SANDIA PERSPECTIVES

1997

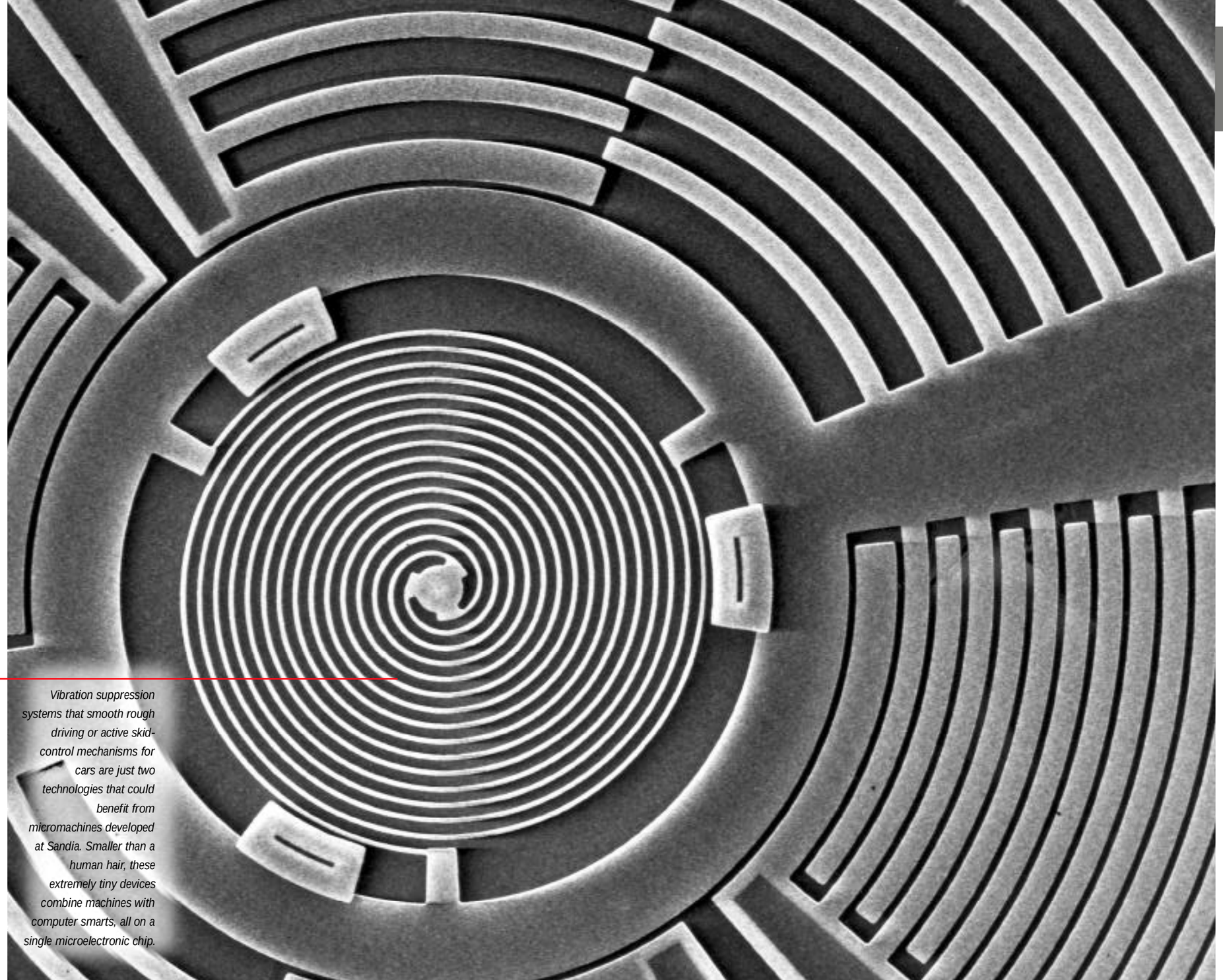
Sandia National Laboratories

Success

We're talking tiny

Smarter and smaller electronic products, from computers to cellular phones, require smaller, more efficient microchips. This year, Sandia researchers fabricated the world's first working microelectronic device made with extreme ultraviolet light — resulting in features a thousandth of the width of a human hair. The device is a field effect transistor, a common building block of integrated circuits used in micro-electronics. It has a circuit width of 0.1 micron.

Current leading-edge chip patterns are printed with optical lithography, similar to photography, creating features 0.35 micron wide. The shorter wavelength of ultraviolet light allows even smaller features. This project is sponsored by the Department of Energy in collaboration with Lawrence Livermore National Laboratory, Lawrence Berkeley National Laboratory, AT&T, Intel, and other partners.



Vibration suppression systems that smooth rough driving or active skid-control mechanisms for cars are just two technologies that could benefit from micromachines developed at Sandia. Smaller than a human hair, these extremely tiny devices combine machines with computer smarts, all on a single microelectronic chip.

C O N T E N T S

Sandia Perspectives is published by Sandia National Laboratories. It can also be found on the Web at http://www.sandia.gov/SandiaPerspectives.

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the Department of Energy. With main facilities in Albuquerque, New Mexico, and Livermore, California, Sandia has broad-based research and development responsibilities for nuclear weapons, arms control, energy, the environment, and other areas of importance to the needs of the nation. The Laboratories' principal mission is to support national defense policies by ensuring that the nuclear weapon stockpile meets the highest standards of safety, reliability, security, use control, and military performance. For more information on Sandia, see our Web site at http://www.sandia.gov.

WELCOME

WELCOME

WELCOME

Sandia President Paul Robinson (right) and Executive Vice President John Crawford, pictured in the Robotic Manufacturing Science & Engineering Lab. Behind them, the stabilizer of an F-111 fighter plane is about to be treated with a coating applied by an intelligent machine.

André Sakharov, father of the Soviet hydrogen bomb and later a leading dissident in the Soviet Union, once said that the American character could be summed up in a few words: "May I help you?" At Sandia, we strive to embody that spirit in our corporate personality.

TODAY, WE ARE FOCUSING OUR TALENTS ON THE CURRENT AND EMERGING SECURITY NEEDS OF THE NATION.

Our service to the nation evolves as the nation's needs evolve. The common thread linking all our work is that we bring world-class science and engineering to bear on problems of national importance.

We continue to ensure the safety, reliability, and security of the nuclear weapons stockpile — still our core mission as it was when Sandia was created in 1949. However, events of the past few years have signalled a new and challenging phase in Sandia's journey. It has become evident that other threats to national security — such as proliferation of nuclear, chemical, and biological weapons — will demand the attention of institutions such as Sandia.

Our ability to contribute to these national security issues stems from the technical capabilities we have developed in fulfilling our historic nuclear weapon mission. Today, in addition to our nuclear weapon responsibility, we are focusing our talents on the current and emerging security needs of the nation. These include the safety, security, and reliability of energy supplies, natural resources, information systems, environmental technologies, and other critical infrastructures. We are increasingly committed to responding to uncommon security threats — terrorism, intrusion or sabotage of U.S. information systems, and proliferation of weapons of mass destruction.

During the past year, three major new facilities opened at Sandia — for robotics research and development, for the manufacture of neutron generators, and for explosives evaluation and testing. Our researchers won national recognition for excellence in technical fields vital to our missions.

THE COMMON THREAD LINKING ALL OUR WORK IS THAT WE BRING WORLD-CLASS SCIENCE AND ENGINEERING TO BEAR ON PROBLEMS OF NATIONAL IMPORTANCE.

We also took steps to ensure that we fulfill our government missions more efficiently by adopting business techniques employed by the private sector and maximizing the benefits of strategic partnerships.

Successful pursuit of these objectives will ensure that, in collaboration with our partners in industry, academia, and other government institutions, we will continue to render "exceptional service in the national interest" in the broad context of national security as well as in stockpile stewardship.

People often ask what differentiates Sandia from other laboratories. We believe the answer lies in our dedication to science with the end in mind, a process essential to meeting our responsibility for America's nuclear arsenal from conception to dismantlement. Our primary mission of making sure nuclear weapons will function if needed and not function otherwise requires that our performance be backed with broad-based scientific knowledge, agility, and expertise. To achieve this, we operate as a team, bringing together the best qualified scientists and engineers to meet challenges that frequently involve partners in industry, academia, and other federal laboratories. Achieving technological advances in a rapidly changing world is only possible through the dedication of the immensely talented individuals who make up our team.

PEOPLE OFTEN ASK WHAT DIFFERENTIATES SANDIA FROM OTHER LABORATORIES. WE BELIEVE THE ANSWER LIES IN OUR DEDICATION TO SCIENCE WITH THE END IN MIND.

Success

Airworthiness

Inspectors checking the safety of DC-9 commercial aircraft can complete their work more thoroughly, less expensively, and 15 times faster using a technique developed through a team effort involving Sandia National Laboratories, industry, and the Federal Aviation Administration. Ultrasound, a technique better known for looking at unborn babies, allows inspectors to evaluate the structural integrity of a DC-9's wing attachment in about 48 hours, compared to 800 hours previously.

The ultrasound technique uses equipment developed by Northwestern University and SAIC/Ultra Image International. Sound waves projected through an airplane's skin are reflected in patterns that reveal whether corrosion is present inside the plane. If damage is detected, mechanics can repair or replace affected parts.

Sandia became involved in aircraft inspection following the Aviation Safety Act of 1988, passed by Congress following the midair structural failure of an Aloha Airlines Boeing 737. Since then, the role of Sandia's Airworthiness Assurance Nondestructive Inspection Validation Center has expanded to address overall safety system design, ranging from fire protection to accident investigation support.

A WINNING TEAM

FROM TRADESPEOPLE TO SCIENTISTS, SECRETARIES TO ENGINEERS, SANDIA'S EMPLOYEES GIVE THE LABORATORIES ITS TREMENDOUS DIVERSITY OF TECHNICAL EXPERTISE AND TALENT.

Sandia energy technology is providing solar power to Barstow, California.

Sandia's people are its strength. From tradespeople to scientists, secretaries to engineers, Sandia's employees give the Laboratories its tremendous diversity of technical expertise and talent.

Fifty-two percent of Sandia's researchers are engineers, the majority in mechanical and electrical engineering. Twenty-four percent are in the sciences, such as physics, chemistry, mathematics, and other disciplines. The rest of Sandia's employees holding technical degrees work in computing and other fields. Of those individuals, 76 percent hold master's or doctoral degrees. Most work at sites in New Mexico and California; a few work on temporary assignment in Nevada, Hawaii, Texas, Washington, D.C., and Moscow.

These researchers provide Sandia with unparalleled understanding of materials, microelectronics, computing, and all aspects of systems engineering — capabilities useful for civilian as well as military research. In 1996 alone, Sandia researchers won six *R&D 100 Awards* honoring inventors of the 100 most significant technological innovations of the year. The six winning Sandia projects cast a wide net in the field of invention, from information protection on the Internet to nuclear waste reduction. Sandia's researchers have often won national recognition.

The Robotic Manufacturing Science and Engineering Lab opened in 1996.

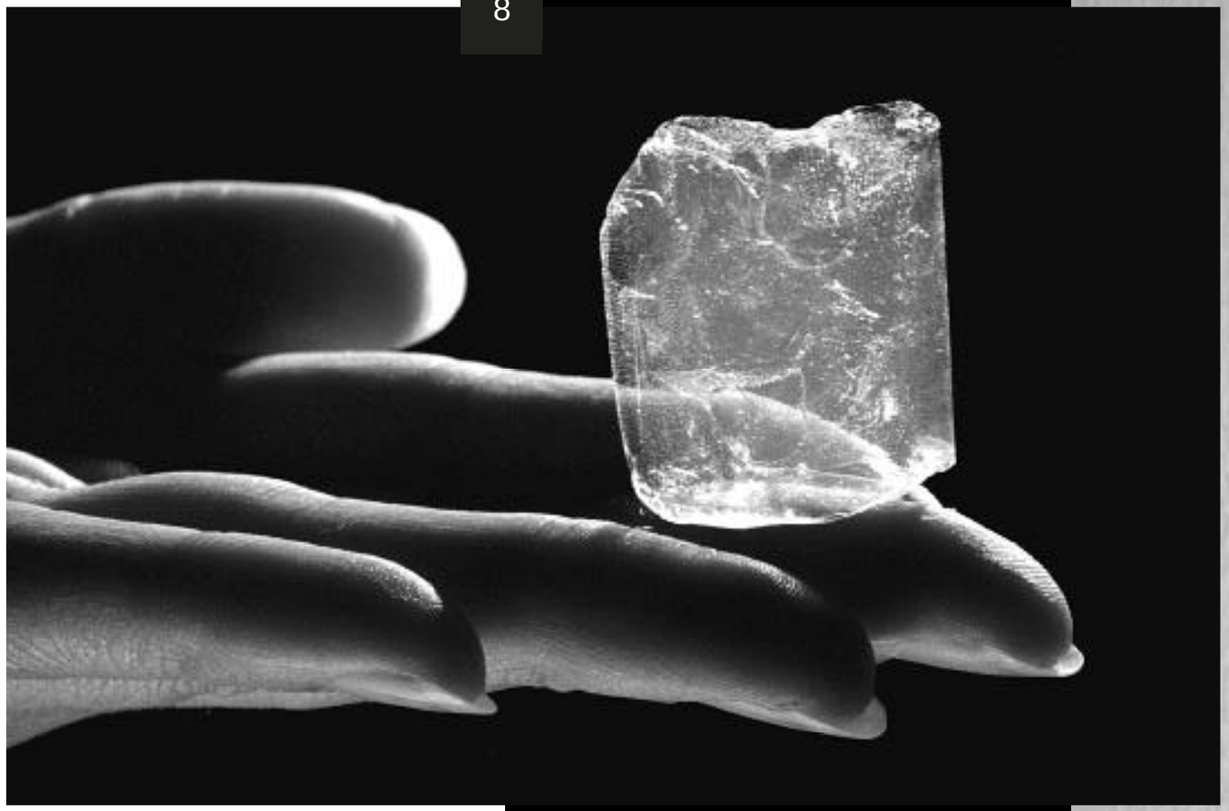
Sandia is proud of its exceptional research facilities. More than 40 user facilities are available to U.S. industry and universities. Following are just a few examples:

- The Combustion Research Facility in California is dedicated to studies of the physical chemistry of combustion and has been used by U.S. manufacturers to maximize fuel efficiency and minimize pollution.
- Microelectronics and semiconductor manufacturers have tested new devices in Sandia's Microelectronics Development Laboratory.
- The new Robotic Manufacturing Science and Engineering Laboratory helps researchers develop and test agile, automated manufacturing processes.

These and other laboratory facilities provide the foundation for the government work that is vital to Sandia's mission. They also benefit partners in industry and academia.

MORE THAN 40 USER FACILITIES ARE AVAILABLE TO U.S. INDUSTRY AND UNIVERSITIES.

Chemist Carol Ashley begins a procedure for synthesizing glass using a solution-gelation process. Sandia is developing high-porosity glass foams for rapid detection of chemical and biological agents.



Aerogels, made of 90 percent air, are porous, lightweight, and absorbent, and have novel properties as sensors, catalysts, and insulators. Sandia scientists are using aerogels to detect harmful substances in chemical and biological weapons and to insulate batteries.

PROTECTING THE NATION IN A CHANGING WORLD

The world today is a different place than in 1949, when Sandia National Laboratories was founded. World War II had just come to an end, and the atomic bomb had changed the course of history. America's nuclear scientists were wrestling with the problem of how to contain the tremendous power of this new weapon yet still stay ahead of potential adversaries in maintaining its readiness.

As long as the possibility of conflict remains, Sandia is committed to maintaining the safety and readiness of the U.S. stockpile.

In the post-Cold War environment, new threats lurk. Sandia's national security role has grown from responding to the known challenges of the former Soviet Union to preparing to respond to a host of less well-defined threats — some nuclear, some not. As long as the possibility of conflict remains, Sandia is committed to maintaining the safety and readiness of the U.S. stockpile.

Sandia's traditional and ongoing role is to provide engineering support for the nation's nuclear weapons program. The cornerstone of Sandia's mission is the design of components and controls that ensure the safety, security, and reliability of nuclear weapons. Sandia provides support for advanced conventional weapons, ballistic missile systems, and military space systems that use related technologies and are key elements of national defense.

Sandia has been an innovator in America's science and engineering communities for the past 50 years. Key developments have included:

This passthrough box eliminates the need for gowning while transferring products to restricted areas during fabrication of neutron generators, a non-nuclear component of nuclear weapons.

- The laminar air flow clean room, now a fixture in virtually every microelectronics factory.
- The new vertical cavity surface-emitting laser, destined to revolutionize laser communications — from fiber-optic telephone links to office copying machines.
- World record-setting massively parallel computing.

In recent years, the national security role of Sandia's laboratories in Albuquerque, New Mexico, and Livermore, California, has emphasized the safe dismantlement of weapons taken from the stockpile. Since the early 1970s, Sandia has responded to the national need for energy security. Solar energy, combustion research, and petroleum recovery have all benefited from technology developed at Sandia.

Sandia National Laboratories has been an innovator in America's science and engineering communities for the past 50 years.

In 1996, the Department of Energy selected Sandia to become the sole U.S. producer of molybdenum-99, a short-lived radioisotope used in diagnostic medicine. The research reactor that will produce this isotope has been used in the past to test weapon components, establish safety standards for nuclear reactors, and test nuclear rocket fuels.

A computer directs a robot's motions in three-dimensional space.

From parachutes to airbags

Precision Fabrics Group Inc., a North Carolina manufacturer of textiles for parachutes and other products, has teamed with Sandia National Laboratories to develop a revolutionary new airbag. The airbag inflates to the same size as conventional airbags but has less than half the packed volume and weight.

The design is the result of a cooperative effort between Sandia and the company. It represents the first significant improvement in airbag technology in the past 25 years and is a good example of how work at national laboratories benefits both defense and non-defense objectives.

Sandia contributed expertise from designing parachutes for weapon delivery systems to improve the performance of automotive airbags.

New Horizons for supercomputers

Methods for understanding the behavior of nuclear weapons have changed radically over the years. The advent of high-performance computers has offered new options unimaginable 50 years ago. Instead of monitoring actual nuclear explosions, researchers today manipulate huge amounts of data to simulate weapons effects. Ultra-fast computers enable scientists to simulate nuclear detonations and weapon safety scenarios, such as lightning strikes, crashes, fuel fires, or the deterioration that occurs with aging. Aging studies are especially important given the facts that no new weapons are being produced, all underground testing has ceased, and older weapons must remain safe and reliable for many years beyond their original design life.

Not surprisingly, this work has applications beyond defense. For example, Sandia's computer codes have been used to:

- Predict the migration of underground waste.
- More precisely target radiation treatment of cancer.
- Improve nuclear reactor safety.
- Understand global climate change.

Sandia conducts test launches of the Strategic Target System from the island of Kauai, Hawaii.

In a joint project with Kaiser Permanente of California, Sandia is modeling entire health care delivery systems, which will be used to study the effects of policy changes or treatment recommendations on medical costs and patient health.

Sandia and Intel Corporation first achieved the world record for computing speed in 1994 — 281 billion floating point operations per second with a Paragon computer. In 1997, a still more powerful computer will be installed at Sandia as part of a joint project involving Intel and Lawrence Livermore and Los Alamos national laboratories. It will have a computing speed of almost two trillion floating point operations per second.

SANDIA AND INTEL CORPORATION FIRST ACHIEVED THE WORLD RECORD FOR COMPUTING SPEED IN 1994.

STEWARDSHIP OF THE NUCLEAR STOCKPILE

Sandia researchers also study the behavior of nuclear weapons with huge accelerators powered by intense pulses of electrical energy. In early 1996, Sandia achieved record X-ray output with its Saturn accelerator — 85 trillion watts, which is about 50 times more power in a fraction of a second than the output of the U.S. utility grid. A modification of a 10-year-old accelerator at Sandia, the Particle Beam Fusion Accelerator-Z, is expected to produce 150 trillion watts of X-radiation.

Just as advances in supercomputing and pulsed power make it possible to solve larger and more complex problems, advances in microelectronics and silicon technology make

Rockets propel Strategic Target System vehicles from Kauai, Hawaii to Kwajalein, 2,300 miles away in the Pacific Ocean.

Success

Rubber meets the road

Goodyear, the last major U.S. tire maker, working with Sandia, has completed finite-element analysis of new product designs — an approach that allows computers to crunch huge amounts of data and predict overall tire performance. This work has improved fuel efficiency and reduced the time it takes to build and test prototype tires. Sandia's contribution stems from computer modeling expertise applied to weapon dynamics.

An estimated 4 percent to 7 percent of a vehicle's highway fuel is burned in overcoming the tire's natural resistance to rolling. A cooperative research project between Goodyear and Sandia is reducing this resistance as well as improving longevity, performance, and safety of tires. Goodyear has contributed more than $18 million to cover the cost of the research. Sandia's contribution stems from expertise in using computer modeling to understand materials and weapon dynamics.

it possible to produce smaller and more reliable components. In 1996, Sandia researchers succeeded in fabricating tiny micromotors together with electronic "brains" on a single silicon chip. The machines turn gears one-hundredth the thickness of a sheet of paper and smaller in diameter than a human hair. One of their expected uses is to improve weapon safety, security, and reliability. They can be combined with microsensors to determine information about temperature, pressure, motion, corrosion, and decomposition.

Sandia's nuclear weapon stewardship includes the capability to replace critical components. In 1993, Sandia accepted responsibility for production of neutron tubes and generators for the Department of Energy. These generators contain tritium, a radioactive isotope of hydrogen that decays naturally over time and must be replaced periodically to maintain stockpile readiness.

Sandia has been selected by the Department of Energy to produce molybdenum-99, a short-lived radioisotope used in diagnostic medicine.

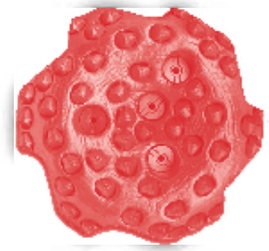
Sandia is a leader in intelligent machines and robotics technology. Intelligent machines are not only helpful for handling repetitive tasks, they are invaluable for protecting humans from exposure to dangerous environments. Sandia-designed intelligent systems handle critical tasks, such as dismantling nuclear weapons and explosive components and processing the hazardous materials that are removed. From high-energy physics to massively parallel computing, Sandia's employees are overseeing the performance of the most technologically demanding device ever conceived — the nuclear weapon. The spinoff technologies are useful in many environments, from banks to hospitals to battlefields.

SANDIA-DESIGNED INTELLIGENT SYSTEMS HANDLE CRITICAL TASKS, SUCH AS DISMANTLING NUCLEAR WEAPONS AND EXPLOSIVE COMPONENTS.

Success

A worthwhile investment

A recent University of New Mexico study determined that polycrystalline diamond drill bits, applied to hard rock drilling in the 1970s with help from Sandia National Laboratories, have provided a return of $125 for each dollar invested in research. And that's a conservative estimate, according to the study.



Diamond drill bits make it possible for oil-drilling companies to drill much faster with fewer failures. This improves worker safety and saves money. Sandia experiments determined the optimum geometry for cutter blades and drilling fluid circulation.

Several manufacturers later entered the marketplace with drill bits based on the improved design. The improved products prevented an estimated 3,260 accidents, saving an estimated 36 lives over a 10-year period. The total economic impact is estimated at $2.7 billion so far.

MAKING PEOPLE SAFE

Sandia security guards practice tactical team emergency response techniques.

An estimated 20 countries are developing weapons of mass destruction — nuclear, biological, and chemical. To prevent the use of these weapons against the United States or its allies, Sandia is working with academic and industrial partners to develop systems to locate and neutralize buried or mobile targets, defend against missile attack, and detect and identify chemical and biological weapons. This work is pushing the frontiers of science and engineering and paving the way for means to counter terrorism.

Sandia's security experts and engineers work closely with federal and local law enforcement agencies and intelligence agencies to improve the tools available for preventing crime and apprehending violent criminals. Other technologies being developed at Sandia include non-lethal sticky foam that immobilizes an intruder and a "smart gun" that responds only to its authorized user. Sandia recently formed an alliance with the National Institute of Justice to improve the accuracy and reliability of sniffer chips that detect explosive vapors and save lives. A new counterterrorist technology Sandia is developing in partnership with the Federal Aviation Administration is an extremely sensitive device for detecting and identifying explosives.

AN ESTIMATED 20 COUNTRIES ARE DEVELOPING WEAPONS OF MASS DESTRUCTION — NUCLEAR, BIOLOGICAL, AND CHEMICAL.

The federal government often calls on Sandia for technical assistance in matters involving explosive devices and security systems. In the wake of the 1995 bombing of the Alfred Murrah federal building in Oklahoma City, Sandia helped the General Services Administration develop standards and guidelines for new construction projects to improve blast resistance and security. Sandia worked with the Port Authority of New York City after the World Trade Center bombing to develop plans for improving the safety of bridges, tunnels, and airport facilities. Following the recent explosion aboard TWA Flight 800, the White House Commission on Aviation Security directed that vulnerability analysis tools developed by Sandia be used to improve aviation security. Also during 1996, Sandia provided the Olympic Games in Atlanta with a system for safely disabling explosive devices. This device has become the tool of choice for disabling conventional, handmade bombs. In 1989 and 1990, Sandia helped Congress and the Navy investigate and determine the cause of the turret-gun explosion on the *USS Iowa* that killed 47 crewmen. Sandia is a key member of the Nuclear Emergency Search Team, a special tactical team for responding to nuclear terrorist threats.

A Sandia-designed system allows bomb squads to safely disable explosive devices.

In 1996, Sandia teamed with three New Mexico and Arizona universities to offer the first undergraduate program in the country that focuses on training students in the methods and principles of security systems design.

Russian visitors examine armored blankets for protecting nuclear materials.

GLOBAL SECURITY THROUGH COOPERATION

Sandia National Laboratories, working with the Energy Department and the State Department, supports joint programs aimed at preventing the spread of nuclear weapons. Even though the two nuclear superpowers have agreed to shrink their arsenals, that has not eliminated the risk that nuclear materials could fall into hostile hands.

Prevention

One such program would allow the United States and Russia to keep tabs on each other's weapons-grade nuclear material, especially enriched uranium and plutonium. The Remote Monitoring System is equipped with fiber-optic seals, motion sensors, video cameras, customized software, and a secure communication network.

Safety

Sandia has helped former Soviet republics improve how they protect, control, and account for weapons-grade nuclear materials. Sandia engineers have installed perimeter barriers, exterior and interior sensors, video systems, and communication and emergency response systems. To protect nuclear materials during weapon dismantlement, Sandia has provided security systems for Russian railcars, fissile material storage containers, and flexible armor blankets that provide protection during transport.

Commercial applications

Another effort aimed at preventing nuclear proliferation seeks to redirect the expertise of Russian scientists from weapon-related activities to commercially viable work. Teams of scientists from Sandia and the former Soviet Union have begun joint research projects in materials, energy, manufacturing, lasers, and environmental remediation. Examples are laser spectroscopy for cancer diagnosis, reactor safety analysis, and wear-resistant diamond coatings.

EVEN THOUGH THE TWO NUCLEAR SUPERPOWERS HAVE AGREED TO SHRINK THEIR ARSENALS, THAT HAS NOT ELIMINATED THE RISK THAT NUCLEAR MATERIALS COULD FALL INTO HOSTILE HANDS.

Cooperation

All efforts to reduce the proliferation of weapons of mass destruction must ultimately deal with the problems that motivate other nations to acquire them. An important contribution in this area is the Cooperative Monitoring Center in New Mexico, where potential adversaries can learn about technologies available for monitoring compliance with regional arms control agreements. Sandia has hosted several delegations from the Middle East and the Far East to acquaint arms control specialists and political and military leaders with peaceful monitoring technologies, such as cameras, airborne data collection, sensors, and unclassified satellite imagery.

All efforts to reduce the proliferation of weapons of mass destruction must ultimately deal with the problems that motivate other nations to acquire them.

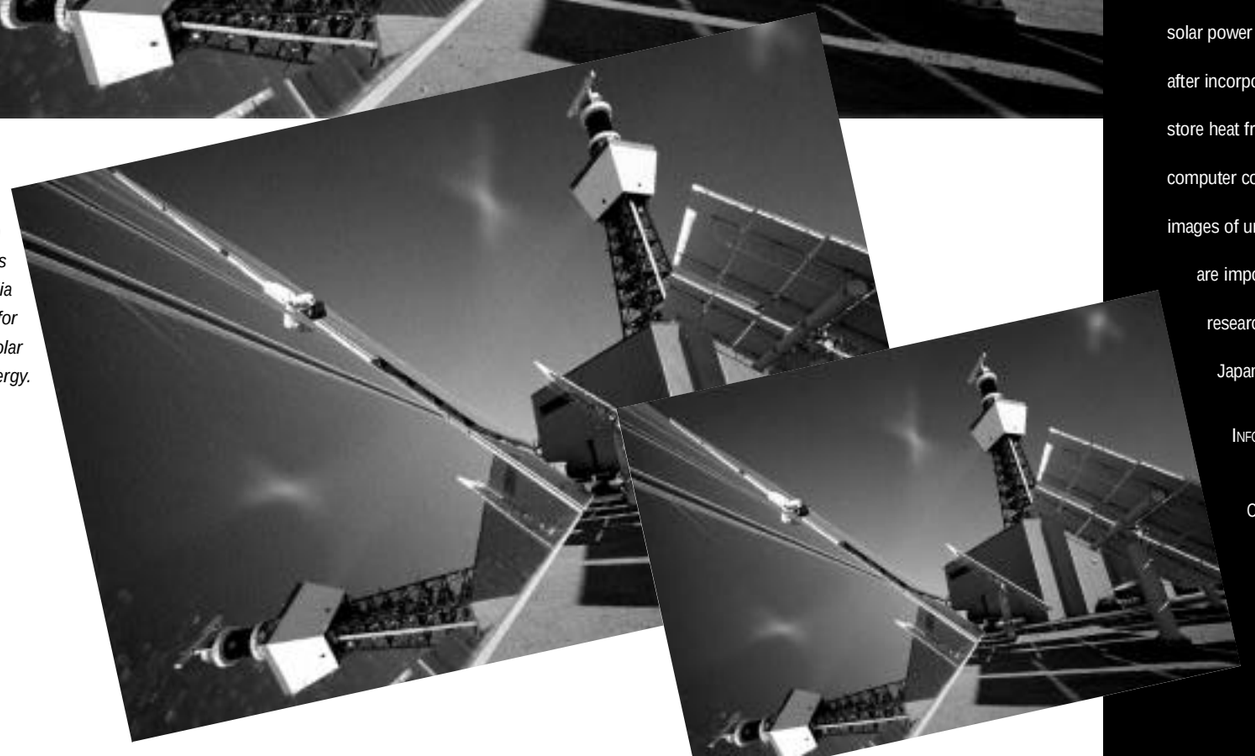
Diplomatic initiatives

Sandia continues to provide technology support to U.S. diplomatic initiatives and to the U.S. intelligence community. Sandia advisers assist the International Atomic Energy Agency in monitoring the use of nuclear materials around the world. In partnership with the Energy Department, Sandia supports export controls to prevent the transfer of technologies critical to the development of weapons of mass destruction.

Just as Sandia's role will continue to assure a nuclear deterrent that meets the needs of the United States, Sandia will continue efforts to reduce the vulnerability of the nation to the proliferation of nuclear weapons.

Tamper-evident shrink wrap developed at Sandia provides evidence if sensitive facilities or objects are disturbed. When heat is applied, the film layers shrink randomly and produce a unique fingerprint.

WHAT HAPPENS WHEN THE LIGHTS GO OUT ?



The Solar Two power plant in California uses a Sandia technology for storing solar energy.

Increasingly, the United States and all other nations are becoming globally interconnected. Commodities such as energy, information, water quality, air quality, and soil quality are important to everyone. Interruptions or failures in any of these could not only cripple commerce but also lead to regional or global armed conflicts. For that reason, Sandia is committed to helping protect these commodities and preserve peace.

INTERRUPTIONS OR FAILURES IN ANY OF THESE COULD NOT ONLY CRIPPLE COMMERCE BUT ALSO LEAD TO REGIONAL OR GLOBAL ARMED CONFLICTS.

ENERGY

Since the early 1970s, Sandia has contributed to the security of energy supplies — work that continues today. Solar Two, a large solar power plant near Barstow, California, reopened recently after incorporating molten salt technology developed at Sandia to store heat from sunlight. In another energy project, sophisticated computer codes dramatically reduce the time it takes to create images of underground oil reservoirs. Sandia's reactor facilities are important to understanding nuclear energy. Energy research at Sandia benefits other countries as well, such as Japan, Mexico, and South Africa.

INFORMATION

Computerized information networks, such as electronic cash systems, can be vulnerable to hackers who gain unauthorized access to

confidential data. Sandia is an internationally recognized expert in encryption techniques, and is using this capability to reduce the vulnerability of financial networks and health care databases that routinely transmit sensitive information.

Virtual Lab

A high-speed computer network linking Sandia, Los Alamos, and Lawrence Livermore national laboratories will soon be available to private industry. Called the Virtual Lab Testbed, this network will help industrial partners test new approaches to solving computationally complex problems, such as engineering new products on-line at different locations simultaneously. The network will accelerate the nation's shift from nuclear weapons testing to computer-based simulation, and at the same time enable manufacturers to make product modifications in days rather than months.

Climate

A global environmental concern is greenhouse warming. Sandia scientists are helping study the role of clouds in climate change. This work began as a small research project and has grown into a national program involving laboratories and universities sponsored by the Department of Energy.

Environment

Dealing with hazardous and radioactive waste is of global importance, whether the waste is generated by the nuclear weapons complex, hospitals, manufacturers, or nuclear power plants. Sandia is developing techniques for handling and disposing of hazardous waste in ways that protect human health. For example, Sandia and the University of Texas are developing a new inorganic material that locks highly radioactive cesium into crystal lattices and removes it from other wastes for long-term disposal. *R&D Magazine* selected this as one of the most promising technologies of 1996.

Industry

Sandia works with U.S. manufacturers, such as the automotive industry, to improve industrial processes. Results include wear-resistant materials for aluminum engines, tougher electronics, and a new airbag design that takes up less than half the packed volume and weight of conventional airbags. The global benefits of such work are improved air quality and better use of resources.

Since the early 1970s, Sandia has contributed to the security of energy supplies — work that continues today.

Success

A winning formula

In 1989, when Sandia signed an agreement with SEMATECH, an Austin-based consortium of U.S. semiconductor manufacturers, Sandia became an important player in helping the United States take the lead in this field. Semiconductors are the materials that make microelectronic devices possible — from computers to microwaves to weapon control systems.The goal of the agreement was to develop design models and methods to improve future generations of semiconductor manufacturing equipment.

Today, America has regained the lead from Japan in semiconductor equipment manufacturing and is closing the gap in chip sales. Sandia, with many years of experience in designing microelectronics for weapon systems, has teamed with other national labs and private firms to help SEMATECH achieve this goal. The initial 30-month technical assistance agreement between Sandia and SEMATECH has now grown into a multiyear partnership worth more than $100 million.

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