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From the President

New Mexico Tech has once again experienced an extraordinary year, replete with crowning achievements, exciting breakthroughs, and unparalleled successes. Yet, our mood remains subdued in light of our nation’s recent tragedies.

In looking back over the past year, particularly in regard to the devastating events which transpired on September 11, as well as the anxious days that have since followed, we can all take great pride in the major roles New Mexico Tech has assumed in our nation’s struggle to understand and, indeed, to respond to these unprecedented acts of terrorism.

First of all, New Mexico Tech has expanded its efforts to reach even more students—the very people who are destined to become the leaders of tomorrow—by using Internet2, interactive television, CD ROMs, and other distance education methods to efficiently and effectively disseminate the curricula of some of our newest, cutting-edge degree programs to our national laboratories, government agencies, and other universities. Sharing our goals with this larger constituency is of overriding importance as we all work together to the good of our nation and society as a whole.

Also of mounting importance to our nation’s security and preparedness is the establishment of New Mexico Tech’s new Information Technology degree program, which is closely aligned with our Institute for Complex Additive Systems Analysis (iCASA). In collaboration with iCASA, our computer science and management departments are now actively involved in basic and applied research in complex additive systems, such as computer-linked information networks, international financial markets, and national infrastructures.

In addition, a comprehensive plan for enhancing student life and learning at this university also has taken shape with the implementation of our new First-Year Experience Program and the establishment of the Advising Resource Center, programs which promise to transform the student experience at the Institute while maintaining our commitment to providing our students with an excellent education.

While New Mexico Tech recently has realized a number of noteworthy achievements in its education mission, a timely relevance also has been attached to the university’s counter-terrorism and first-responders training programs. Likewise, newer research programs, such as our biology department’s pathogen detection program, have also been thrust into the spotlight, confirming once again that learning at New Mexico Tech does not take place solely in the classroom.

Sincerely yours,

Daniel H. López
President
Accomplishments

The Wall Street Journal, in an article published on Oct. 5, 2001, named New Mexico Tech to its list of "This Fall's Hot Schools." Tech made the list on the basis of its peaceful location, research in counter-terrorism, and scholarship money available. Tech was one of 16 schools on the Wall Street Journal’s list, including Dartmouth, Pennsylvania State, Rice University, University of Iowa, State University of New York at Albany, and the College of William & Mary.

New Mexico Tech was the subject of a front-page feature article in the Albuquerque Sunday Journal on Oct. 14, 2001. The state-supported research university was highlighted for the many research opportunities it provides for students. Over 80 percent of Tech’s undergraduates work in research programs, with some student jobs paying as high as $15 an hour. As a policy, research grants must include money for student jobs.

Tech was the subject of a front page article in the Denver Post on Nov. 19, 2001, focusing on anti-terrorism research.

Dr. Richard Aster, professor of geophysics, was quoted in the lead paragraph and feature article in the December 2001 issue of National Geographic, in an article on Antarctica.

The research budget of Tech’s Energetic Materials Research and Testing Center (EMRTC) is expected to increase by about $10 million, following the Sept. 11 terrorist attacks.

Tech received about $60 million last year in research grants and contracts, for both on-campus and off-campus facilities.

New Mexico Tech’s Petroleum Recovery Research Institute (PRRC) was awarded a $750,000 grant by the Department of Energy to evaluate ways to boost the productivity of oil exploration and production operations on Alaska’s North Slope in a more environmentally sound manner. According to U. S. Senator Pete Domenici, who helped secure the funding, the PRRC will study how synthetic-oil-based muds change the properties of rock cores extracted from Arctic reservoirs. The university will contribute another $360,400 to the three-year project.

New Mexico Tech is on a team to operate and manage the Maui Supercomputing Center, home to some of the country’s major high performance computing resources.
The Air Force Research Laboratory awarded the contract to a team headed by the University of Hawaii. In addition to New Mexico Tech, the team included Boeing Rocketdyne Technical Services, Textron, Science Applications International Corporation (SAIC), and the Ohio Supercomputer Center. The contract, which began on October 1, 2001, may be extended for up to 10 years and has a potential value of $181 million.

New Mexico Tech joined an elite group of 182 U.S. universities, along with national research laboratories such as Sandia and Los Alamos, that have begun developing and deploying the advanced network applications and technology of the Internet2. Internet2 is a separate Internet that is specifically set aside for education and research, designed for very high speed, state-of-the-art communications.

The patent owned by the New Mexico Tech Research Foundation that creates environmentally sensitive animal and insect repellents using chile peppers, was licensed by Global Source Advantage, international farming, extraction, and marketing firm. The process which was discovered and patented by scientists at New Mexico Tech, allows capsaicin, the natural heat of chile peppers, to be molecularly bonded into paints, stains, plastics, and other rubberized materials, thus creating a wide range of repellents.

New Mexico Tech and Sandia National Laboratories signed a memorandum of understanding (MOU) to collaborate in research and development in areas related to power sources manufacturing. Under the agreement, scientific and engineering experts from Tech's EM RTC will collaborate in research with Sandia's Power Source Components, Independent Surveillance Assessments & Statistics, and Reliability Assessment & Human Factors Departments. Their initial work will focus on thermal batteries, specifically on developing and applying statistical methods necessary to assure high reliability and quality in small lot production; traditional techniques require sample sizes too large to be used cost-effectively.

"New Mexico Tech is one-of-a-kind among American universities. It has 1,600 students enrolled in top-notch science, engineering, and mathematics courses, but what really sets it apart are its research and off-campus clients." — Denver Post, November 19, 2001.
Faculty Achievements

**Dr. Daniel H. López**, president of New Mexico Tech, was selected by the University of New Mexico Alumni Association as the 2002 recipient of its Bernard S. Rodey Award. The Rodey Award is to be conferred on individuals “who have devoted an unusual amount of time in a leadership capacity and whose efforts have contributed significantly to the field of education.” Dr. López earned his bachelor of arts, master of arts, and Ph.D. degrees at the University of New Mexico, all in the field of political science.

**Dr. Van Romero**, Tech vice president of research, has been appointed National Chairman of the National Domestic Preparedness Consortium, a partnership of public and private organizations committed to serving emergency first-responders by providing them with counter-terrorism training.

**Dr. Osman T. Inal**, a professor of materials and metallurgical engineering at New Mexico Tech, was selected by ASM International, the Materials Information Society, as a 2001 Fellow. Inal’s esteemed professional career at New Mexico Tech began nearly 30 years ago and has been marked by excellence in both teaching and research. A world-renowned scientist, inventor, and innovator in the field of materials engineering, Inal has had over 190 research papers published and is the holder of several patents, many of them related to the correlation of microstructures to the properties of materials.

A researcher from New Mexico Tech was part of an international research team which published a paper in the prestigious science journal Nature. **Dr. William C. McIntosh** played a major role in the study by accurately dating volcanic ash layers, using advanced techniques of argon dating. McIntosh is a volcanologist with the New Mexico Bureau of Geology and Mineral Resources and an assistant professor of geochemistry at New Mexico Tech. The research indicated that the Earth’s natural “wobble” may have directly influenced fluctuating global temperatures.

**Dr. Mark P. Cal**, an assistant professor of environmental engineering at New
Mexico Tech, was honored by his alma mater after being named by the University of Illinois at Urbana-Champaign (UIUC) as this year’s recipient of its “Young Civil Engineer Achievement Award.” The award was given for outstanding accomplishments in the field of air quality control.

**Dr. Stephen D. Schery**, a professor emeritus of physics at New Mexico Tech, is the author of the latest volume in the Environmental Science and Technology Library series, published by Kluwer Academic Publishers. Schery wrote *Understanding Radioactive Aerosols and Their Measurement* as an introduction to radioactivity and aerosols. Schery has been a research physicist and professor of physics at the university since 1979. He also served as director and principal investigator of Tech’s Atmospheric Radioactivity Laboratory since 1985.

**Student Achievements**

Ten New Mexico Tech students took a team experiment to never-before-achieved heights aboard a NASA aircraft during the summer of 2001. On a NASA plane specially designed to simulate low- and zero-gravity, Tech’s **TEAM FRACTAL** explored the effects of reduced and increased gravity on the fractal characteristics of buoyancy-driven turbulent flow. The Tech students plan to publish results of their work and also conduct educational outreach programs at New Mexico middle and high schools.

New Mexico Tech teams of electrical engineering students received more awards than any other college during the **Eighth Annual Fire-Fighting Home Robot Contest**, an international robotics contest held at Trinity College. Five out of the nine robotics entries fielded by New Mexico Tech placed among the top ten positions in the senior division. Two of the students later competed in the **Second Annual Regional Fire-Fighting Home Robot Competition** in Beijing, China, and took first and third places.

A team of four New Mexico Tech students placed first in the **11th Annual International Environmental Design**
Contest, held in April in Las Cruces. The contest was part of WERC, the Waste-Management Education & Research Consortium, whose membership consists of several universities in New Mexico.

Mechanical engineering major Steven C. Ball was one of the co-authors of an article published in Nature, which describes a startling discovery made in the summer of 2000 by Ball and 13 other college students who were doing research on the Very Large Array (VLA) radiotelescope. Ball and his colleagues studied a brown dwarf and saw the unexpected: radio emissions, many times more powerful than solar flares from our own Sun. The discovery could shed light on the dividing line between the formation of stars and the formation of planets. Ball also received an award from the White Sands Missile Range Chapter of the International Test and Evaluation Association (ITEA) for having written the best technical paper of any undergraduate in a paper competition.

New Mexico Tech materials engineering students garnered three of the top prizes at a research poster competition held in September in conjunction with the 13th Annual Rio Grande Regional Symposium on Advanced Materials in Albuquerque. The poster competition included nearly 50 presentations made by students representing New Mexico Tech, the University of New Mexico, New Mexico State University, the University of Colorado at Boulder, and the University of Texas at El Paso.

Virginia Alison Starke, a native of Los Alamos and senior majoring in both physics and mathematics at New Mexico Tech, was awarded the 2001-2002 SPS Leadership Scholarship, a national scholarship award given by the Society of Physics Students (SPS) to outstanding physics students.

Alumni Achievements

Dr. Alan H. Cheetham (50, BS, geology), a native of Taos and now a senior scientist emeritus at the Smithsonian Institution, was honored twice this year for his research in paleontology. At the annual meeting of the Geological Society of America in Boston in November, he was given the Paleontological Society Medal, the Paleontological Society's most prestigious award. In June, the University of Chicago Press book, Evolutionary Patterns: Growth, Form, and Tempo in the Fossil Record (J.
B. C. Jackson, S. Lidgard, and F. K. McKinney, editors) was published in his honor.

**Dr. Zane Spiegel** (62, Ph.D., hydrology) is a member of Santa Fe’s Water Quality Task Force. He is the principal author of a petition to the EPA on “La Cienega Valley Area Sole Source Aquifer, Santa Fe County, New Mexico” from October 2000 to March 2001.

**Dr. John F. Alderete** (73, BS, math; 74, BS, biology) of the University of Texas Health Science Center at San Antonio, has been elected to a fellowship in the American Academy of Microbiology. He is honored for a distinguished career in infectious disease research. Alderete has investigated the molecular pathogenesis and virulence factors of the sexually transmitted disease, *Trichomonas vaginalis*, which affects millions of women worldwide.

**James A. Lupens** (73), principal geologist with Phillips Petroleum Co. in Englewood, Colo. has been named a 2001 *ASTM Award of Merit* winner; accompanying this award is the title of Fellow. The award is the highest society award to individuals for outstanding service and outstanding participation in committee activities.

**Dr. Donald Wenner** (74, BS, chemistry) and **George Scott III** (81, BS, geology) have been awarded a patent for a surgical laparoscopic instrument that is used to remove stones from the bile duct. This tool will be instrumental in saving thousands of lives each year as the tool and resultant enhanced surgical procedure are adopted.

**Dr. Karl Staudhammer** (75, Ph.D., metallurgy) is the new deputy division leader for programs and science for the Nuclear Materials and Technology Division at Los Alamos National Laboratory. Staudhammer is a U.S. Senior Scientist Humboldt Fellow and an American Society for Materials International Fellow. He received the DOE’s Weapons Recognition Award for Outstanding Technical Achievement for electron microscopy evaluation of plutonium in 1987.

**Dr. Terry Wallace** (78, BS, math; 78, BS, geophysics; 83, Ph.D., geophysics) was the subject
of an article in *Discover* magazine in September 2001. The article is on how seismologists can detect man-made events that governments often want kept secret, specifically the loss of the Russian submarine Kursk.

David Duggan (80, BS, computer science) and Ruth Aerts Duggan (81, BS, physics) were written up in *Scientific American* in Dec. 2000. They were on the Information Design Assurance Red Team at Sandia National Laboratories, which was hired to test security systems by breaking into cyber systems for a wide variety of government and commercial entities.

Ward Herst (86, MS, hydrology) and his wife, Debra, are executive officers of Herst & Assoc., a firm they founded in 1998. The firm was recognized as the Number One Service Provider in the United States by the National Business Incubator Association. Herst & Associates, Inc. is a hydrogeologic, hydrochemical, and general environmental consulting firm located in St. Louis, Mo.

Sgt. Joseph Stroud (97, BS, geology) is a member of the New Mexico Air National Guard. Last year, during the Cerro Grande fires near Los Alamos, he volunteered to assist with the financial aspects of supporting the operation. For his efforts, he was awarded the New Mexico Distinguished Service Medal. This year, he was selected to be the accounting liaison for the Air National Guard with the Defense Finance Operating Location in Limestone, Maine. He is the first Air Guardsperson in the nation’s history to be selected for such a position.

**New Student Service Program – First Year Experience**

New Mexico Tech has initiated a new program called “First Year Experience” to help freshmen make the transition to college and fully realize their academic and personal goals. More than 230 students have opted to join the program, which meets in small groups weekly to discuss issues such as proper preparation for classes, different learning styles, effective note taking
and textbook reading, time and stress management, academic integrity, and effective test taking. The groups are lead by peer facilitators, upperclassmen who are successful in their studies and have demonstrated leadership abilities. Studies have shown that peer education is extremely effective, and college students are more apt to listen to advice delivered by their peers.

Many of the enrolled students also enjoy social events which are interspersed throughout the semester, such as friendly competitions in volleyball and kickball, movies, and barbecues. Participation in the program ranges from students who form their own independent study groups to those who stay in contact mostly through e-mail.

The First-Year Experience program evolved from the university's Group Opportunities for Activities and Learning (GOAL) program, which began in 1996. According to Elaine Debrine-Howell, director of Tech's Advising Resource Center, "One of the things we learned from the GOAL program and we now use to our advantage in First-Year Experience is that freshman students actually prefer to interact with upperclassmen, and stand to benefit from the vision and experiences slightly older students can bring into these mutually beneficial relationships. As a result, they often form learning communities on their own as well."

The goal is to see New Mexico Tech's retention rate from freshman to sophomore year increase over its current 72 percent and also to improve the graduation rate, however the program will need to run for several years before data are conclusive.

New Academic Programs

Information Technology, Bachelor of Science program

In the spring of 2001, New Mexico Tech initiated a bachelor of science degree in Information Technology (IT). IT is an evolving interdisciplinary field that is driven and shaped by the rapid development of computing, communication, and Internet-related technologies and their tremendous impact on our daily lives. In contrast to the more traditional Information Systems discipline, Information Technology deals with the development, utilization, interrelation, and confluence of computers, networking, telecommunication, business, and technology management in the context of the global Internet.

The program is administered jointly by the Computer Science and Management departments. The curriculum includes relevant computer science, management, and engineering courses and emphasizes secure information systems and information assurance that are among the areas of research at Tech's Institute for Complex Additive Systems Analysis (iCASA) where IT students may find employment or internship opportunities.
Master's Degree in Engineering Mechanics with a Specialty in Explosives Engineering

New Mexico Tech and Sandia National Laboratories signed a memorandum of understanding (MOU) to establish a master's degree program in engineering mechanics with a specialty in explosive engineering, initiated for participants in Sandia's Weapon Intern Program. The intense, two-year program provides the next generation of young scientists and engineers at Sandia with a broad and in-depth understanding of nuclear weapons and the entire weapons complex. As part of the MOU, New Mexico Tech gives the interns 21 hours of graduate credit for the courses they take as part of the program. In addition, Harold Walling, New Mexico Tech professor of mechanical engineering, conducts three classes - an introduction to explosive engineering, shock wave theory, and advanced explosive engineering. The university also considers the research the interns do part of the program as their independent studies.

Mechanical Engineering, Bachelor of Science program

New Mexico Tech's engineering mechanics program branched out in 2001, adding a bachelor's program in mechanical engineering. Mechanical engineering is considered to be one of the cornerstone engineering disciplines and is perhaps the broadest of all engineering disciplines. Mechanical engineers are found in every sector of our technology-based economy.

Graduate program in Atmospheric Science

The departments of chemistry, Earth and environmental sciences, environmental engineering, and physics at New Mexico Tech teamed up to offer interdisciplinary opportunities for graduate work in the atmospheric sciences. Graduate students enrolled in any of these departments can take courses and do their graduate research in any of the specialties listed below.

Current research specialties include atmospheric and environmental chemistry, cloud physics, cloud dynamics, and atmospheric electricity, hydroclimatology, and upper atmospheric physics. One of the prime research facilities of the program is the world-famous Laboratory for Atmospheric Research (see page 00).
Distance Education and Community College

Tech's Distance Education program went from producing one class per semester to producing graduate-level courses for degree-seeking students from a state-of-the-art production facility. Distance Education is producing live and videotaped courses in addition to live, off-site classes for the Master of Science Teaching program and specialized classes in explosives and mineral engineering. Distance Education is also producing and delivering classes via web-casting over the Internet2 to Northwestern University and soon to other facilities and sites across the nation. Production output has increased three fold in the past year. Distance Education's client base has expanded to include Sandia National Labs, Los Alamos National Labs, Livermore National Labs, DOE, and other government and private sector entities.

During 2001, New Mexico Tech's Community College served 1,583 students. About 90 courses were offered, mostly serving the Socorro-area community. These courses are in professional and personal development, physical recreation, fine arts, and language.

Two important Community College courses are offered through a partnership with Louisiana State University and Tech's EMRTC. They are “Incident Response to Terrorist Bombing,” offered to first responders, such as police and firefighters from across America and “Explosives Laboratory Safety” offered to American lab technicians, engineers, and scientists.

A significant new offering was the Microsoft Certification Program, training the student to become a Microsoft Certified Systems Engineer (MCSE). This program, offered through a partnership with iCASA, benefits Socorro-area residents by providing them with job-oriented training.

Tech's Community College also established a partnership with UNM-Valencia to offer developmental courses, such as introductory English and mathematics. The courses are offered in Socorro, taught by UNM-Valencia instructors. Students receive New Mexico Tech credit.

Research Organizations

Energetic Materials Research and Testing Center

EMRTC conducts research on the safety and testing of energetic materials and explosives for industry and government agencies. This work is done at EMRTC's 40-square-mile field laboratory with over 30 separate test sites, gun ranges, and research laboratories. EMRTC also uses a wide array of modeling and simulation computational techniques to predict and analyze many types of reactions,
structures and energetic events.

EMRTC has been active in broadening its historic mission of defense-related research to include numerous activities related to counter-terrorism to include training and research, and many other new research endeavors involving energetic materials.

Counter Terrorism Research Programs.
These programs assist government agencies and private organizations with assessing and evaluating the risks, threats and consequences posed by the terrorist activity.

DOT Examining Agency
EMRTC is an official Department of Transportation examining center for explosives and other energetic materials making recommendations to the DOT as to the Class, UN designated numbers and packaging for new materials that are to be transported on our highways, railways, airways and waterways.

Ballistic Programs
EMRTC has a ballistic capability that is used in the launching of a variety of munitions and missile components. Programs include deep-earth penetrators, production range support, precision guided projectiles, and testing of energetic material component parts.

Liquid Fueled Rocket Propulsion Testing
The commercialization of space has provided a significant stimulus for research and development related to the development of low-cost liquid-fueled rocket engines and other parts of the propulsion system. EMRTC provides a low-cost alternative to government test facilities.

Active Protection Program
The active protection system is an integral part of the Army concept of “Army After Next.” The Active Protection System concept as tested at EMRTC is designed to negate the full spectrum of threats that may exist.

Counter Terrorist Training Program
New Mexico Tech, Louisiana State University, and Science Applications International Corporation (SAIC) are providing comprehensive, integrated, and targeted training in the areas of First Responder, Rural Border Crossing, and Hostage Negotiation for both national and inter-national officials who are responsible for responding to terrorist incidents.
The year 2001 marks the third year for research into modeling, simulation and vulnerability analysis of our nation's critical infrastructure systems, the core mission of the Institute for Complex Additive Systems Analysis, or iCASA. The State of New Mexico in March granted iCASA division status, thus enabling the Department of Defense-funded institute to officially carry out its mission under the research umbrella of New Mexico Tech.

With its strategic partners and first-class research team, iCASA is charting new ground in systems science. iCASA’s modelers and analysts utilize an analytical process, titled iCASA, to simulate dynamic system configurations and investigate potential system vulnerabilities.

The catastrophic events of Sept. 11, 2001 underscore the need for a deeper understanding of systems science as it relates to the infrastructures that support a nation as technologically advanced as the United States. In addition, as a research university with an international reputation, New Mexico Tech is charged with educating future generations of scientists and engineers in cutting-edge research, another tenet of the iCASA mission.

Through the foresighted vision of key individuals, among them U.S. Sen. Pete Domenici and Congressman Joe Skeen, iCASA was created to fill critical needs in research and education. The institute is unique among academic programs in that it:

- Offers a degree program in Information Technology based on rigorous, innovative modeling and analytical processes;
- Functions as a classified and unclassified research center;
- Focuses work on real-world problems;
- Fuses expertise and perspectives from academia, government, and private industry;
- Draws on the high caliber of students characteristic of New Mexico Tech;
- Offers short courses and virtual training to other agencies as needed; and
- Offers high-caliber student internships to seniors in computer science, engineering, math, management and technical communication.

An understanding of critical infrastructure systems is absolutely vital in today’s highly complex, interdependent world.

The iCASA team is dedicated to its mission, and its mission is dedicated to the protection of critical infrastructure systems in the United States.

Research and Economic Development

During the past five years, New Mexico Tech has increasingly focused on counter-terrorism research in various capacities. But after the terrorist attacks of September 11th — and with the ongoing anthrax situation on America’s East Coast — these research programs have taken on a new sense of purpose.

Dr. Van Romero, Vice President of Research & Economic Development: “New Mexico Tech has been involved in protecting our nation since World War II. We are now being looked to as a leader in counter-terrorism research because of the expertise and infrastructure that we have built up over the years.”
New Mexico Tech is developing several new programs that acknowledge the new reality of terrorism in America.

**The Pathogen Detection Program**

Drs. Tom Kieft and Snezna Rogelj of Tech’s Biology Department hope their research in the Pathogen Detection Program will lead to the development of ultra-sensitive technologies for detecting pathogenic organisms in the environment. Technologies such as automated microarrays and immunopolymerized chain reactions will be used to sense and identify relevant virulence factors in the water, air, and food supply well before such pathogens are abundant enough to cause disease. Although the program was initially intended to focus on environmental remediation, the researchers realized that the processes and technologies developed would also be very important for anti-terrorism applications.

The program had already received funding from the Office of Naval Research before September 11th. It is a collaborative effort that includes investigators at Battelle, Becton-Dickinson, BioStar, Oak Ridge National Laboratory, Pacific Northwest National Laboratory, and the Yale University School of Medicine.

**E-Smart**

The E-SMART program, under the direction of Dr. Peter Gerity, Tech vice president for academic affairs, intends to develop a suite of sensors that will be linked to create the Environmental Systems Management, Analysis, and Reporting neTwork (E-SMART). The sensor network will include devices to detect the presence of chemical and biological warfare agents.

Drs. Dimitri Ivnitsky and Daniel O’Neil, lead researchers for the E-SMART project, recently transferred to New Mexico Tech from the New Mexico Engineering Research Institute at the University of New Mexico. Both Ivnitsky and O’Neil were key members of the E-SMART Chemical and Biological Detection Network. During the course of the E-SMART program, they were entrusted by the General Atomics Corporation and the U. S. Air Force with identifying, soliciting, evaluating and undertaking preliminary negotiations to bring technologies from the former Soviet Union (FSU) into the E-SMART program. Working closely with the International Science and Technology Center in Moscow, New Mexico Tech’s team leaders were instrumental in attracting 25 proposals from 18 FSU teams, representing leading-edge technologies for
chemical and biological sensors. After a detailed screening and selection process, New Mexico Tech completed discussions and recommended the placement of contracts with two of three FSU teams, headed by Moscow’s General Physics Institute of the Russian Academy of Sciences, and the State Research Center for Applied Microbiology in Obolensk.

Device validation will include testing with simulants and live agents at certified facilities. System validation will be conducted using approved materials, remote signal transmissions, and/or simulated signal inputs to demonstrate detection and response actions.

Magdalena Ridge Observatory (MRO)

With a new $12 million federal appropriation, fresh partnerships with the Office of Naval Research and Cambridge University, and ongoing partnerships with New Mexico State University, New Mexico Highlands University, the University of Puerto Rico, and Los Alamos National Laboratory, groundbreaking for Magdalena Ridge Observatory (MRO) could occur as early as 2002. Environmental studies are being conducted and designs for the observatory are being finalized.

Perched at 10,000 feet on a mountain ridge west of Socorro in the Langmuir Research Site, which was set aside by Congress for scientific research, MRO will combine the light from a handful of large telescopes in a technique called optical interferometry. This state-of-the-art technique adapts the technology used by the Very Large Array (VLA) radiotelescope to optical and infrared wavelengths of light.

The resulting pictures can be incredibly sharp, with resolution far more precise than that of a single telescope. Stars will be visible as round disks, rather than single points of light.

IRIS/ PASSCAL Instrument Center

The staff and students of the New Mexico Tech Incorporated Research Institutions for Seismology Program for Array Seismic Studies of the Continental Lithosphere (IRIS PASSCAL) Instrument Center supported over 60 seismic research experiments around the world in 2001. These projects included:

- The first large-scale study of the mantle underneath the boundary between very
old East and much younger West Antarctica (Washington University, Penn State);

- Completion of the most comprehensive experiment to date (RISTRA) to investigate the crust and mantle beneath the Rio Grande rift and adjoining regions in Texas, New Mexico, Arizona, and Utah (New Mexico Tech, New Mexico State University, Los Alamos National Laboratory, Dine College, University of Texas at Austin);

- Studies of the deep structure underneath Yellowstone (University of Wyoming, University of Utah);

- Research into the crustal structure of volcanic zones in the North Island of New Zealand (University of Colorado, Victoria University of Wellington, N.Z.); and

- Other experiments supported in California, Tibet, Bhutan, Turkey, Ethiopia, the Andes, Mount Erebus (Antarctica), the Southwest Pacific, and Alaska.

In addition, the Instrument Center:

- Made major progress towards recapitalizing its instrument pool with assistance from U.S. Senator Pete Domenici and the Department of Energy ($1M in 2000-2001, and $2.5M in 2001-2002).

- Provided major instrumentation assistance to New Mexico Tech’s teaching labs in the Geophysics program;

- Hosted over 300 visitors, ranging from researchers, to IRIS national committee meetings, to high school tour groups, to tours for Geology 101 students;

- Supported IRIS Education and Outreach efforts by assisting in the installation of teaching seismometers in schools, and through PASSCAL PI. Rick Aster’s appointment to chair the IRIS Education and Outreach Standing Committee. PASSCAL also supported an intern from Jamaica during the summer of 2001.

### Langmuir Laboratory for Atmospheric Research

Langmuir Laboratory for Atmospheric Research is one of the world’s leading centers for atmospheric studies. The lab conducts research not only to achieve a basic understanding of how the atmosphere works but also to solve practical problems. In 2001, laboratory staff and undergraduate and graduate students worked together on the following projects:

- Developing a system of radio receivers to find out where lightning propagates inside thunderstorms where the visible light cannot be seen;

- Developing electric field sensors to warn people working outside about impending lightning flashes;

- Developing a better understanding of lightning rods so that the large lightning currents can be carried safely to ground.

- Studying sparks high in the atmosphere (called red sprites and blue jets) to see if they might harm airplanes or space vehicles; and

- Analyzing population fluctuations in rodents for clues about the effects of climate change.
New Mexico Bureau of Geology and Mineral Resources

The New Mexico Bureau of Geology and Mineral Resources is the official state agency responsible by law for geologic mapping and studies of the geology and mineral and water resources in New Mexico. The Bureau investigates, evaluates, and disseminates information on geology, such as mineral, water, and energy resources, and geologic hazards — with emphasis on aiding the discovery and development of geologic resources for the benefit and well-being of the citizens of this state with full consideration of environmental concerns. The director of the Bureau also serves as State Geologist.

Service is an important component of the Bureau’s role. The Bureau supports New Mexico Tech by teaching both graduate and undergraduate classes, advising graduate students, providing laboratory services, and employing students in research. It serves the mineral industry and state and federal offices and departments as an important resource for information. Finally, the Bureau serves interested citizens by advancing the understanding of the state’s geology and natural resources. Specific services include a Geologic Extension Service, which assists people in accessing resources, a Teacher Resource Center in Albuquerque, LiteGeology—a publication for teachers and the general public, and online geologic information.

Publications Office – the information assembled by the Bureau staff of scientists and engineers is provided to the public through maps, publications, direct response to individual inquiries, and a public access library of publication on New Mexico geology.

Mineral Museum – the Bureau’s Mineral Museum represents one of the outstanding mineral collections in the United States and contains more than 13,000 mineral, rock, mineral product, mining artifact, and fossil specimens. The Mineral Museum is open to the public free of charge seven days a week and entertained more than 11,000 visitors last year.

Petroleum Recovery Research Center (PRRC)

The Petroleum Recovery Research Center of New Mexico Tech is recognized worldwide as one of the nation’s leading petroleum research organizations. Its work focuses on the development and application of improved oil and gas recovery processes. Its technology transfer activities benefit New Mexico producers and the nation’s petroleum industry.
The oil and natural gas industry is New Mexico’s single greatest source of income, annually contributing around 20 percent of General Fund revenues. Most of the state’s producers have few funds for research, but they must have access to the advanced technologies that will extract the remaining oil and gas from the plays and reservoirs of northern and southeastern New Mexico. They also need information—production data, oil and gas prices, produced water quality data, corrosion data, and the corresponding GIS information. As mandated by the New Mexico State Legislature, the PRRC/NMT performs research that directly addresses producers’ needs. In cooperation with several New Mexico state agencies, the PRRC/NMT has developed a Petroleum Production Data System to make New Mexico oil and gas production data easily accessible via the Internet for use by industry and state agencies.

The PRRC/NMT also supports New Mexico Tech’s academic program through teaching and research. Besides our 19 full-time personnel, an average of 25 graduate and 20 undergraduate students are an important part of our research projects. Current research includes:

- Development of effective oil and gas recovery processes, especially through the use of gels to increase reservoir sweep efficiency and reduce water production;
- Fundamental research on rock/fluid interactions and their influence on oil recovery, with emphasis on studies of wettability alteration and asphaltenes;
- Enhanced CO₂ flooding with emphasis on the mechanisms that control injectivity;
- The use of artificial intelligence for reservoir characterization;
- Development of a Geographical Information System (GIS) to provide data on oil and gas production, water quality, pipeline infrastructure and other operational information via the Internet; and
- Development of a low-cost, portable modified reverse osmosis process for produced water.
Budgetary Information, 2000-2001

Revenues by Source

Student tuition and fees ........................................ $3,614,795
State appropriations .................................................. $20,047,000
Research and restricted ........................................... $48,986,200
Capital outlay ........................................................... $9,101,500
Auxiliary income ..................................................... $3,637,990
Renewal and replacements ....................................... $1,300,000
Endowment income .................................................. $1,300,000
Debt service .............................................................. $400,000
Other ........................................................................ $18,754,835
Total .................................................................... $107,142,320
Expenditures by Function

Instruction and general .................................................... $30,339,732
Research .......................................................................... $51,228,700
Capital outlay/renewal/replacement/debt service ............ $18,146,315
Independent operations..................................................... $4,045,300
Auxiliary enterprises........................................................... $3,145,082
Other ................................................................................... $237,191
Total ............................................................................ $107,142,320