

divining rod

NM Will Miss Reynolds

On Wednesday, April 25, 1990, New Mexico lost one of its great resources, and probably its greatest public servant, State Engineer Steve Reynolds. Sometimes called the state's water czar, Reynolds' original two-year appointment as state engineer lasted 35 years and 10 gubernatorial administrations.

Reynolds was not loved by all, but respected by almost everyone. He had a reputation for out-preparing the other guy, for considering all sides of an argument, and for honesty. Reynolds not only seemed to know everything about water law in New Mexico, he even-handedly applied the state's water laws. All citizens were treated the same.

Former Rio Grande Compact Commissioner Jesse B. Gilmer, who was a friend and often opponent of Reynolds,



said, "Steve was one of the most capable people I ever saw in my life. He was an honest administrator of New Mexico laws, which a lot of Texans didn't like."

University of New Mexico Law School Professor Chuck DuMars recently wrote: "Unless you knew Steve well, you could never understand the complexity of the man. He loved New Mexico, he wanted her to retain all of her God given resources for her citizens, and he wanted her water resources to be managed in such a way that made the maximum contribution for all New Mexicans."

John Hernandez, a New Mexico State University civil engineering professor, recalls a meeting when he worked for the State Department of Health. It was before the construction of Navajo Dam and there was a conference with Reynolds to discuss the effects of the dam's construction. The Department of Health staff was concerned that if most of the water was diverted for irrigation, there wouldn't be enough water left in the river to dump effluent.

The state engineer was opposed to injecting effluent into the river. Hernandez said Reynolds told them, "You guys have it all wrong. This is my river, and we're going to do it my way." He went on to tell them to keep their dirty sewage out of the river and coined one of his favorite sayings--dilution is not the solution to pollution.

As state engineer, Reynolds worked to conserve what water New Mexico has and to expand its existing supply through \$1.5 billion worth of water

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projects. He also worked to conserve the state's water by declaring underground water basins. In 1955 when Reynolds took office only about 8 percent of the state's area was within declared underground water basins. A little over 70 percent of New Mexico now lies within declared basins.

Reynolds was portrayed in John Nichols's book, *The Milagro Beanfield War*, by the character Nelson Bookman, a state engineer who "was more responsible than any other person or group for what water the state had obtained during that time through interstate compacts and reclamation projects. . . ."

Around the time the movie *The Milagro Beanfield War* was filmed, Reynolds told WRRRI Director Tom Bahr that an official from Milagro Productions had called him to request water rights to irrigate some plastic beans on the film set. Reynolds asked the representative, "Do you know who you're talking to? This is Nelson Bookman. I told them no then and I'm telling you no now."

Reynolds didn't set out to be state engineer. He came to New Mexico from Illinois with \$300 in his pocket to study

PDRB Provides Expertise, Continuity for Research Program

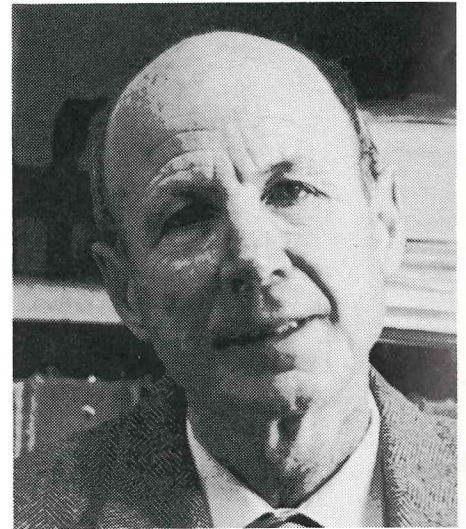
The Program Development and Review Board consists of nine representatives from New Mexico State University, the University of New Mexico, New Mexico Tech, the State Engineer Office, the New Mexico Environmental Improvement Division, and the U.S. Geological Survey plus the director of the Water Resources Research Institute. This advisory board provides the expertise and continuity important to a good research program. Its members know the state's water resources needs and which needs are most critical. The board reviews all research proposals submitted to the institute and provides input for the institute's five-year plan. Although vital to our program, these board members don't receive as much recognition as they should for the outstanding work they do for the institute. We'd like to extend thanks to them for all the time and effort they contribute to our program.



Ron Cummings was appointed to the PDRB in 1985. Chairman of the Department of Economics at the University of New Mexico, he is also a member of the Economic Development and Tourism Board for the State of New Mexico and an Eminent Scholar in the University of New Mexico Eminent Scholars Program. Ron received his Ph.D. at the University of Kansas.



A member of the first PDRB over 20 years ago, **Bill Ellis** began his second term on the board in 1987. He received his law degree from Indiana University and attended graduate school at Harvard Law School. Bill has been with the University of New Mexico School of Law since 1968, and was the Visiting Holder of the Chair of Natural Resources Law at the University of Calgary.



Gerardo Gross has been an active member of the PDRB for twenty years. He is a professor of geophysics at New Mexico Tech and has authored or co-authored over 50 articles for publication. He is currently at the University of Cordoba in Argentina on a Fulbright grant. Gerry earned his Sc.D. from the University of Cordoba and his Ph.D. from Pennsylvania State University.

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WRI Announces Funding for Nine Research Projects

Out of twenty-three proposals and four requests for continuation of funding submitted this spring, the Water Resources Research Institute announced funding for the following nine projects. Total project funding is \$200,032.

As in the past, high priority research areas included water conservation and water quality projects as well as those to improve the understanding of atmospheric/surface/ground water relationships and projects studying uses for saline water.

This year, the Institute's Program Development and Review Board established a provision for funding studies which might be considered "high risk." These studies may be preliminary in nature but deal with innovative concepts that might have a significant relationship to water resources problems.

The PDRB's purpose in considering these types of projects was to encourage creative thinking in non-traditional areas that would be considered to have

a high risk of failure, but great payoff should the project prove successful.

Two of the projects awarded funding fit into this category: "Manipulation of Water Use Efficiency and Quality through Genetic Engineering of Nematode Resistance" and "Analysis of Relationships Between Lightning, Precipitation, and Runoff."

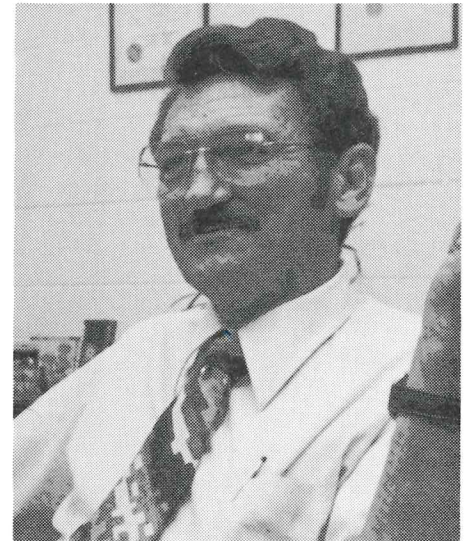
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John Kemp has been with the board for three years. He is director of the Plant Genetic Engineering Laboratory at NMSU and a professor of plant pathology. In 1983, the first successful recombinant DNA transfer was performed under John's direction in research at the University of Wisconsin and Agrigenetics Corporation. He earned a Ph.D. at UCLA.



Russ Livingston, district chief of the Water Resources Division of the U.S. Geological Survey, became a PDRB member last year. Russ is a graduate of the Watershed Management and Hydrology Program of Colorado State University. His accomplishments include a bibliography of over 20 publications and receipt of the Interior Department's Communication Award.



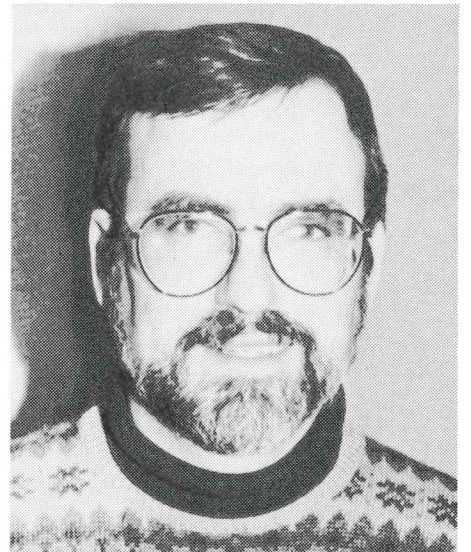
Sam Maggard has been a faculty member in the Civil, Agricultural, and Geological Engineering Department at NMSU since 1963 and a board member since 1975. Sam received a Ph.D. from Purdue University. He was one of the organizers of the NMSU Quality Concrete School in 1964 and has served as head of the department and director of the Engineering Research Center.



Bhasker Rao, a water resources engineer for the State Engineer Office since 1983, joined the board last year. Bhasker received a Ph.D. in civil and environmental engineering from Utah State University. His current research interests are in application of groundwater flow and solute transport models for water rights administration purposes.



Kathleen Sisneros, health program manager for the Surface Water Quality Bureau of the New Mexico Environmental Improvement Division, was appointed to the board in 1985. At EID, she administers water and wastewater facility grants and loan programs. Kathy holds a master's degree in chemistry from New Mexico Highlands University.



John L. Wilson was appointed to the PDRB in 1989. He holds a Ph.D. from Massachusetts Institute of Technology and was a faculty member there for six years before joining INTERA Technologies, Inc. in Houston, TX. John joined the New Mexico Tech faculty in 1984 and is director of the hydrology program in the Department of Geoscience.

Water Education Materials Available

Water education materials are often hard to come by. The American Water Works Association has posters, educational booklets, handouts and computer software available for classroom use.

Booklets include **The Story of Drinking Water** in English, Spanish, and French. Posters illustrate basic water processes and answer commonly asked questions.

Project Water Works is AWWA's new \$25 software package for middle school and high school students for use on Apple II Plus, Apple IIe, or Apple IIc computers. It uses colorful graphics, on-screen science experiments and positive reinforcement to teach students about water science, water management, ecology, and political issues surrounding water use and conservation.

The **Project Water Works** menu includes the following programs:

- *Journey to Earth*--Students probe the surface of the earth via spacecraft in search of fresh water resources.
- *Water Labs*--Students are presented with a variety of observable phenomena, such as snow melting, engines overheating and water freezing.
- *Hydrologic Cycle*--The student travels 40,000 meters above the earth's surface to locate water-related problem areas.
- *Water Management*--Students can explore water conservation measures, water management principles and political concerns.

For more information about the association's educational materials, contact AWWA, 6666 W. Quincy Ave., Denver, CO 80235.

35th Annual Water Conference to be Dedicated to Steve Reynolds

The 35th Annual Water Conference, to be held November 15-16, 1990 at the Holiday Inn Pyramid in Albuquerque, will be dedicated to Steve Reynolds.

It is especially fitting this year's conference is dedicated to Reynolds because the focus of the conference will be on Indian, federal, state, and local governments and organizations working

together on water issues. Reynolds was known for his willingness to consider all sides of an argument (although he might not have agreed).

More information regarding the conference will be sent to those on the WRRRI mailing list in August and will appear in the fall issue of the **Divining Rod**.

Cuba High School Sophomore Wins WRRRI Science Fair Award

Nolan McGlasson, a sophomore at Cuba High School, received the Water Resources Research Institute's award for the outstanding water resources project at the 38th Annual New Mexico Engineering and Science Fair.

McGlasson's project, "Appetite for Destruction," concerned preventing river erosion. Using a stream table, he tested the effectiveness of hydrofoils (also known as "Iowa Vanes") which he constructed himself, vs. lining the river bank with concrete to prevent erosion. His display included photographs showing the effectiveness of each method as well as calculations of the amount of sediment deposited and the surface current velocity.

The study indicated the hydrofoils were more effective in preventing erosion. According to McGlasson, they succeed-

ed in eliminating the spiral current as well as decreasing water velocity.

McGlasson got the idea for his study from a November 1989 issue of **Discover** magazine. He says the Iowa Vane concept originated from River Engineering International, a firm affiliated with the University of Iowa's College of Engineering. "Their original design differs from mine in scale size and slight variations in shape," he reports.

In addition to the WRRRI prize McGlasson received a first place, a category award, and an armed forces award, and attended the International Science and Engineering Fair in Tulsa, OK. Besides engineering, the sixteen-year-old is interested in basketball, track, sports and classic muscle cars, and military aircraft.

House Approves \$30 Million for NM

On June 19 the House of Representatives approved more than \$30 million for water projects in New Mexico, according to Congressman Joe Skeen. The approval came as part of the Energy and Water Development Appropriations bill for FY '91.

The tri-state Animas/La Plata Project was fully funded at \$13,415,000. Other projects receiving partial funding were four Army Corps of Engineers general investigation projects including an arroyos flood design program in Albu-

querque, a flood design program for the Las Cruces/El Paso area, a modification project on the Rio Hondo, and a project providing spoil bank from San Acacia to Bosque del Apache. Also funded were construction projects for the acequias irrigation system, the Albuquerque North Diversion Channel, and Cuchillo Negro Dam, and operation and maintenance projects at the following dams: Abiquiu, Cochiti Lake, Jemez Canyon, Two Rivers, Conchas, Galisteo and Brantley.

Gilmer Retires from RGCC

After over 20 years as the Texas representative on the Rio Grande Compact Commission, Jesse B. Gilmer has retired. Gilmer has been very active in southwestern water issues since his commission appointment in 1969, acting as both adversary and ally to New Mexico.

The Texas native has some strong ties to New Mexico. He graduated from New Mexico State University with a degree in civil engineering in 1934. After graduation he began an interesting career with the federal government.

One of Gilmer's jobs soon after he graduated was to help relocate WWI veterans who had been swindled into buying land at Crater, NM. He explained that some veterans from the eastern U.S. had been talked into buying farmland that was actually useless. Later Gilmer worked to relocate New Mexico's dust bowl farmers. He moved on to Amarillo, TX after the president ordered the establishment of a regional office to combat the dust bowl's effects on agriculture.

During WWII, Gilmer served the U.S.

Department of Agriculture in a number of capacities including president of the Commodity Credit Corporation, operated by the government to procure agricultural products for the army and U.S. allies. Following the war Gilmer went to Paris with New Mexico Senator Clinton Anderson to work on a project which aimed to feed civilians in the war zones.

After a two-year stint to help establish a post-war plan for agriculture, Gilmer returned to Texas, becoming manager of the Tri-State Equipment Co. in El Paso, which he bought a few years later. Gilmer retired from Tri-State about eight years ago to devote more time to the Compact Commission.

Texas Governor Bill Clements appointed El Paso banker Jack Hammond to the six-year post on the RGCC. Besides his work for the commission, Hammond is working part-time for the Bank of the West. Previously he was a vice-president at MBank El Paso. Hammond, a former intelligence analyst in the army, graduated with a degree in business management from Park College in Parkville, MO. He took the oath of office December 22.



Doug Clark, Jackie Clark, and Rebecca Clark pose in front of a stained glass window created by Jackie Clark in honor of her husband, the late John Clark, for the John Clark Laboratory in the new building for the Civil, Agricultural and Geological Engineering Department at New Mexico State University. John Clark was director of the Water Resources Research Institute 1971-1976 and was a faculty member in the Civil Engineering Department for over 25 years. Mrs. Clark also created a set of seven panels to form one stained glass window, "Life on the Rio Grande," for the new building.

WRRRI Report Briefs

The following reports may be ordered from the New Mexico Water Resources Research Institute, Box 30001-Dept. 3167, Las Cruces, NM 88003, (505) 646-1813.

Report No. 248: Proceedings of the 34th Annual New Mexico Water Conference - Catherine Ortega Klett, ed. March 1990. Cost: \$5.00.

The 34th Annual Conference focused on "The Relationship of Water Issues: Southeastern New Mexico as a Case Study." The proceedings contains 22 papers plus a transcription from a panel discussion involving the mayors of Hobbs, Carlsbad, Roswell, and Artesia; the city manager of Ruidoso; and the president of the Mescalero Apache Tribe. Some of the topics examined include the Pecos adjudication, the Texas/New Mexico settlement, and the outlook for water use in the future.

Report No. 249: Microalgae Production and Shellfish Feeding Trials at the Roswell Test Facility - Barry Goldstein. March 1990. No cost.

The project examined the technical possibility and commercial potential of intensive bivalve aquaculture in southern New Mexico. Because bivalves feed on live microalgae, Goldstein looked at whether microalgae could be grown in sufficient quantity with sufficient consistency to support a bivalve crop. Four species of algae were grown in the laboratory and outdoors. Three species of bivalve molluscs including the Pacific and American oysters and the hard clam were evaluated for survival and growth.

Report No. M22: A compilation of Trace Metal Values in Water and Sediments Collected Along the Rio Grande and Its Tributaries in New Mexico - Lynn A. Brandvold and Donald K. Brandvold. April 1990. No cost.

This report is a compilation of data on trace metals from all studies in the Rio Grande watershed through 1986, with the data assembled in a consistent form. It excludes U.S. Geological Survey data, which is readily available but contains very little trace metal data.

Funding for Projects, continued

Water Conservation Projects

Manipulation of Water Use Efficiency and Quality through Genetic Engineering of Nematode Resistance - Champa Sengupta-Gopalan and Stephen Thomas, NMSU

The principal investigators propose to develop a new, environmentally safe nematode control method by using genetic engineering. Such a method would reduce the water stress and damage to the plant associated with nematode infection and circumvent the need for chemical nematicides which could leach into ground water.

Somatic Cell Selection to Genetically Improve Plant Water Use Efficiency and Tolerance to Stresses - Gregory C. Phillips and Glenn D. Kuehn, NMSU.

This is the second year of a three-year project designed to test the hypothesis that certain uncommon polyamines are involved in mechanisms of plant water-use efficiency and/or tolerances to water deficit and heat stresses. If the hypothesis is confirmed, the results would be used by plant breeders and genetic engineers to develop new crop varieties tolerant to drought and heat stresses.

Depletion of Ground Water in New Mexico's Confined Aquifers: Developing Policy Relevant Economic Measures - H. Stuart Burness, UNM.

This project focuses on the economic variables and institutional factors which would delimit an appropriate model of optimal ground water use. The results of the study will identify optimal economic patterns of ground water use which then can be compared to other similar estimates, and the costs of premature depletion can be identified and quantified.

Water Quality Projects

Preferential Flow Effects on Chemical Transport and Retardation in Soils - Robert S. Bowman, NMT.

This is the second year of funding for this two-year project, important because we are still unable to accurately predict

chemical migration from the soil surface to ground water. Recent experiments show that water movement through soils can be very irregular, in contrast to the uniform flow assumed by most transport theories. This project will result in quantitative data on the effects of water flow rate, water application method, and degree of preferential water flow on the sorption and retardation of a model organic compound in soil. The data will be used to justify or reexamine the use of fixed sorption parameters in simulation and prediction of contaminant migration.

Onsite Treatment of Septic Tank Effluent: An Evaluation of Rotating Biological Contactor Capabilities - Ricardo Jacquez, NMSU.

This is also the second year of funding for a two-year project, designed to evaluate the feasibility of using rotating biological contactor technology to provide extensive treatment of septic tank effluent. See the Spring 1990 issue of the **Divining Rod** for more detailed information about this project.

Manipulation of Aquifer Environmental Factors to Enhance Biodegradation of Organic Contaminants - Clifford N. Dahm and Mary E. Watwood, UNM.

The principal investigators will gather quantitative data concerning specific aspects of contaminant biodegradation necessary for the site-specific implementation of *in situ* bioremediation. The project will provide remediation personnel with methodological tools for preliminary site screening, a data base for decision-making based on aquifer environmental parameters and contaminant types, and a unique reference for the effects of particular environmental manipulation on the process of contaminant biodegradation.

Low Volatile Organics in Ground Water: Techno-Economic Evaluation of an Innovative Treatment Process - N. Khandan, NMSU.

The principal investigator has developed a modification of the air stripping process called "cascade air stripping," used in removing low and semi-volatile contaminants from ground water." The

technical feasibility of cascade air stripping has been proven through an earlier study. This project will provide for field testing and demonstration of the process.

Atmospheric/Surface/ Ground Water Relationships Research

Analysis of Relationships Between Lightning, Precipitation and Runoff - William Rison, NMT, and Herbert D. Grover, and Douglas I. Moore, UNM.

This project will extend the current applications of lightning location data by determining statistical relationships between these data, precipitation amount and intensity, and, for some areas, runoff. Because the lightning data is acquired in real time, it could be used to monitor the course of severe storms and predict precipitation amount and intensity in areas subject to flash flooding.

Three Dimensional Pump Tests for Determining Aquifer Permeability Anisotropy - Chia-Shyun Chen, NMT.

The principal investigator will conduct three-dimensional pump tests to characterize the permeability anisotropy of the Sevilleta aquifer. Many pump tests have been conducted to identify permeability anisotropies, but most were limited to the determination of two-dimensional permeability anisotropies. This research will produce field data that can be used to verify pertinent three-dimensional ground water theories or numerical models and enhance understanding of the Sevilleta aquifer's hydrogeology.

Bahr Appointed to Commission

Governor Garrey Carruthers has named WRRI Director Tom Bahr as the member-at-large for the Water Quality Control Commission. Created in 1967, the commission consists of nine members, eight members representing various state agencies. It is responsible for promulgating rules and regulations under the guidelines of the Water Quality Act.

Ice is a Hot Topic for New Mexico Tech Researcher

Story and photo by George Zamora, New Mexico Tech Public Information Office

Dr. Gerardo Gross, professor of geophysics at New Mexico Tech and long-time member of the Water Resources Research Institute's Program and Development Review Board has studied the physical properties of ice for 30 years. He is now comparing notes with ice researchers in Argentina through a grant provided by the Fulbright program.

Gross left Socorro in early June to continue his ice physics research at Cordoba University in Argentina, where he will also teach courses on the electrical properties of ice.

"Ice shares common properties with water and also with solids, such as semiconductors," Gross observes. "It cannot be described completely through solution chemistry and neither can it be described by classical semiconductor theory. In other words, it is neither fish nor fowl, and that is what makes ice so complicated."

Gross began his ice physics research when he first arrived at New Mexico Tech in 1960. His early studies on the electrical properties of ice were directly

linked to thunderstorm research being conducted by Tech's Research and Development Division.

"The electrical properties of ice, such as the storage and generation of electrical charge, depend on the presence of small traces of impurities, such as ammonia or salt, which are present in the atmosphere through natural processes," Gross explains. "The effects of impurities on ice and the role that ice plays in thunderstorm electrification are processes which are not very well known," he adds. "Unless we understand the fundamental process which take place in the laboratory, we cannot fully understand and analyze the processes which occur in clouds, which are much more complex."

Gross says "Besides the role that ice plays in thunderstorm electrification, it has also been found that ice is an important factor in the formation of precipitation. Much of what we get as rain starts out at the tops of thunderclouds as ice," he notes. Yet another important application of ice physics research which has become prominent in recent years is the study of how ice

and snow absorb impurities from the atmosphere. Gross says these studies can help answer questions about how air pollution propagates through winds and atmospheric currents.

Biologists have recently become interested in how the properties of ice can be applied to research in the life sciences. According to Gross, researchers at Carnegie-Mellon University "have found that water in living tissue takes on an ice-like structure and that these types of structures may be responsible for transmitting nerve impulses." Also biologists are now studying how certain bacteria promote or counter freezing on plants and hope to apply this research to prevent the crop damage that ice can sometimes cause.

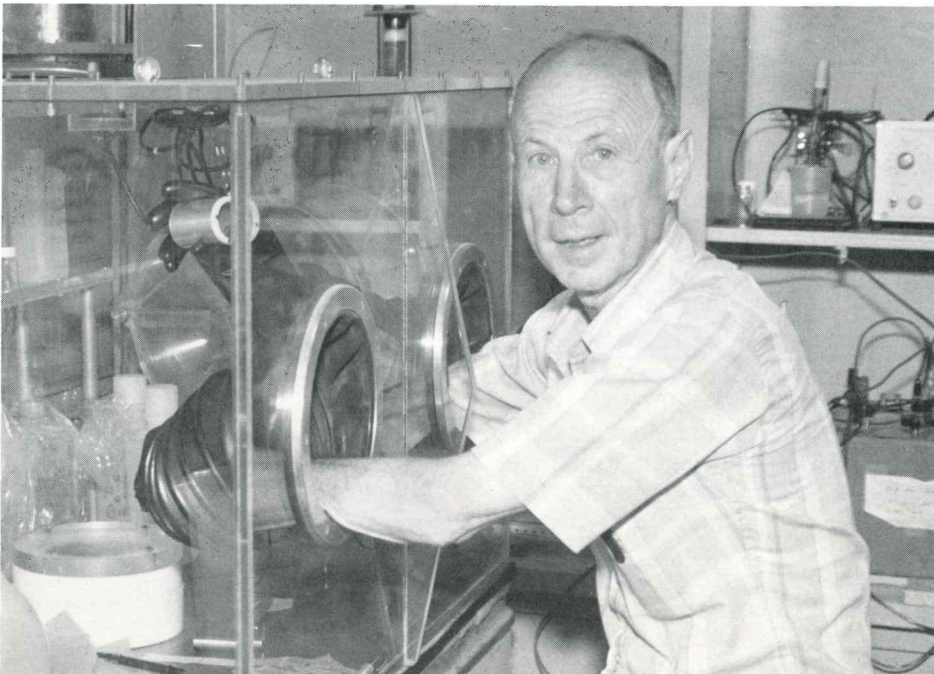
Even as worldwide scientific interest on the frozen subject begins to "warm up," Gross can look back on his three decades of ice physics research and point out that ice has always been a hot topic with him.

New SCS Ag Economist

In March, Gary O'Neill of Ponca City, OK, was named state agricultural economist on the staff of the U.S.D.A.'s Soil Conservation Service Office in Albuquerque. He is primarily responsible for economic input for the agency's water resources activities throughout New Mexico. The Oklahoma State University graduate began his career with SCS in 1983 as a soil conservationist.

Wang Wins NMSU Award

Analytical chemist Joseph Wang received New Mexico State University's Westhafer Award, the most prestigious honor presented to faculty, recognizing excellence in research. Wang has worked on two projects funded by WRRRI, developing electrochemical sensing devices which can be used for on-site testing of water for environmental pollutants and continuous monitoring of industrial effluents. His current research focuses on sensing devices for use in the medical field. Wang is the author of more than 180 papers, and has received almost \$1 million in grants.



Geophysics Professor Gerardo Gross studies the complicated physical properties of ice in his New Mexico Tech laboratory.

Reynolds (continued)

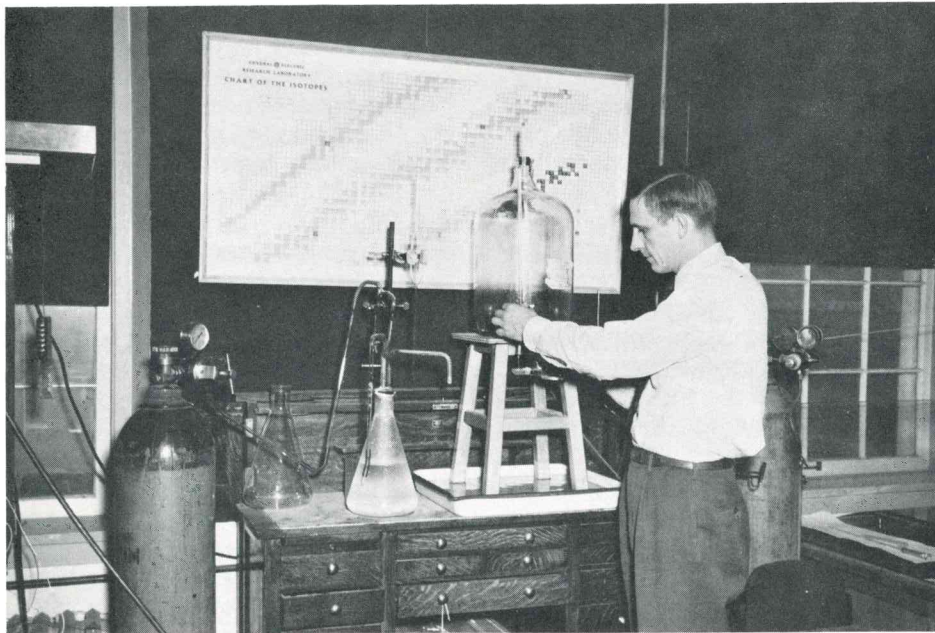
mechanical engineering at the University of New Mexico. He was captain of the football team and president of the student body during his senior year.

Reynolds remained a UNM football enthusiast. "Although he was business 99 percent of the time, he liked to joke and talk sports," Hernandez remembers. "When he talked sports, it was Lobo-Aggie football." And it was *always* Lobos-Aggies--the Aggies never won."

Reynolds served in the Navy during WWII. Afterward, he became a research

physicist at New Mexico Institute of Mining and Technology, spending time studying thunderstorms. He and then NMIMT President E. J. Workman discovered the Workman-Reynolds Effect, the phenomenon of electrical charging which occurs when water freezes.

It was while Reynolds was at Tech that Governor John Simms tapped him for the job which would span the rest of his life and change western water law.



Steve Reynolds in a New Mexico Institute of Mining and Technology laboratory during the late 1940s.

Photo courtesy of New Mexico Tech Archives.

Dr. Saul Resnick, retired director of Arizona Water Resources Research Center, recalls working with Reynolds on a cloud-seeding project while Reynolds was at NMIMT. Resnick was teaching at Colorado State University at the time, and had been sent to Socorro to learn about cloud seeding.

Resnick and Reynolds, along with two other researchers, were working to increase the snowpack one cold winter night. He says they used silver iodide, which would turn your skin and clothes yellow. They had been trying for hours to catch an updraft in an area over actress Greer Garson's ranch in northern New Mexico, where she kept prized white Charolais cattle.

About 12:30 a.m., Reynolds suggested they take a break and go get a cup of coffee. He said, "I don't think we're doing anything but turning Greer Garson's cattle yellow."

Resnick reported the group went into a coffee shop along the highway. Two rough looking men with revolvers strapped on were sitting at the next table. The researchers heard one man say to the other, "You know, against that snow, those cattle look yellow." Resnick said the four didn't dare laugh for fear they would be shot on the spot. The other two men were from Garson's ranch.

Tom Bahr, director, New Mexico Water Resources Research Institute
Leslie Blair, editor

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