91-196 by Wirt, Peter Van Metre and Barbara Favor provides historical water quality data for surface water, groundwater, and uranium mine discharges for water years 1942-1988. To order contact, the USGS Books and Open File Reports Section, P.O. Box 25425, Federal Center, Denver, CO 80225. Microfiche \$4; paper copy \$57.25.

Conferences, call for papers, etc.

- ☼ **Water Quantity/Quality Disputes and their Resolution** - May 2-3, 1992 - Omni Georgetown Hotel, Washington, D.C. Sponsored by Resources for the Future, the World Bank, the Farm Foundation, Ben-Gurion University of the Negev, U.S. Army Corps of Engineers, U.S. EPA, and USDA-ERS. Registration \$75. Hotel rate \$99, single. Contact Ariel Dinar, Department of Agricultural Economics, University of California, Davis, CA 95616; (916) 752-1526.
- ☼ **Pollution Prevention through Waste Minimization** - February 9-12, 1992 - Hyatt Regency, Denver, CO. Sponsored by the National Environmental Health Association. Contact: NEHA, 720 S. Colorado Blvd., Suite 970, Denver, CO 80222; (303) 756-9090.
- ☼ American Water Resources Association is accepting abstracts for its conference and symposia, **Managing Water Resources During Global Change**, to be held November 1-5, 1992 in Reno, NV. Deadline for submission of abstracts is January 15, 1992. Contact: Raymond Herrmann, Water Resources, Cooperative Park Studies Unit, 233 Natural Resources, Colorado State University, Fort Collins, CO 80523; (303) 491-7825.
- ☼ The National Center for Groundwater Research at Rice University is having a call for posters and exhibitors at its **Subsurface Restoration Conference** to be held June 21-24, 1992 at the Doubletree Hotel in Dallas, TX. Deadline for poster abstracts is February 1, 1992. Contact: Susan McSpadden, Environmental Science and Engineering, Rice University, P.O. Box 1892, Houston, TX 77251.

Pollen, continued

animals or worms. These holes are filled with soil, but it is not as compact as surrounding soils. As moisture moves through the earth, these old holes provide the routes of least resistance. These former forest areas work much like a sieve helping the water flow into nearby waters.

When no pollens are found in an area, it indicates the siting of an ancient lake. The lake bed fills with sedimentation and silt from the

bottom up and becomes quite solid. Water moving through the soil does not penetrate these lake beds easily and moves across the top edge of the ancient lake until the soil becomes more permeable.

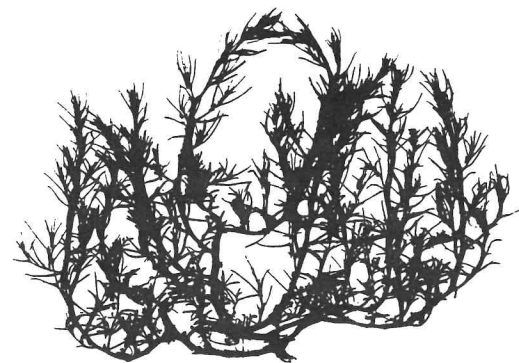
Weatherington-Rice emphasizes her research provides only one piece of the total picture. It takes several types of soil analyses to insure that an area near a landfill site will be environmentally secure after a landfill is built and operational.

Carol Moody, The Ohio State University Water Resources Center

Tall tumbleweeds deplete more water than previously thought

According to a two-year U.S. Department of Agriculture study, tumbleweeds higher than nine inches tall use more moisture and nitrogen from fields than previously thought.

Also known as saltwort or Russian thistle, the weed extracts very little water or nitrogen from the soil during its first six weeks of growth, according to soil scientist J. Kristian Aase. But after the plant reaches about nine inches in height — watch out! At a density of three plants per square yard, they used 406 pounds of nitrogen and four inches of soil moisture on a per acre basis. Aase and research technician Larry Reitz conducted their study in northeastern Montana on tumbleweeds and kochia. The kochia extracted more water than the tumbleweeds, using 4.7 inches per acre, but less nitrogen, using 100 pounds per acre.



Student competition stiff at 36th Annual Water Conference

A call for papers for the student competition at the 36th Annual New Mexico Water Conference brought abstracts from seven disciplines. A panel of five judges from different areas of expertise selected three finalists to compete at the conference on November 7.

The three finalists were:

- Sabir Majumder, Department of Chemistry, University of New Mexico - "Enhancing Solar Photocatalytic Detoxification by Adsorption of Porphyrins onto TiO_2 "

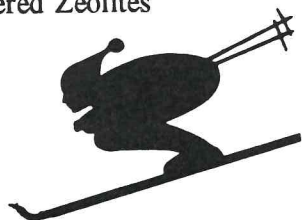
- James L. Markwiese, Department of Biology, UNM - "Assessment of In Situ Bioremediation of Cyanide and Nitrate at a Heap Leach Mining Operation in New Mexico"

- Daphne Neel, Department of Geoscience, New Mexico Tech - "Sorption of Organics using Surface-Altered Zeolites"

All three gave excellent presentations, and it was a difficult decision for the judges, but Daphne Neel was awarded the \$500 prize. Our thanks to all the students who submitted abstracts, and to the three finalists for their excellent work.



Master's degree candidate Daphne Neel accepts the first-place award for the student competition from WRRRI Director Tom Bahr. Daphne is working under Dr. Rob Bowman in the Geoscience Department at New Mexico Tech. Daphne is from Mooresville, North Carolina and received her B.S. in Chemical Engineering from Clemson University.



Season's Greetings

Tom Bahr, Director, New Mexico Water Resources Research Institute
Leslie Blair, Editor

the divining rod

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