



Desert Research Institute

# DRI News

S P R I N G

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*&*  
2007  
Annual Report



Science Environment Solutions

**A**s I look back at 2007, I believe it will be said that this was a pivotal year in the history of the Desert Research Institute, a year where we took key steps to ensure the Institute's future research success as we approach our 50<sup>th</sup> anniversary in 2009.

DRI's fundamental research mission remained strong even during a year of economic downturn and political uncertainty. During 2007, research faculty, staff and administration worked collaboratively to complete a thorough self-study of critical aspects of the Institute. This study focused on where our resources should be directed for a more efficient, streamlined and effective research operation. In addition, we completed and received approval of DRI's updated strategic plan, allowing the institution to plan for and begin implementation of new and innovative science programs—such as renewable energy, human health and the environment—while capitalizing on the Institute's core research mission in environmental sciences, hydrology and atmospheric sciences.

With the support of the Board of Regents, the Governor and Nevada's legislature, the Institute made critical progress during the 2007 legislative session. DRI received new and additional funding for many areas, including: research administrative support; the Computational Research and Visualization building; the funding of nearly 7,000 square feet in support of DRI's research operations in the Tahoe Center for Environmental Sciences at Sierra Nevada College in Incline Village; and additional money for operations and maintenance.

Never before has private fundraising been so critical to the Institute's future. After several years of building a solid base of friends and supporters, DRI's

Institutional Advancement office was restructured to emphasize development activities, which should lead to many more major gifts in support of our faculty, as well as for equipment, capital projects and endowments. DRI is now in the midst of a national search to hire a vice president for development, who will focus on fund-raising efforts throughout Nevada, and will search out new funding partners and opportunities on both national and international levels.

This past year, DRI received significant donations from DRI Research Foundation trustees and family foundations, specifically in support of faculty science and entrepreneurialism. The Nazir and Mary Ansari Foundation created two distinct awards known as the Nazir and Mary Ansari Medal of Excellence in Science and the Nazir and Mary Ansari Chair in Entrepreneurialism and Science. The Tom and Mary Kay Gallagher Foundation funded innovative research equipment for archaeological studies, and an endowment for the Senior Director of the Center for Watersheds and Environmental Sustainability was created by Joe Guild and Jann (Guild) Cadematori from the Clark J. Guild Jr. Foundation. Thanks to the key leadership of our DRI Research Foundation, our trustees have been focused on building the Institute's donor base and significantly improving major-gift contributions. I also am grateful that both Hal Lenox, president of AT&T Nevada, and Roberto Denis, senior vice president for Energy Supply at Sierra Pacific Resources, have accepted invitations to become trustees on our Foundation. AT&T has funded the Nevada Medal since its inception, and Sierra Pacific Resources, Nevada's major power company, has been the primary sponsor of our Green Power program, which expanded this year in both Reno and Ely.

Our signature event, the awarding of the Nevada Medal, was given to Massachusetts Institute of Technology molecular biologist Susan Lindquist. Her

## From the President



Stephen Wells  
PRESIDENT  
DESERT RESEARCH INSTITUTE

We are committed to science that improves people's lives around the world, enhances our stewardship of Earth's resources and helps to sustain our environment.

presentation on protein-folding research, a key in understanding neurodegenerative diseases, captivated audiences at dinners in both Las Vegas and Reno.

A major turning point in the evolution and growth of DRI as an institute has been expansion of our physical facilities. Two new buildings were opened in 2007, and ground was broken on a third new building, all of which will allow increases in our research capabilities. These new facilities will help DRI grow for years to come.

🌊 In Boulder City, the \$1.2 million Underground Weighing Lysimeter facility (*page 7*) was unveiled. This state-of-the-art center was funded by the National Science Foundation, and will allow measuring of detailed interactions among soil, water and plants in arid settings. This facility will be used in collaboration with faculty from the University of Nevada, Reno and the University of Nevada, Las Vegas. DRI faculty member Mike Young has been instrumental in obtaining funding for this facility and has assumed a leadership role in running its operations.

🌊 In Reno, we celebrated the completion of the \$5.7 million addition to the Maxey Science Building (*page 8*). The Maxey expansion created more space for laboratories, especially for Alison Murray and Christian Fritsen, who are part of DRI's program that examines life in extreme environments.

🌊 Also in Reno, ground was broken and construction began on the \$26 million Computational Research and Visualization Building. When completed, this building will bring DRI's computational groups together under one roof and will house our advanced computer visualization facility.

DRI's most significant resource is its people—the remarkable faculty, staff and students who, collectively, have advanced the Institute to new levels of research, education, outreach, administrative support and effectiveness. It is a pleasure and honor to tout the accomplishments and creative research of our scientists, post-doctoral researchers and graduate students to other institutions, donors, policymakers and DRI stakeholders. Below, a brief snapshot of research achievements and awards from 2007 highlights just a few of the significant contributions DRI people made to the state of Nevada, the nation and the world.

🌊 Faculty member Nick Lancaster received the Nevada System of Higher Education's Regents' Researcher Award for 2007, marking the third year in a row that a DRI faculty member has received this honor. Lancaster's pioneering work on sand dunes has brought him international recognition in this field.

🌊 Jim Thomas, senior director of the Center for Watersheds and Environmental Sustainability, an endowed chair position funded by the Clark J. Guild Jr. Charitable Foundation, is leading DRI's participation in the Walker Basin Project, a \$10 million federally funded project that includes collaborative environmental and economic research between DRI and the University of Nevada, Reno. This research will explore the best means to get additional water to Walker Lake while still maintaining the Walker Basin's economy and ecosystems.

🌊 This past year, the Southern Nevada Public Land Management Act awarded fifteen grants to study Lake Tahoe, and one-third of these competitive grants, worth \$1.66 million, were awarded to DRI faculty.

🌊 The Sierra Pacific Resources Foundation for Charitable Contributions donated \$84,000 to the Institute for a two-year period. The donation is to cover the salary and benefits for a half-time position to manage the GreenPower program. The GreenPower program is designed to promote the use of renewable energy in Nevada's K-8 schools.

🌊 Don Sabol, together with faculty members Eric McDonald and Todd Caldwell, was awarded \$300,000 to study landmine detection for the U.S. Army. By studying the characteristics of disturbed soils, they hope to keep our troops safer.

🌊 Judy Chow was recognized with the inaugural Nazir and Mary Ansari Entrepreneurialism and Science Chair, a \$75,000 award spread over three years, funded by the Nazir and Mary Ansari Foundation. Chow will use the award to study how different types of air pollution are affecting the preservation of cultural artifacts in places as diverse as Xi'an, China, Italy, Cyprus, Chile and India.

🌊 The donation from Tom and Mary Kay Gallagher will fund DRI's archaeology program by purchasing additional analytical equipment. It will tremendously expand the capability of researchers to identify biological and archaeological materials such as hair, charcoal and bone. In recognition for the equipment purchase, DRI's Division of Earth and Ecosystem Sciences will name the archaeology and paleoecology laboratory in their honor.

While 2007 was full of highlights, the year for me ended on a particularly special note when I saw that in its January 2008 issue, Discover Magazine ranked research conducted by DRI researchers Joe McConnell, Ross Edwards and colleagues nineteenth out of their 100 top science stories of 2007. Through a new method they developed at DRI, McConnell and Edwards determined that eight times as much black carbon was deposited in Greenland's ice from 1906 to 1910 than during the previous 100 years, which shows the dramatic effect the industrial revolution had on the environment.

This study is just an example of the excellence and recognition of our faculty's research in 2007, and there is the promise of even more breakthrough research in our future. Perhaps, in retrospect, 2007 will be seen as a pivotal year for us—a year where we looked ahead in order to build on the Institute's accomplishments, and planned new initiatives for DRI to grow, excel and to continue to shine as Nevada's premier research institute. Time will tell, but from where we stand now, the future looks very bright indeed.



Stephen Wells  
President



The Desert Research Institute is a nonprofit, statewide division of the Nevada System of Higher Education. DRI is internationally recognized for excellence in environmental research. DRI operates two campuses: one in Las Vegas and one in Reno at the Dandini Research Park. Articles appearing in this publication may be reprinted with appropriate attribution given to the Desert Research Institute.

#### Administration

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<b>Senior Vice President of Finance and Administration and Chief Operations Officer</b>	O. Cleve McDaniel
<b>Vice President for Academic and Faculty Support</b>	Roger Jacobson
<b>Director of Communications and Government Affairs</b>	Greg Bortolin
<b>Interim Director of Development and Marketing</b>	Mary Woods

#### Division Directors

<b>Earth and Ecosystem Sciences</b>	Michael Auerbach
<b>Atmospheric Sciences</b>	Alan Gertler
<b>Hydrologic Sciences</b>	John Warwick

#### Center Directors

<b>Advanced Visualization, Computation and Monitoring</b>	Frederick Harris
<b>Arid Lands Environmental Management</b>	Nicholas Lancaster
<b>Watersheds and Environmental Sustainability</b>	James Thomas
<b>Environmental Remediation and Monitoring</b>	David Shafer

#### DRI News

<b>Editor</b>	Bob Conrad
<b>Copy Editor</b>	Sara Marcus
<b>Design</b>	Rollermonkey Design
<b>Printing</b>	Bear Industries

<b>Reno Campus</b>	<b>Las Vegas Campus</b>
Desert Research Institute	Desert Research Institute
2215 Raggio Parkway	755 East Flamingo Road
Reno, NV 89512-1095	Las Vegas, NV 89119-7363
(775) 673-7300	(702) 862-5400

[www.dri.edu](http://www.dri.edu)

The Desert Research Institute is committed to Equal Employment Opportunity/Affirmative Action in recruitment of its students and employees and does not discriminate on the basis of race, color, religion, sex, age, creed, national origin, veteran status, physical or mental disability or sexual orientation. DRI employs only United States citizens and aliens lawfully authorized to work in the United States. Women and under-represented groups are encouraged to apply.

Cover image by: Stöckli, Nelson, Hasler Laboratory for Atmospheres, Goddard Space Flight Center/NASA

## At-a-glance

- Established by the Nevada Legislature in 1959
- Became a stand-alone institution in 1969
- More than 500 researchers, staff and students
- More than 300 active research projects
- Research conducted in every state and on every continent
- Three research divisions**
  - Atmospheric Sciences
  - Earth and Ecosystem Sciences
  - Hydrologic Sciences
- Four science centers**
  - Advanced Visualization, Computation and Modeling
  - Arid Lands Environmental Management
  - Environmental Remediation and Monitoring
  - Watersheds and Environmental Sustainability
- Main campuses**
  - Las Vegas
  - Reno
- Satellite facilities**
  - Boulder City, Underground Weighing Lysimeter Lab
  - Incline Village, Tahoe Center for Environmental Sciences
  - Stead, Weather Modification Center
  - Steamboat Springs, Colo., Storm Peak Laboratory

#### Nevada System of Higher Education Board of Regents

Michael Wixom, Chair	Dorothy S. Gallagher
Howard Rosenberg	Jason Geddes, Ph.D.
Mark Alden	Ron Knecht
Stavros S. Anthony, Ph.D.	James Dean Leavitt
Cedric Crear	Dr. Jack Lund Schofield
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**James Rogers, Chancellor**

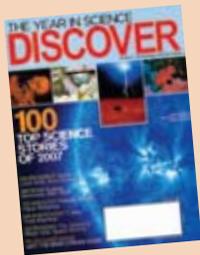
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### Study makes Discover's top 100

In its January 2008 issue, *Discover Magazine* ranked research conducted by two Desert Research Institute scientists 19<sup>th</sup> in their review of the top 100 science stories of 2007.

Researchers Joe McConnell, Ross Edwards and colleagues, through a new method they developed in ice core research, showed the dramatic effect of the industrial revolution on the environment.



“Joe and Ross are on the cutting edge of global climate-change research,” says Stephen Wells, DRI’s president. “The recognition they received first by *Science Magazine* and now *Discover* is well deserved.”

### ‘Beam of Light’ is ray of hope for Israeli-Jordanian cooperation

An Israeli, Jordanian and U.S. cooperative project aimed at measuring air quality between neighboring cities in Jordan and Israel has been launched by scientists from the Hebrew University of Jerusalem and the Desert Research Institute.

The trans-boundary regional air-quality study began this fall, with Israeli and Jordanian researchers operating laboratories on both sides of the border to measure air quality.

As part of the experiment, researchers shine a powerful light projected from the Israeli side to the Jordanian side. The returning rays are then submitted to analysis, which enables the group to determine the composition of the air over the Red Sea that lies between the two measuring sites.



A beam of light from Hebrew University scientists working with Jordanian colleagues. Photograph by Alan Gertler, Desert Research Institute.

## Global Reach News in Review

### From Mars to the Arctic, the Desert Research Institute makes worldwide headlines

#### EPA awards \$75,000 for air-pollution research

The U.S. Environmental Protection Agency recently awarded \$75,000 for air-pollution research in Paso del Norte, Texas. The Desert Research Institute received the grant to collect emissions of particulate matter from unpaved roads. Particulate matter, once inhaled, can adversely affect the heart and lungs. Researchers will measure variations of particulate matter over a period of years to determine the effectiveness of road surface treatments.

#### Defense bill advances Nevada research

Continuing his efforts to champion Nevada causes, U.S. Senator Harry Reid recently announced that Nevada is to receive \$93,350,000 in the Defense Appropriations bill.

The bill includes \$2 million for the Desert Research Institute to develop methods and technologies for characterizing varied natural environments—polar, tropic, temperate and desert—in support of the U.S. military’s critical worldwide operations.

#### \$1.66 million awarded for Lake Tahoe research

Five of the 15 Lake Tahoe research projects funded by the Southern Nevada Public Land Management Act have been awarded to the Desert Research Institute. The projects are worth \$1.66 million.

“When you consider that 90 projects were submitted for consideration and that five that were submitted by the Institute were accepted, that’s truly an accomplishment to be proud of,” says DRI President,

Stephen Wells. “This is a great example of the high level of research that our scientists conduct.”



The five projects will examine potential pollution from prescribed burns in the Tahoe Basin, sources contributing to air pollution

in the basin, the cost effectiveness of road-dust control strategies, erosion control and water runoff.

“These research projects culminate a great year in our collective efforts to preserve Lake Tahoe,” says Jim Thomas, director of the Center for Watersheds and Environmental Sustainability.

#### Researchers celebrate grand opening of research center in China



Researchers celebrate the opening of the Center for Global Change and Water Cycle in China.

The inauguration ceremony for the Center for Global Change and Water Cycle was held in November at Hohai University in Nanjing, China. The vice-chancellor of the university welcomed more than 20 scholars, including John Warwick, director of the Division of Hydrologic Sciences at the Desert Research Institute.

The new center will investigate the effects of climate change, land-use change and desertification on the water cycle. It is the first research organization in China devoted to these topics.

## Top personnel join the Institute

### Staff visualization scientist comes from TRPA

Derek Norpchen is a new staff visualization scientist at the Desert Research Institute. He previously worked at the Tahoe Regional Planning Agency, where he was a Geographic Information System specialist, air-quality project manager and graphic illustrator.

"We are very familiar with Derek's work," says Stephen Wells, DRI president. "While working at TRPA, Derek also worked on computer visualization, desert terrain and other projects here at the Institute."



### Groundwater modeler joins the Las Vegas campus



Yong Zhang recently joined the Desert Research Institute as an assistant research professor specializing in groundwater modeling in the Division of Hydrologic Sciences.

President Stephen Wells says: "We are happy to get Yong back, where he spent a couple of years as a post-doctoral research associate. He will not only be an asset to the Institute, but he brings valuable expertise with his area of specialty in the study of groundwater flow and contaminant transport."

Zhang was recently awarded a \$50,000 grant from the National Science Foundation.

### Surface-water hydrologist to study sediment and erosion in rivers

Dong Chen has joined the Desert Research Institute as an assistant research professor specializing in surface-water hydrology.

"Dong comes to us with research experience on the effects of sediment transport into Lake Mead when the Las Vegas Wash floods," President Stephen Wells says. "While much of our work takes place on other continents, his research is a good example of how the Institute addresses important issues closer to home."

Chen is working on an urban flood demonstration project for the U.S. Army Corps of Engineers that examines sediment transport in the Las Vegas Wash, Rio Salado in Arizona and Rio Grande in New Mexico.



### Information Technology gains new leadership



Ed Novak was selected from a national search to become the Assistant Vice President of Information Technology and Chief Information Officer.

"Ed brings with him a diverse background in information technology and strategic planning that will be vital to our future," Stephen Wells, DRI president, says. "As the Institute's research portfolio has doubled during the past decade, the technology demands have increased to an even greater degree. In the coming year, we will open one of the top computational and visualization centers in the world on our Reno campus."

## Institute to help NASA with space exploration

Researchers from the Desert Research Institute and University of Nevada, Reno partnered with University of Nevada, Las Vegas scientists this year to help NASA enhance the success of future missions to the moon and Mars. The collaborative project was made possible by a new \$750,000 grant from Nevada NASA Experimental Program to Stimulate Competitive Research.

Researchers involved in the project include Nicholas Lancaster, senior director of the Center for Arid Lands and Environmental Management, and Henry Sun, assistant research professor. The research team will draw from each institution's expertise to help NASA better interpret data from planetary missions and improve the operations of future manned and robotic missions.

"NASA is in the midst of an ambitious exploration program to return humans to the surface of the moon and provide a robotic presence on Mars," Lancaster says.

## Student gets a boost from the Institute



Joanne Heslop, a student from Incline Village, was named Science Student of the Month for September. The Science Student of the Month program is sponsored by KOLO-TV, the Desert Research Institute and the Western Nevada Regional Science and Engineering Fair.

"I have been very interested in working with Joanne in her research of the relationship between atmospheric temperature and carbon dioxide release rates from the soil, since it is an issue that receives a lot of attention within the international scientific community," says Associate Research Professor Paul Verburg, who has been Heslop's mentor. "I continue to be particularly impressed by her scientific maturity that goes well beyond her age."

Verburg is referring to Heslop's project, which earned her second place overall at the 2007 Western Regional Science and Engineering Fair and an entry into the 2007 Intel International Science and Engineering Fair in Albuquerque. Heslop is a senior in high school and home-schooled by her mother, Kathy.

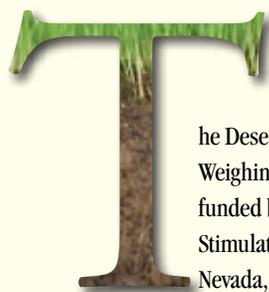
## Mountain View Montessori School goes green with GreenPower program

In November, the Desert Research Institute and Sierra Pacific Resources unveiled the GreenPower structure at the Mountain View Montessori School in Reno. The school is the fifteenth GreenPower school in Nevada and the first private school to participate in the GreenPower program. The GreenPower installation at the school includes a photovoltaic (solar) system and wind turbine. Data from the system can be viewed on the Internet, where students and teachers can monitor solar and wind production.

"Thanks to the generous support of our program partner Sierra Pacific, this program is able to reach directly into the schools to support and promote the use and development of renewable energy sources in Nevada," says Stephen Wells, DRI president.



## \$1.2 million underground laboratory unveiled in Boulder City



The Desert Research Institute unveiled its new \$1.2 million Underground Weighing Lysimeter Lab in Boulder City this October. The facility was funded by the National Science Foundation's Experimental Program to Stimulate Competitive Research, in partnership with the University of Nevada, Reno and the University of Nevada, Las Vegas.

"This new facility will be a state-of-the-art center for precisely measuring the interactions among soil, water and plants in arid environments," says Stephen Wells, president of the Institute. "When completed, we envision the center as a magnet for high-end research conducted by faculty and students inside and outside of Nevada."

The laboratory consists of a series of scientific instruments known as weighing lysimeters—soil containers resting freely on large capacity balances. Lysimeters are used for studying plant water use, soil water budgets and the flow and transport of a variety of compounds. Each lysimeter is contained in a separate room, with a tunnel that connects the rooms.

The lysimeters were built so that the outer walls of the container are not touching any part of the facility, allowing each one to float freely on the balance. The free-floating aspect of the instrument is vital if the measurements from the balance are to be accurate.

The top of the soil container is flush with the ground surface because the lysimeter must be even with the ground surface to ensure that wind does not buffet the container, causing errors in the measurements. It also prevents soil and other material from either collecting on the lysimeter surface or being eroded from it.

"We have a very basic knowledge of dirt systems," says Michael Young, deputy director of the Institute's Division of Hydrologic Sciences. "With this facility, land managers can now determine how long it takes for the soil to restore itself and for plants to be re-established."

Numerous other experiments can be conducted using the lysimeters, such as how desert soils might sequester carbon dioxide, or how contaminants move through desert soils. The rates of how water and other fluids move through the soil also can be determined.

"The new lysimeter facility will be a state-of-the-art center for precisely measuring the interactions among soil, water and plants in arid settings."

—Stephen Wells, DRI president



Regent Mark Alden, Tungalag Has-ochyr and DRI President Stephen Wells inside the new Underground Weighing Lysimeter Lab in Boulder City.

## The Maxey Science and CAVE buildings advance research in Reno

**T**he Desert Research Institute celebrated this past October the completion of the \$5.7 million Maxey Science Building expansion and dedicated the \$26 million Computational Research and Visualization Building.

“These two new facilities will give the Desert Research Institute the ability not only to house more researchers, but to take on more exciting research in areas such as climate change and advanced computer and visualization technology,” says Stephen Wells, president of the Institute.

The public joined U.S. Sen. Harry Reid, Lt. Gov. Brian Krolicki, Washoe County Commissioner Kitty Jung and EDAWN President and CEO Chuck Alvey at the dedication and open house in the fall.

Personnel moved into the Maxey addition in September. The new wing adds 10,000 square feet to the Institute, including microbiology labs, faculty and administration space, as well as a new conference room.

The Computational Research and Visualization Building (CAVE) will add 40,000 square feet to the Institute when completed in 2008. It will feature a six-sided CAVE, an advanced piece of visualization equipment that will give scientists the ability to create complex 3-D projections. 3-D visualization technology is incredibly useful to scientists, giving them an opportunity to actually see and quantify the phenomenon they are researching. This is considered an important attraction for the DRI Research Park, which surrounds the Institute and Truckee Meadows Community College.

“The CAVE at the Desert Research Institute will provide scientists and researchers with the perspective needed to work on some of the most advanced experiments ever conceived, and it will all take place in Nevada,” says U.S. Sen. Harry Reid. “I am happy that I was able to secure funding for this magnificent piece of technology.”



In fiscal year 2004, Senator Reid secured a \$3 million appropriation for the initial phase of funding for the CAVE, and subsequent appropriations in fiscal years 2005 and 2006 that totaled \$12 million. Reid’s efforts were supported by Nevada’s congressional delegation. In particular, through their positions on the Senate and House Armed Services Committees, Senator John Ensign and former Congressman Jim Gibbons secured authorization language in the fiscal years 2005 and 2006 Defense Authorization Bills for the project.

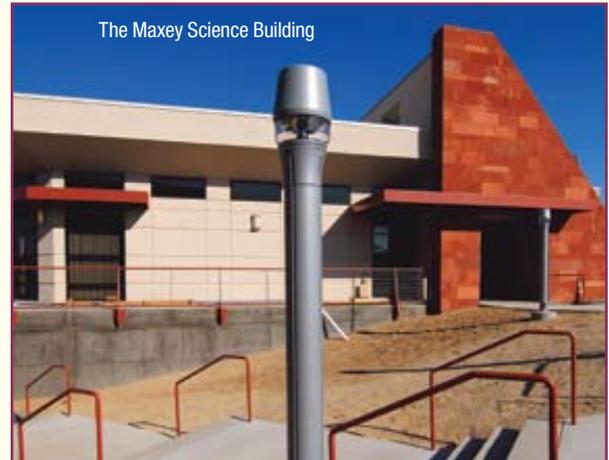
When the CAVE is complete, the Institute will become one of the most technically advanced visual-research facilities in the world, and it will empower DRI researchers to model real environments and landscapes .

“The CAVE at the Desert Research Institute will provide scientists and researchers with the perspective needed to work on some of the most advanced experiments ever conceived, and it will all take place in Nevada.”

—U.S. Senator Harry Reid



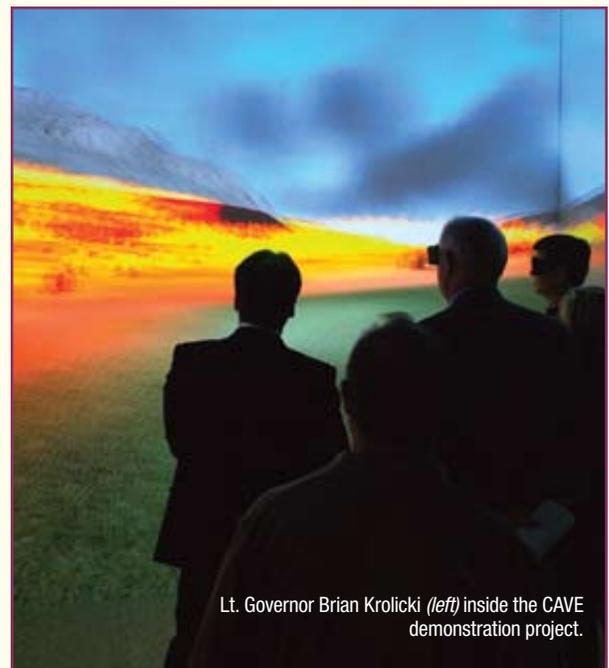
EDAWN President Chuck Alvey



The Maxey Science Building



President Stephen Wells



Lt. Governor Brian Krolicki (*left*) inside the CAVE demonstration project.



## *At-a-glance*

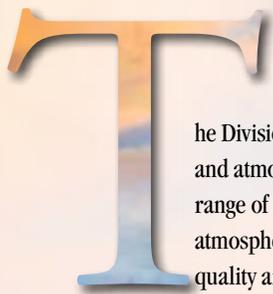
-  Fifty employees hold doctoral degrees
-  The division is home of the Western Regional Climate Center
-  Research programs are supported by two state-of-the-art chemistry laboratories
-  Fifty-two percent of funding comes from the federal government
-  Significant research funding also comes from state and local governments, private organizations and foreign governments
-  Research expenditures during fiscal year 2007 were \$11.7 million

## The Division of Atmospheric Sciences



Alan Gertler  
INTERIM DIRECTOR  
DIVISION OF ATMOSPHERIC SCIENCES

In 2007, the division addressed the atmospheric contribution to declining water clarity in Lake Tahoe, and performed studies to evaluate sources of pollutants in the Lake Tahoe Basin.



The Division of Atmospheric Sciences conducts air-quality and atmospheric research. Our research covers a wide range of areas including meteorology, aerosol formation, atmospheric chemistry, visibility assessment, urban air quality and the transport of pollutants.

### Expertise and capabilities

The division conducts research in Nevada and around the world in response to the needs of public and private organizations. Areas of expertise include air-quality monitoring for pollutants, pollutant emissions, basic meteorological measurements, aerosol, cloud and precipitation measurements, satellite meteorology, weather, climate-information services, wildfire and renewable energy. In addition, division faculty members are responsible for teaching and administering much of the Atmospheric Sciences Graduate Program at the University of Nevada, Reno.

Our research programs are supported by two state-of-the-art analytical labs: the Environmental Analysis Facility and the Organic Analytical Laboratory. These laboratories provide analysis of atmospheric pollutants and supporting assessments of human impacts on air quality. The division is also the home of the Western Regional Climate Center, one of six National Oceanic and Atmospheric Administration-supported centers that comprise a climate-services network serving the entire United States. The Climate Center provides data and information tailored to the needs of federal agencies, state and local organizations and the private sector.

### Research highlights

Our research made significant strides in 2007. Over the past year, our faculty members have:

- ☉ Studied energy and air pollution issues in China. The report, “Energy Futures and Urban Air Pollution: Challenges for China and the United States,” was published in November.
- ☉ Conducted a study to assess the potential impacts of changes in gasoline specifications adopted by the Nevada Department of Agriculture. Under certain circumstances, these changes—meant to mitigate occasional fuel shortages within the state—could increase pollutant emissions and cause vehicle operability problems.
- ☉ Worked closely with National Weather Service forecasters in Reno to help forecasters predict extreme rainfall that could produce major flooding in the Truckee River basin.

- ☉ Addressed the issue of the atmospheric contribution to declining water quality in Lake Tahoe and performed studies to evaluate sources of pollutants in the Lake Tahoe Basin. The division also worked to implement programs to reduce the impact of these pollutants.

- ☉ Developed and tested a portable, off-grid system that uses renewable energy—hydrogen generated by wind and solar power—to produce electricity in remote areas of Nevada and the U.S.

- ☉ Demonstrated that when clouds interact with pollution aerosols, snowfall is reduced. The effect, which could be as much as 25 percent on an annual basis, is significant in the intermountain West, where snow pack is the principal source of water.

- ☉ Measured mercury emissions during biomass combustion to determine the impact of wildfires on atmospheric mercury.

- ☉ Modeled and tested an internal-combustion engine fueled by a blend of hydrogen and compressed natural gas. This is a key component of the U.S. energy strategy—to promote clean, renewable energy for transportation.

- ☉ Established the Institute’s Storm Peak Laboratory as the first inland station to measure and quantify how much mercury in the atmosphere over the continental U.S. is from Asian air pollution. By comparing results from the laboratory to coastal monitoring stations, it was confirmed that Asian air pollution contributes to mercury in the atmosphere over the United States.

- ☉ Increased collaborative efforts among scientists in Israel and its Arab neighbors by developing a research study to investigate the regional spread and impacts of pollutants in the Jordan Valley.

### Our Future

In addition to continuing our current efforts, we plan to expand our research in climate change and renewable energy. Our renewable-energy efforts will focus on wind energy, integrated hydrogen power systems, hydrogen in transportation and biomass/biofuels. We are exploring biomass resources for possible alternative fuels. Scientific research is in place for significant breakthroughs that will affect daily energy consumption, and the Division of Atmospheric Sciences will continue to be a leading partner in these developments.



## *At-a-glance*

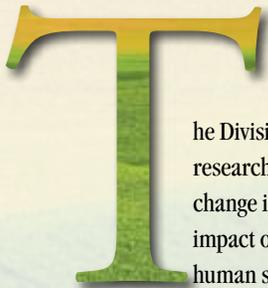
-  The division has 50 research faculty involved in more than 75 projects on any given day
-  The vast majority of research funding comes from competitive federal grants, with the Departments of Defense and Energy and the National Science Foundation being the largest sponsors
-  The division is home to a unique, controlled-environment facility, as well as a cutting-edge geochronology laboratory
-  Research expenditures during fiscal year 2007 were \$9.9 million

## The Division of Earth and Ecosystem Sciences



**Michael Auerbach**  
EXECUTIVE DIRECTOR  
DIVISION OF EARTH AND ECOSYSTEM SCIENCES

The Division of Earth and Ecosystem Sciences conducts research on how landscapes on the Earth's surface have changed and will change in the future.



The Division of Earth and Ecosystem Sciences conducts research on how Earth's landscapes have changed and will change in the future. DEES research also examines the impact of these changes on plants and animals, and how human societies have responded to these changes. The research ranges from basic to applied, testing fundamental scientific notions while also providing solutions to environmental problems.

The division is remarkably diverse scientifically, with faculty drawn from the disciplines of archaeology, biology, geosciences and computer science. Expertise in archaeology is focused largely on heritage management, prehistory of the western U.S., human adaptation to arid lands, and Cold War archaeology and historic preservation.

Biological expertise spans physiology, microbiology, genetics, bioinformatics, ecology and astrobiology—the study of life throughout the universe. Expertise in the geosciences is equally diverse, ranging from geomorphology to geochronology and soil science. Expertise in geographic information systems and remote sensing spans the division. Computer visualization and artificial reality is a new and growing area of expertise within the division.

## Research Highlights

Our researchers are involved in more than 75 projects on any given day. Research has been conducted on all continents and the high seas, as well as other planets. To give a sense of the range of research conducted within the division, three recent accomplishments are highlighted below.

🌐 The Tibetan Plateau is a hostile, high-elevation environment, yet it may have been occupied by hunter-gatherers as early as 15,000 years ago. Archaeologist David Rhode and colleagues from the U.S. and China recently completed the first phase of the Tibet Paleolithic Project, funded by the National Science Foundation. The primary goals of the project were to determine what processes led human populations to colonize this extreme environment, and what behavioral strategies facilitated successful colonization. The use of yak dung as an energy source for heating and cooking by present-

day residents of the Tibetan Plateau provides an intriguing insight into past human survival and migration. Ancient humans may have used the dung of large herbivores as a primary energy source on treeless, cold landscapes. Since today's conditions on the Tibetan Plateau are similar to the cold, arid climate of the ancient land bridge that connected what is now northeastern Russia and Alaska, dung may have fueled the migration of humans into North America.

🌐 The U.S. military is engaged in two major conflicts in arid regions, and is likely to have to move personnel and material through these areas for the foreseeable future. Geologist Eric McDonald has been leading a large team of researchers drawn from across the Desert Research Institute, as well as other institutions in the U.S. and Israel, in developing models and technologies to predict desert-terrain conditions for the Department of Defense. This eight-year project recently passed its half-way point, with major scientific advances and benefit to the military already apparent.

🌐 Microbial ecologist Chris Fritsen, in conjunction with his students and technicians, cultured and assessed microbiota from an isolated, cold and saline body of water beneath 20 meters of perennial lake ice in the Antarctic. These studies' results are aiding in understanding the basic constraints on the energetics of ecosystems under extremely restrictive conditions that might be found on other solar planetary bodies, such as Mars, Europa and Enceladus.

## Our Future

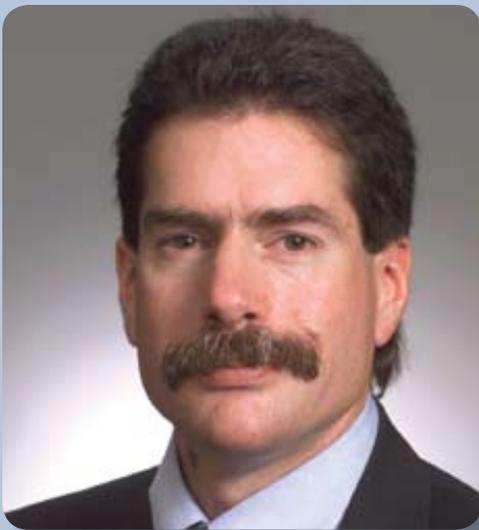
The division looks forward to maintaining its cutting-edge archaeological, biological and geological expertise, while adding faculty in new disciplinary areas and increasing strength in others. In the near term, we will expand inquiry into the relationship between environmental change and human health. The division also plans on adding additional expertise in geomorphology, ecological modeling and land-use planning.



## *At-a-glance*

-  Forty researchers within the division hold doctoral degrees
-  More than 70 percent of research funding comes from the federal government
-  The division is home to an EPA-approved water-quality laboratory that has more than 30 years of experience and provides services for a variety of customers
-  Research expenditures for fiscal year 2007 were \$13.3 million

## The Division of Hydrologic Sciences



**John Warwick**  
EXECUTIVE DIRECTOR  
DIVISION OF HYDROLOGIC SCIENCES

Recently, the division has increased its faculty expertise in ecological engineering, an emerging field that considers the needs of humans and ecosystem sustainability when engineering projects are designed—with the goal of benefiting both.



Since its inception in 1960, the Division of Hydrologic Sciences has grown steadily, and built a strong program of research, development and education. The division's scientific interests involve natural and human factors that influence the availability and quality of water resources.

The scientific areas encompassed by the division reflect issues and concerns common to arid and developing regions worldwide. Consequently, the scope and relevance of this research extends well beyond the borders of Nevada and the nation. While the research breadth of our faculty and students is understandably broad, the following themes emerge:

-  Aquatic biology/chemistry
-  Ecological engineering
-  Environmental processes within snow and ice
-  Regional groundwater hydrology and hydraulics
-  Surface and subsurface flow and contaminant transport
-  Watershed hydrology.

Our facilities and research equipment help bolster our research capabilities. Thanks to a \$1 million Nevada legislative appropriation, the division has acquired a critical mass of field instruments to collect data needed to determine the level of sustainable water resources in a hydrologic basin. The division also hosts a world-class ice-core analysis laboratory that can make very high resolution measurements of trace elements and contaminants in ice cores and liquid samples. Finally, the division is home to an EPA-approved water-quality laboratory that has more than 30 years of experience and provides services for a variety of customers, including federal, local and state government agencies, private industry and commercial laboratories.

## Research Highlights

At any given time, our faculty members are involved in more than 60 research projects. Recent scientific accomplishments include:

### Water conservation

Polyacrylamide (PAM), a long-chain polymer, has been studied for several years as a possible tool for reducing seepage, thus conserving water in unlined water delivery canals throughout the western U.S. Nearly 20 of the Institute's faculty, staff and students are working on PAM-related projects, assessing the risks and benefits of using this technology. During 2007, many of the research projects were completed and made available to the U.S. Bureau of Reclamation, the sponsoring agency. Using the feedback and peer-review of a nationally prominent panel, the results showed that risks to water quality and aquatic species, using PAM, are very low, and that risks can be further reduced by following proper application procedures. The work done by our scientists will provide immediate water-conservation benefits to the Bureau of Reclamation.

### Soil in desert landscapes: the SEPHAS project

The Scaling Environmental Processes in Heterogeneous Arid Soils (SEPHAS) project is part of a National Science Foundation grant awarded to Nevada System of Higher Education institutions. SEPHAS, based in the Division of Hydrologic Sciences, investigates how processes of soil development, water cycling and ecosystem production are linked in arid environments. More than 40 individuals are receiving support from the SEPHAS grant. Their research activities will directly benefit Nevada by improving our knowledge of how environmental processes—such as water recharge, soil development and plant productivity—are influenced by climate, soil disturbance and time.

### Ice-core analysis

Two studies reporting new results from the Institute's unique ice-core laboratory received worldwide attention in 2007. In a study published in April in the *Proceedings of the National Academy of Sciences*, results suggest that changing climate and land use have influenced atmospheric dust levels over the northern Antarctic Peninsula and nearby regions of the Southern Ocean for much of the last century. The finding holds far-reaching implications for understanding the interactions of atmospheric dust and climate.

In another study published in *Science*, the first detailed measurements of black carbon (soot) in an ice core showed that industrial emissions from North America greatly altered climate in the Arctic during the late 19<sup>th</sup> and early 20<sup>th</sup> centuries. Soot is emitted to the atmosphere by forest fires and by industrial, agricultural and domestic burning. Although poorly understood, soot is an important factor in climate warming both in the atmosphere and when deposited on highly reflective surfaces such as snow. The new measurements were only possible because of an analytical breakthrough in the Institute's ice-core lab.

## Our Future

The Division of Hydrologic Sciences continues to maintain its critical mass of cutting-edge researchers. Increasingly, hydrology is interfacing with fields beyond the physical sciences. Recently, the division has increased its faculty expertise in ecological engineering, an emerging field that considers the needs of humans and ecosystem sustainability when engineering projects are designed—with the goal of benefiting both. Such an expansion of expertise helps ensure the division's research continues to benefit people and our environment well into the future.



## Dear Friends:

As 2007 Chair of the DRI Research Foundation, it is my honor to share with you my thoughts of the work we conducted over the past year, and the direction in which we're headed. I have always been very open about my feelings for the Institute. My association with this organization is something I cherish deeply. I am humbled to be affiliated with such great minds conducting such great science. The Institute's researchers have an extreme capacity for knowledge and an awesome compulsion for exploration which is becoming of keen interest to a broader audience.

At no other time in my memory has there been a stronger quest for knowledge and growing synergy among business, government, education and the public concerning the environment. The research the Institute conducts is of monumental value to not only Nevada, but the world. Supporting environmental research, especially in this time of great concern regarding water management, global climate change and environmental impact on human health, is an undertaking we must all embrace.

The Research Foundation is working to secure meaningful financial support to allow this world-class organization to grow even stronger. The team we have formed is outstanding. The best way to describe us is that we are good and getting better. Under the leadership of our new Chair, Mike Benjamin, who picked up the reins early, I eagerly anticipate the unfolding of a magnificent and meaningful fundraising organization.

## Highlights:

Thanks to two very special gifts from trustee Nazir Ansari and his wife, Mary, this year saw the founding of the Nazir and Mary Ansari Chair in Entrepreneurialism and Science, as well as the Nazir and Mary Ansari Medal for Excellence in Science. These awards for the Institute's scientists are a special incentive toward the continuation of exceptional work in environmental science.

Building on the momentum created by the Ansari gifts, trustee Tom E. Gallagher and his wife, Mary, pledged \$100,000 toward the archeology program.

Joe Guild and his sister, Jann Cademartori, established a \$100,000 endowment in memory of their father, Clark J. Guild Jr., for watershed sciences. Clark Guild was a former Research Foundation trustee.

Chancellor Jim and Beverly Rogers graciously offered a Chancellor's Challenge, resulting in an additional \$100,000 raised at the 2007 Nevada Medal Dinners. This year's dinners also featured a particularly engaging live auction in Las Vegas, and silent auctions at both events.

A special appeal to donors was featured to help fund the expansion of the Maxey building on the Reno campus. The ongoing campaign to finish the funding of this much-needed expansion will continue to be a focus of our fundraising until completed.

The GreenPower program opened its fourteenth school site in Ely, and work was almost completed on the next site in Reno. A grant from Sierra Pacific Resources was received to hire a new staff person to administer the GreenPower program for the next two years.

This year's events were exciting opportunities for the public to learn about the Institute's science. The Golf Tournament celebrated its tenth anniversary in July 2006. More than 500 visitors attended the Institute's first-ever Las Vegas Open House in October 2006. The faculty and scientists who put their work on display made sure that everyone in attendance had a truly well-rounded and fun visit.

Perhaps most close to me has been the work done with the trustees of the Research Foundation. As we transition into a more streamlined fundraising organization, we are picking up steam, momentum and energy. Two new trustees joining the board in January will build upon our strength. They are Hal Lenox, president of AT&T Nevada, and Roberto Denis, senior vice president, Energy Supply, Sierra Pacific Resources.

To those of you who have supported the Institute in the past, *Thank You!* For those of you who will continue to support the Desert Research Institute, or who will donate for the first time, *Thank You!* You are making a difference on behalf of high-integrity, non-biased science. During my tenure as Chair of the Foundation, I have been struck by the generosity of the trustees, donors and friends. Your participation made a big difference in the success of the past year. *Thank you!*

Yours truly,



Kenneth G. Ladd  
Chair  
DRI Research Foundation

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**Howard Wahl** • retired, Bechtel Group, Inc. (Napa, Calif.)



“The Desert Research Institute has been a part of our family since its inception. Over the years our admiration for and support of the Institute continues to grow. We have great appreciation for the substantial contributions the Institute has made worldwide to the sciences, particularly those related to the environment.”

Fred Gibson  
Donor, Past DRI Research  
Foundation Chair



“The Desert Research Institute does an impressive job making good use out of the money they receive. If you have any interest in the environment, and you want to feel like you’re helping to move research efforts forward, DRI is a worthy vehicle.”

Bob and Del Noland  
Donor and Research Foundation Trustee

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“The Desert Research Institute has always had a strong place in my heart. My wife, Mary, and I have felt for quite sometime the work the Institute does statewide and world-wide deserves a high-level of recognition. Environmental research is much of what we’re going to be focused on in the future. It’s of world-wide interest and not confined to a particular area. We decided to make our leadership gift to set the pace and encourage others to contribute to DRI. The Desert Research Institute is a wonderful vehicle for people to show support for environmental research.”

Nazir Ansari  
Donor, Research Foundation Trustee and  
Trusteeship Committee Chair

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“My wife Mary Kay and I chose the Desert Research Institute because of its extraordinary potential to improve life, not just in Nevada but also on a national and international scale. Our gift continues a tradition of significant contributions by Foundation Trustees such as the Ansari Chair in Entrepreneurialism and Science established by Nazir Ansari and his wife Mary.

In our case, Mary Kay and our daughter Erin are the scientists in the family. When a request came for some important equipment for the archaeology lab at DRI, Mary Kay’s 40-year interest in the field made it a natural for a gift from us. Unlike other parts of the University System in Nevada, DRI has few alumni, but its constituency and its importance extend far beyond the boundaries of our state. We are delighted to add to the momentum of contributions by Foundation trustees.”

Tom E. Gallagher  
Donor, DRI Research Foundation Trustee  
and Finance Committee Chair

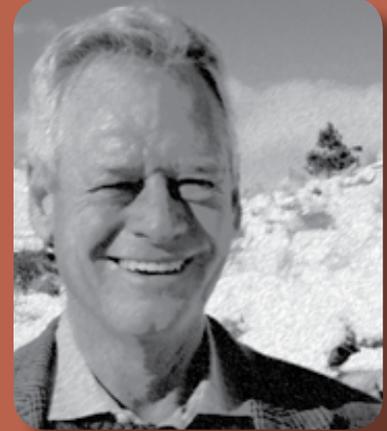
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“My dad, Clark J. Guild, Jr., had a great interest in natural resources and was also a DRI Research Foundation trustee for a number of years. He was the reason my sister, Jann, and I decided to create an endowment for watershed science at the Desert Research Institute. The Institute is really a Nevada treasure because of its world-wide reach for research. It has a high-caliber reputation for excellence which goes way beyond our Nevada border. I highly recommend others to support DRI...whether it's \$1 or \$1,000,000...this is exactly the kind of institution we need to support.”

Joe Guild  
Donor



For information on giving to the Desert Research Institute, contact the DRI Research Foundation at (775) 673-7350.

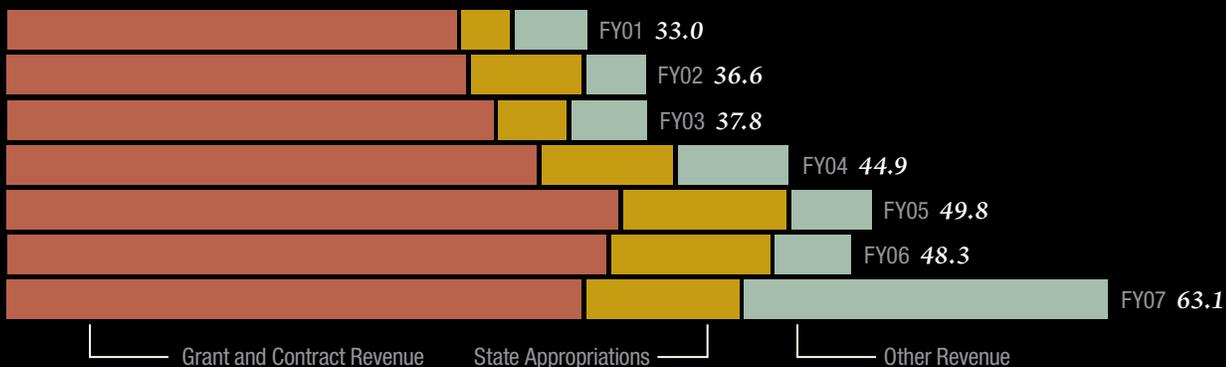


NET ASSETS IN MILLIONS OF DOLLARS



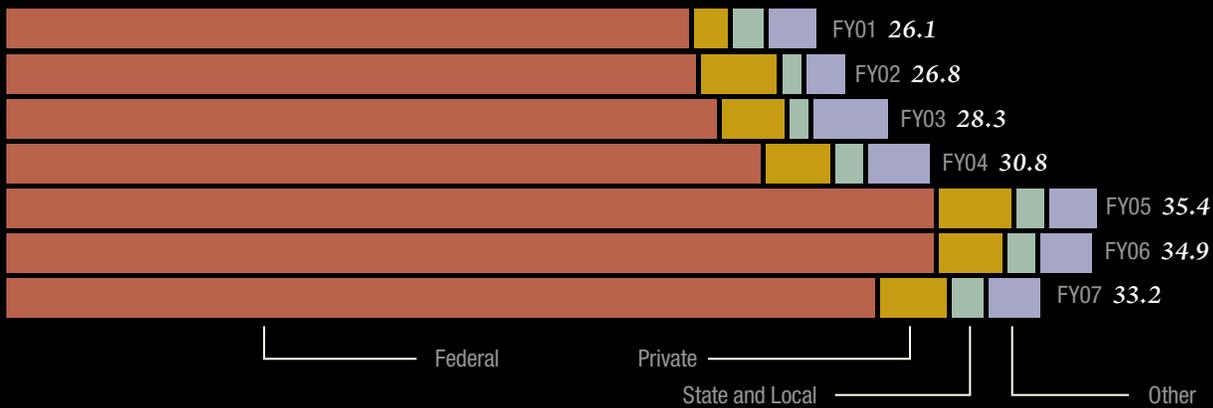
DRI's financial position at June 30, 2007 reflects assets of \$99 million and liabilities of \$21.9, with total net assets of \$77.1 million. This represents an increase in total net assets from FY2001 of 86%. The increase is due primarily to increases in facilities, in laboratory and field-research equipment, and cash and investments transferred from the NSHE Administration for additional building construction.

TOTAL REVENUE IN MILLIONS OF DOLLARS



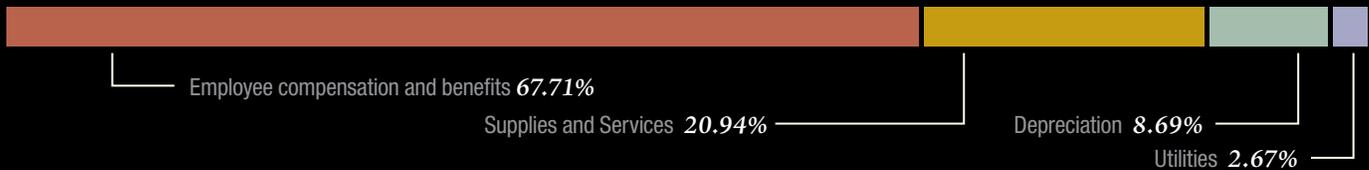
Since FY 2001, DRI's total revenues have increased by 91%, with the primary growth seen in grants and contracts, and transfers from NSHE Administration for additional building construction.

## GRANT AND CONTRACT REVENUE BY SOURCE



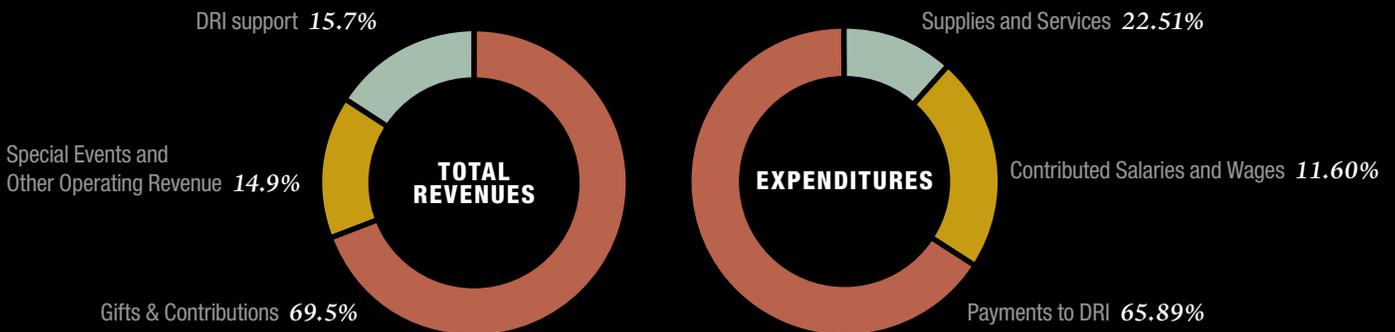
Federal sources remain the largest component of grant and contract revenue.

## FY07 OPERATING EXPENSES



DRI's employees are the cornerstone of DRI's success, with employee compensation and benefits being the largest component of operating expenses.

## DRI Research Foundation Financial Overview



For the year ending June 30, 2007, total revenue for the Foundation was approximately \$1,300,000. For the year ended June 30, 2007, over \$1,000,000 was given to DRI by the Foundation to support activities and programs.

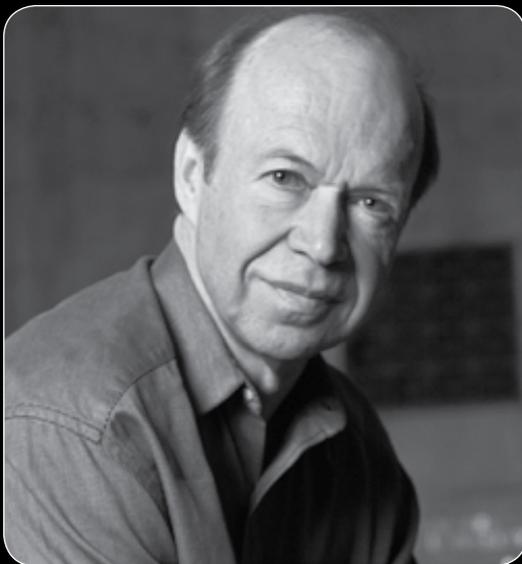


## THE NEVADA MEDAL DINNERS 2008

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and  
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Cordially invite you to the  
21<sup>st</sup> Annual Nevada Medal Dinner and Award Ceremony

*Honoring*



*Dr. James Hansen*  
NASA Goddard Institute for Space Studies

**April 15, Reno, The Peppermill**

**April 17, Las Vegas, Caesars Palace**



Dr. Hansen has studied the effects of greenhouse gases (GHGs) on Earth's climate throughout most of his illustrious career. Through his development and application of global models to explore the potential climate effects of unchecked increases in GHG concentrations, Dr. Hansen has become one of the most prominent and recognizable scientific spokespersons on the topic of climate change."

—Stephen Wells, president, DRI



For more information, please call Dawn Coots at  
(775) 674-7555, or e-mail [dawn.coots@dri.edu](mailto:dawn.coots@dri.edu)



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