DIVINING ROD

NEW MEXICO WATER RESOURCES RESEARCH INSTITUTE

Vol. XX, No. 2 September 1997

Water Quality Research Funded

Research projects aimed at detecting *Cryptosporidium* and viral contaminants in water samples will be funded through the institute's 1997 WRRI Seed Money Research Program.

Both projects continue research which may lay the foundation for future funding from agencies such as the U.S. Environmental Protection Agency. Both projects utilize PCR (Polymerase Chain Reaction) reactors to multiply (hence amplify) DNA pathogen information, thereby greatly enhancing detection sensitivity.

There is growing concern for potential health risks associated with the presence of viral pathogens in surface, ground and drinking water. However, the risk of waterborne viral agents to the public is largely unknown because of the difficulty in concentrating and detecting viruses in water both from a technical and practical standpoint. Detection methods also are expensive. Current methods to concentrate viruses have tended to be technically cumbersome and results vary based on differences in water quality and target viruses.

Investigator Kevin Oshima of New Mexico State University's biology department will explore the feasibility of two ultrafiltration systems (hollow fiber and tangential flow) to concentrate waterborne viruses under controlled laboratory scale conditions. Such ultrafiltration also may yield an advantage in the subsequent step of PCR viral nucleic acid amplification, by allowing the removal of inhibitors to PCR.

Experimental results should allow plans for scale-up and filtration under field conditions. Eventually it is hoped that an integrated detection unit (containing a filter and pumping system) will be developed that has a reasonable flow capacity and cost.

Professor Oshima will be assisted in this research by a master's level graduate student and interaction with a Ph.D. student who currently is studying the detection of concentrated viruses. This summer, two undergraduate students from a National Science Foundation supported program tested the ultrafiltration systems and received training in environmental virology.

Another major health concern is the need for a routine test that reliably detects the presence of *Cryptosporidium* in water samples. In general, there is a need to develop

(continued on page 7)

Lisa Salazar (left) of Espanola, New Mexico and Trudy Moore of Burkeville, Virginia worked this summer with NMSU Professor Kevin Oshima on developing methods to isolate waterborne viruses. The students took part in the Research Experience for Undergraduates program co-directed by Naida Zucker of NMSU's biology department and George Middendorf of Howard University's biology department. Eight participants worked with biology professors in the laboratory and field on a variety of environmental and ecological research projects.

Mark your calendars!
42nd Annual Water Conference
October 2-3, 1997
See pages 4-5 for details

Computers to help explore drought contingencies

by Natalie Johnson, NMSU Agricultural Communications

Even though city dwellers' faucets and sprinklers aren't likely to dry up anytime soon, planning is essential to making sure New Mexico's water supply remains adequate over the long haul.

A two-year collaborative study by three Western universities, including New Mexico State University, will consider contingency plans for dealing with water use during drought along the Rio Grande in Colorado, New Mexico and Texas.

The study will look at ways to make water use more flexible during times of short supply, said Frank Ward, natural resources economist with NMSU's Agricultural Experiment Station. The study is funded by the U.S. Geological Survey through the New Mexico Water Resources Research Institute.

"Most of the cities up and down the Rio Grande basin use groundwater, and there is lots of it in New Mexico," Ward said. "So the cities, in the short run, are probably not going to suffer."

However, groundwater—the water within the earth that supplies wells and springs—isn't always renewable, he said. So, over the long run, the only renewable water source is the Rio Grande including Elephant Butte Reservoir, which gets its water mostly from snowmelt in southern Colorado and some from New Mexico.

"Sooner or later, the issue that must be dealt with is how to best use the water in the river to supply the cities plus the farms," Ward said.

This issue of dealing with a limited water supply is common throughout the desert Southwest.

"The classic question has always been: How do you use that limited water supply to produce the greatest benefit for people who live in the region?" he said. "Other water management questions include how to develop, allocate and price water in such a way that droughts don't hit us as hard as they could."

Ward said the researchers are trying to find ways to minimize economic damages during drought.

"We're trying to put together a drought contingency plan. We're approaching it using a mixture of good science and good politics."

On the science side, the researchers are looking for ways to make the institutions that own water rights and manage the water more flexible.

"We're trying to put together a drought contingency plan. We're approaching it using a mixture of good science and good politics."

"The big irrigation districts are not always enthusiastic about selling water rights, but they might be willing to temporarily put some of their water into a water bank," he said.

The researchers will use a computer model to see how well different drought contingency plans would work. The model takes into account the economics, hydrology and laws about water use in the Rio Grande basin.

"We're primarily interested in predicting what the water use patterns would be up and down the basin near the river," Ward said.

The model will consider the value of both consumptive and non-consumptive water uses like recreation and tourism.

The researchers will use a computer model to see how well different drought contingency plans would work. The model takes into account the economics, hydrology and laws about water use in the Rio Grande basin.

"Recreational uses of water typically are not charged a price, so it's not easy to know their value," Ward explained. "We have to look at expenditure patterns to see how far people travel to go to a place like Elephant Butte Reservoir. The fact that people might come from 150 miles is pretty strong evidence that the recreation is worth something to them."

On the political side, Ward said discussing people's attitudes about water and having face-to-face meetings are a necessary complement to "good science." A steering committee for the project includes major water managers along the Rio Grande.

"There is a history among these three states of tension and mistrust," Ward said. "There's an old saying that whiskey is for drinking and water is for fighting."

In light of the history, Ward said the researchers are not so naive to think their study will bring everyone together as friends.

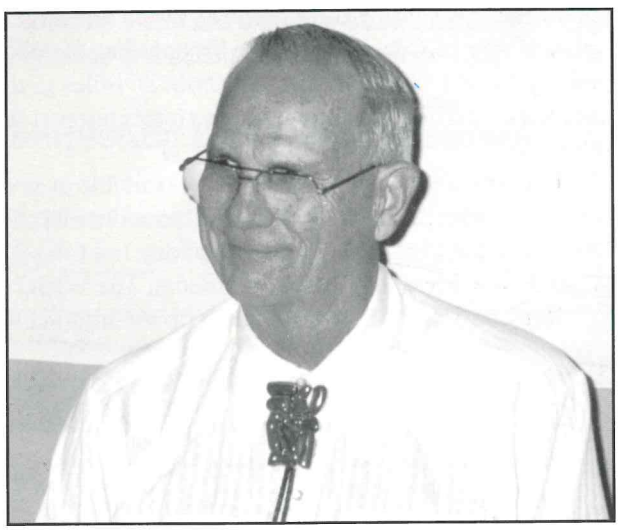
"We think that by having the objective, computer model as the focal point for looking at the water conflicts, it will bring a more modern approach to resolving them," Ward said.

New Mexico Water Community Bids Adieu to John Nixon

With a faint grin, John Nixon accepted accolades from friends and colleagues at a Las Cruces retirement reception in June held in his honor. After serving over 36 years as a State Engineer Office staff member, John will be sorely missed by his colleagues who could count on him for his diligent work and "institutional memory" as well as for his striking and elaborate bolo ties and belt buckles.

Having graduated from high school in Magdalena, John went on to receive an engineering degree from New Mexico Tech. He served two years with the First Guided Missile Brigade at Fort Bliss and two years as a petroleum engineer in west Texas before returning to New Mexico and beginning his career with the SEO in March 1961.

Steve Reynolds was state engineer at the time John started his tenure at the SEO, Frank Irby was chief of the Water Resources Division and D.E. Gray headed the Ground Water Section. The WRD comprised a total of five people, including Mr. Irby; while the Surface Water Section had two people on staff. It may seem nearly unimaginable now, but the entire office had only one part-time attorney.



John Nixon listens to friends during his retirement reception in Las Cruces in June 1997.

At the time, the Water Rights Division had district offices in Albuquerque, Roswell and Deming. Back then, all applications for water appropriation were sent to Santa Fe for action. D.E. Gray was responsible for signing all permits relating to groundwater appropriations with John helping to review applications for all declared underground water basins in New Mexico. In 1967, Irby retired and Gray became Chief of the Water Rights Division and the groundwater and surface water sections were consolidated.

In July of 1982, John transferred from the Santa Fe office to the district sub-office in Las Cruces and became office supervisor. In 1988 the Las Cruces office was designated a separate district office which John continued to oversee until June of this year.

The tall man who spoke softly but whose presence could not be missed will now spend his days traveling with his wife, Barbara. We wish John the best as he embarks on a new phase of his life—he will be missed.

AWWARF Funding Available

The American Water Works Association Research Foundation, a nonprofit organization dedicated to advancing the science of water, has announced its annual Requests for Proposals (RFPs). Fifteen new RFPs are available on the AWWARF web site (www.awwarf.com). Most proposals in response to these RFPs must be postmarked by **October 1, 1997**. The Association also has announced new research projects approved for 1997 funding. The projects cover topics including resources, treatment chemistry, customer issues, health effects, and epidemiology. A list of the 1997 awards is available on AWWARF's web site and from the WRRI by calling 505-646-1195.

Tucumcari to Host Water Conference

Trek to Tucumcari this fall to attend WRRI's annual water conference. The 42nd Annual NM Water Conference is co-sponsored this year by the American Water Resources Association, New Mexico Section. The conference begins with an optional tour of Conchas Dam on Wednesday, October 1. Tour participants will meet at the Tucumcari Convention Center's parking lot at 1:00 pm to caravan about 35 miles to the Dam where staff of the Corps of Engineers will host the tour. All conference participants are invited to a reception at the South Conchas Lodge located at Conchas Dam that afternoon at 4:00.

Lodging during the conference is available at several reasonably priced motels along historic Route 66 and minutes from the Convention Center, site of the conference. Call the Best Western Pow Wow Inn (505-461-0500), the Best Western Discovery Inn (461-4884), or the Holiday Inn (461-3780) for reservations (remember to mention that you are attending the Annual New Mexico Water Conference). The WRRI (646-1813) has a list of other Tucumcari motels and phone numbers.

Registration forms are available on the Internet by accessing the WRRI home page (http://wrri.nmsu.edu).

Preliminary Program

Thursday Morning, October 2

7:00 Registration - Tucumcari Convention Center lobby

8:15 Opening Remarks
Tom Bahr, Director, WRRI
Mike Loudder, Mayor of Tucumcari

8:45 Keynote Address
Commissioner Eluid Martinez, Bureau of Reclamation

Overview of Eastern New Mexico Water Issues

9:15 An Engineer Reflects on the Water History of the Eastern Plains
John Hernandez, New Mexico State University

9:45 Reservoir Storage Development in the Canadian River Basin in New Mexico and Resulting Litigation
Phil Mutz, New Mexico Interstate Stream Commission

10:15 BREAK

10:45 Geology of Eastern New Mexico
Adrian Hunt, Mesa Technical College

11:00 The High Plains (Ogallala) Aquifer: Managing the Resource in the Southern High Plains, Eastern New Mexico
Woody Woodward, US Geological Survey

11:20 Overview of the Hydrology of Eastern New Mexico
Charles Wilson, water resources consultant

11:45 The Arch-Hurley Conservancy District
Jim Geyler, Arch-Hurley Conservancy District

12:00 Luncheon, Tucumcari Convention Center
Update on New Mexico Water Issues
Tom Turney, State Engineer, New Mexico State Engineer Office

Thursday Afternoon, October 2

Current Water Research Projects

1:30 Geohydrologic Characteristics of the Taylor Well Field, City of Las Vegas
Jay Lazarus and Paul Drakos, Glorieta Geoscience

1:50 Aquifer Storage and Recovery Study for the La Luz Well Field, City of Alamogordo
Eddie Livingston, Livingston Associates; and Steven Finch, John Shomaker & Associates

2:10 Groundwater Relationship Between New Mexico and Texas Along the State Line in the Southern High Plains
Mustafa Chudnoff and Linda Logan, New Mexico State Engineer Office

2:30 Water Rights Considerations Regarding Conjunctive Use of Surface Water and Groundwater in New Mexico
Andrew L. Lieuwen, New Mexico State Engineer Office

2:50 A Technology for In Situ Denitrification of Groundwater
H. Eric Nuttall, University of New Mexico

3:10 BREAK

3:30 Cobble Mulch: An Anasazi Water-Conservation Gardening Technique
Carleton White, University of New Mexico; David Dreesen, US Department of Agriculture; Samuel Loftin, Rocky Mountain Research Station

3:50 Why Cloud Seeding?
George Bormar, Texas Natural Resource Conservation Commission

4:10 Student Paper Competition

Thursday Evening

6:30 pm Banquet Picnic
NMSU Agricultural Science Center at Tucumcari

Friday Morning, October 3

Water Planning and Management Issues

8:00 Lake Meredith Salinity Control Project
Leon Esparza, Bureau of Reclamation, Oklahoma City Water Planning
Lee Wilson, Lee Wilson and Associates

8:30 Watershed Management Issues
Debbie Hughes, NM Association of Conservation Districts

8:50 Growth, Development and Water: Panel of Policy Makers
Mike Loudder, Mayor of Tucumcari
David Lansford, Mayor of Clovis
Don Davis, Mayor of Portales
Zaida Babb, Mayor of Logan
Glenn Briscoe, Quay County Commissioner

9:40 BREAK

10:00 Regional Water Planning
Phelps White, NM Interstate Stream Commissioner
Tracy Seidman Hephner, NM Interstate Stream Commissioner
Lee Tillman, Eastern Plains Council of Governments
Mary Helen Follingstad, NM Interstate Stream Commission

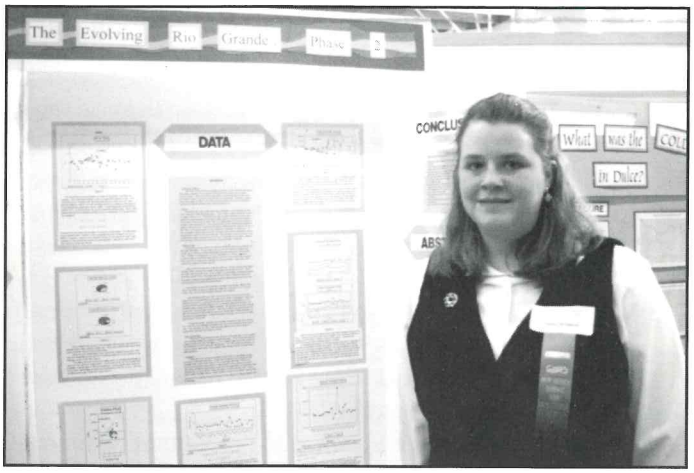
11:00 Agricultural Water Conservation Panel
Woods Houghton, New Mexico State University
Scotty Savage, Natural Resources Conservation Service
Robert Faubion, Mesilla Valley farmer
Palemon Martinez, Taos Valley Acequia Association and NM Interstate Stream Commissioner

11:55 Closing Remarks
Tom Bahr, WRRI

KUDOS

The New Mexico WRRI presented several awards for water-related research projects at this year's science fair held in Socorro in April. In the junior division, encompassing 6th, 7th and 8th grade students, first place went to Lindsay Fagrelius of Farmington for her project entitled, *Analysis and Interpretation of Water Composition in the La Plata River*. Second place was presented to Mario Enriquez of Las Cruces for his project, *Is Bottled Water Better than Tap Water?*

In the senior, or high-school division, Anna Norman of Socorro received first place honors for her continuing project, *The Evolving Rio Grande: Phase 2*. Stephanie Levine of Albuquerque received second place for her effort, *Removal of Radioactive Nuclear Uranium Wastes from Contaminated Water Environments via Pseudomonas Aeruginosa Micro-Organism*. Honorable mention in the senior division was presented to Amena Ishak of Taos for *Ultraviolet Radiation and Acid Rain: The Invisible Killers - Phase II*.



Anna Norman, a junior at Socorro High School, stands alongside the poster she presented at the 1997 Annual New Mexico Science and Engineering Fair. The WRRI awarded Anna first place for Water-Related Research in the Senior Division.

Congratulations to all the students who presented their research at this year's science and engineering fair.

John Braden, chair of the Universities Council on Water Resources' Dissertation/Thesis Award Selection Committee, presents NMSU student Jianmin Lu with a first place award for his thesis.

The Universities Council on Water Resources (UCOWR) selected NMSU master's student Jianmin Lu as the first place recipient of the 1997 Award for the Outstanding Water Resources Thesis in the Field of Environmental and Biological Sciences.

The UCOWR is an organization of almost 100 member universities united in common goals of water research, education and service.

Jianmin's award-winning thesis is entitled, *Stripping Analysis-based Remote Electrochemical Sensors for Trace Metal Contaminants*. The thesis was prepared in conjunction with attaining a master's degree in Chemical Engineering at New Mexico State University. Drs. Ron Bhada and Joseph Wang are Jianmin's research advisors.

An award and check for $500 were presented to Jianmin at the awards luncheon during UCOWR's Annual Meeting in Keystone, Colorado on July 1.

Videos Available

Cadillac Desert Series Aired on PBS

Many of you may have seen the four-part series, *Cadillac Desert* on public television in July. The series focused on the history of water in the American West—how it was bought, sold, diverted and managed—and the contemporary legacy of abundance and risk this history has created both here and abroad. The WRRI has obtained a video copy of the series and copies of the *Discussion and Viewer's Guide*.

According to the *Guide*, the first segment, "Mulholand's Dream," evokes the dark intrigues behind the fiction of the film *Chinatown*. "An American Nile" follows and illustrates how the Colorado River has been asked to do so much for so many with so little. The third segment, "The Mercy of Nature," traces the fierce political and environmental battles that raged around the transformation of California's Central Valley. Finally, "Last Oasis" travels to present-day India and China, where the American way of big dam building continues; then to Mexico, the Middle East, and the American West, where conservation may be humanity's "last oasis."

The viewer's guide provides summaries of the episodes and related discussion topics and activities. It also provides helpful ideas for citizens to mediate public dialogue and for teachers to use in the classroom.

In Las Cruces, after the second segment, a panel discussion was televised in which water experts discussed local water issues. Panelists were Tom Bahr, WRRI Director; Ed Archuleta, General Manager of El Paso Water Utilities, Public Service Board; Gary Arnold, Elephant Butte Irrigation District Board President; and Kevin Bixby, Southwest Environmental Center. The panelists responded to call-in questions concerning water issues in the Lower Rio Grande Valley including New Mexico/Texas Water Commission efforts, conservation, and water rights. The institute has copies of the panel discussion if you are interested in viewing it.

For more information on the programs, visit the Cadillac Desert web site at: http://www.crpi.org/cadillacdesert or http://www.pbs.org/cadillacdesert. Information is also available from the Cadillac Desert Outreach Office, 486 Shawmut Avenue, Boston, MA 02118; phone: 617/867-4095; email: cadillac_desert@crpi.org.

Web Site

There's an Internet site at New Mexico State University that can assist gardeners with a wide range of **gardening topics**, including xeriscape tips. Written by Curtis Smith of the New Mexico Cooperative Extension Service, the site allows users to scroll through months of weekly articles on such gardening issues as proper watering to keep a lawn green during times of watering restrictions. The address for the Yard and Garden site is http://www.cahe.nmsu.edu/cahe/ces/year

continued from page 1

highly sensitive, reliable, rapid and easy-to-use methods for the detection of microorganisms in environmental water samples.

In particular, the species *Cryptosporidium parvum* has been recognized as a serious public health threat. Infections with this protozoan can lead to acute gastroenteritis and diarrhea that can become life threatening in individuals with weakened immune systems. A highly publicized example of an outbreak occurred in Milwaukee in 1993, in which the microbe infected over 400,000 people and contributed to 104 deaths.

New Mexico State University Professor Joseph Wang heads a group of researchers attempting to develop a reliable, cost-effective, compact bioanalytical device for rapid monitoring of *Cryptosporidium parvum*, based on the combination of highly specific DNA hybridization biosensors and a microfabricated PCR reactor.

The biosensor hybridization reactions will be monitored by Dr. Wang's state-of-the-art miniaturized electrochemical transducers, which by themselves can enable extremely low pathogen detection limits. To push the sensitivity still further, to the striking level of just a few *Cryptosporidium* parasites in a water sample, the biosensors will be integrated with a PCR amplification unit, all on a single chip, in an effort to obtain the advantages of simultaneous in situ amplification and detection in a single hand-held unit.

Dr. Wang's team consists of 12 researchers, including 5 graduate students and 7 visiting professors and post-docs. One graduate student and a post-doctoral fellow will focus on this project.

USGS Reports

The U.S. Geological Survey has published the following New Mexico related publications since the last issue of the *Divining Rod*. Copies are available for inspection at the USGS District Office in Albuquerque (4501 Indian School Road NE, Suite 200). 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 303-236-7476 for price information.

- **Water-quality assessment of the Rio Grande Valley, Colorado, New Mexico and Texas—Fish communities at selected sites, 1993-95** by Lisa F. Carter (WRIR 97-4017)

- **Summary of available hydrogeologic data collected between 1973 and 1995 and information on all permeability data and aquifer tests for the Capitan aquifer, Eddy and Lea counties, New Mexico** by G.F. Huff (OFR 97-370)

- **Physical, chemical, and biological data for detailed study of irrigation drainage in the San Juan River area, New Mexico, 1993-94, with supplemental data, 1991-95** by Carole L. Thomas et al. (OFR 97-249)

- The USGS recently published a two-CD-ROM set consisting of stream water-quality data from two national networks operated during the past 30 years. The CD-ROMs provide an especially well-documented source of information for tracking water-quality conditions in major rivers of the U.S. and selected streams in small, minimally developed watersheds. The information, which includes measurements for 122 physical, chemical, and biological properties of water and data on watershed population and land cover characteristics, is also excellent for investigating and illustrating the effects of the natural environment and human activities on water quality.

  For more information access a fact sheet available on the Internet (http://water.usgs.gov/public/pubs/FS/FS-013-971/).

Tom Bahr, Director | New Mexico Water Resources Research Institute | Catherine Ortega Klett, Editor

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Are You Being Served?

The mission of the New Mexico Water Resources Research Institute (WRRI) is ***to develop and disseminate knowledge that will assist the state, region and nation in solving water resources problems.*** Specifically, the WRRI encourages university faculty statewide to pursue critical areas of water resources research while providing training opportunities for students who will become our future water resources scientists, technicians and managers. It provides an outlet for transferring research findings and other related information to keep water managers and the general public apprised of new technology and research advances. In addition, the institute maintains a unique infrastructure that links it with many federal, state, regional and local entities to provide expertise and specialized assistance.

Please let us know how we are doing by completing the following survey.

1. In the last twelve months, have you (or your agency/organization) benefitted from the Institute's...

a. ***Research Program?*** No_____ Yes_____ If yes, in what way?

_____

_____

b. ***Information Transfer Program?*** No_____ Yes_____ If yes, in what way?

_____

_____

c. ***Public Service Outreach?*** No_____ Yes_____ If yes, in what way?

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2. In the last twelve months, have you (or your agency/organization)...

a. ***Received a copy of the WRRI's Divining Rod newsletter?*** No_____ Yes____

b. ***Requested a WRRI publication?*** No_____ Yes____

c. ***Requested general or specific information from WRRI staff?*** No_____ Yes____

d. ***Visited the WRRI Website (http://wrri.nmsu.edu)?*** No_____ Yes____

☞If you answered yes to any of the above, were you satisfied with the service and/or information you received from the WRRI staff? No_____ Yes____

☞Do you have specific comments or suggestions for improvement?

_____

_____

_____

3. What is your affiliation? (please mark any that apply)

_____***Research/academic*** _____ ***Research Administrator***

_____***Research/non-academic*** _____ ***Student***

_____***Agency/government*** _____ ***Other (specify)***_____

We welcome any comments or suggestions. Please complete and return this form to:

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