Z accelerator pushes aluminum plates faster than Earth moves through space

New laser switching to improve peacetime fusion capsule design, provide data for stockpile stewardship

By Neal Singer

The object, which resembled a small plate, slid smoothly from its launch site. By the time it traveled 1/6 of an inch, it had reached a velocity of 76,000 miles per hour, or 50 times the speed of a rifle bullet. In less than a second, the plate had gained approximately three times the velocity needed to escape Earth's gravitational field.

"Being able to send material so fast is not just for vanity or the Guinness Book of Records."

No human could survive that enormous acceleration. The plate itself remained intact only because of the smoothly increasing thrust of the huge magnetic field driving it. A single sharp jolt would have vaporized the plate.

The speed of the thrust was a new record for Sandia's electrically driven Z accelerator, sometimes referred to as the fastest gun in the West. Actually the fastest in the world, it is now able to propel small plates shocklessly at 34 kilometers a second, faster than

(Continued on page 5)

ARE YOU GOOD FOR ANOTHER 15 KM/SEC — Marcus Knudson considers his favorite apparatus — the Z insert that sends flyer plates hurling at phenomenal speeds. (Photo by Randy Montoya)

VP Pace VanDevender retires

RETIRING VP Pace VanDevender reflects on three decades of accomplishments and change at Sandia. See story by Ken Frazier on **page 6.**

Sandia LabNews

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Managed by Lockheed Martin for the National Nuclear Security Administration

Sandia National Laboratories

Events in Russia, Venezuela, Middle East, China led to high oil prices worldwide

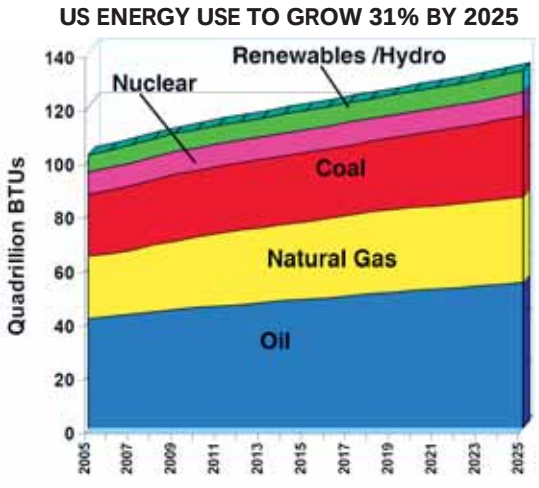
Sandia chief economist sees oil prices dropping back to the mid $30s

By Chris Burroughs

"A perfect storm of sorts" led to the price of oil skyrocketing last month to nearly $56 a barrel. But the price is already starting to fall and within the next few years should stabilize in the mid $30s per barrel range.

That's according to Arnie Baker (6010), Sandia's chief economist.

A number of events led to the dramatic increase of the price of oil that went from $14.80 a barrel in 1998 in inflation-adjusted dollars to $56 in March of this year.



Arnie says that while the Persian Gulf has always supplied most of the world's oil, Russia and Venezuela have also been major producers. Recent internal events in those countries and China, as well, have boosted oil prices.

"Russian production has slowed as President Putin has reasserted control over the Russian oil and natural gas sector," Arnie says. "In addition, President Chavez in Venezuela has siphoned funding from the Venezuelan oil company PDVSA for other purposes, disrupting what would have otherwise been higher levels of Venezuelan oil production. And while Iraq is second to the Saudis in oil reserves, instabilities there have continued to limit oil production. Thus, most of the surge capacity — excess oil production capacity in Saudi Arabia/Kuwait — has been used up."

(Continued on page 4)

Tom Brennan named Labs' first Entrepreneur in Residence

By Erin Gardner

Tom Brennan, Sandia's first Entrepreneur in Residence (EIR), is working to make it easier for the Labs to interface with outside markets.

TOM BRENNAN

Sandia created the EIR pilot program with hopes to stimulate spin-off companies and new commercial licenses built around Sandia technologies that are important to the Labs.

The program is intended to promote a culture of entrepreneurship within the Labs and assist Sandia in interfacing with the venture capital and corporate community.

Tom worked at Sandia from '86 through '96

(Continued on page 4)

California team, partners discover unsuspected intermediates in the chemistry of combustion. See story on ***page 3.***

Labs President and Director Tom Hunter holds first "all-hands" meeting at "sold-out" Steve Schiff Auditorium. See story on ***page 3.***

Three recent PhDs have been selected to receive Sandia's prestigious Truman research fellowship. See story on ***page 9.***

What's what

For an inanimate object, the here-today-gone-yesterday boulder along Hardin Boulevard's sparking a lot of interest. The latest is from Joel Reinhard, civil engineering operations manager for Chugach Management Services, which takes care of much of the Kirtland AFB infrastructure and related things.

"I can assure you the boulder along Hardin [Boulevard] fulfills a valid mission for Kirtland AFB," he e-mailed last week. "Unfortunately we are unable to disclose the mission for security reasons. . . . Because of recent constriction on the base aircraft parking and taxiways, and work-related stress, the Air Base Wing granted the boulder a well deserved leave during spring break to sunny Cancun.

"The trip included . . . a beach resort (see photo at right) sponsored by the 150th ANG (Air National Guard), a critical member of Team Kirtland. . . . We are proud our boulder is back on duty and thank the Air National Guard for its safe return. We look forward to years of dedicated service from our silent sentinel in the future."

Joel may be wasting his time engineering. He should consider staff work on one of the congressional budget-writing committees.

Meanwhile, a couple of other boulder suggestions:

— It's really being moved around as a promotional stunt for the upcoming "Rolling Stones" tour.

— It's being pushed by Sisyphus. The closer it gets to the road, the bigger it grows, until he loses his grip and it rolls back, decreasing to the size of a pebble. Then he starts pushing again. . . .

* * *

If you don't know Bill Wolf (6337), he's an incident commander in the Emergency Management group, identified easily by the blood-red shirt he wears. Because of his outstanding work, he was recently promoted and, as a visual symbol of his increased responsibility, was given gold stars to wear on his collar tabs.

Taking note of his new position and of his new insignia of rank, a colleague who'll remain anonymous suggested that instead of incident commander, maybe he should now be known as incident commodore. And to advance his conviction, the anonymous Sandian says he'll see that Bill also gets a new red hat with a gold star that also notes his title as commodore.

* * *

Funding may be tight, but Barry Ritchey (14425) has his hand up for a project he thinks should be high on Sandia's research list: a "chile hotness sorter."

His rationale? "I can't remember how many times we've purchased 'hot' chile and thought the descriptor was based on taste buds from North Dakota! There ought to be a law for improperly labeled chile!"

— Howard Kercheval (844-7842, MS 0165, hckerch@sandia.gov)

Jim Lee named Director of Radiation Sciences

Jim Lee, Manager of Stockpile Systems Program 1 Dept. 2810, has been appointed Director, Radiation Sciences Center 6700.

Before coming to Sandia in November 1980, Jim was in grad school, measuring neutrino cross sections at Fermilab. He joined Sandia in November 1980, as a staff member in the pulsed-power program, doing research in intense radiation sources and particle-beam diagnostics.

JIM LEE

Jim was the project leader for developing the Saturn bremsstrahlung sources and radiation diagnostics in Beam Source Applications Dept. 4232, which became Simulation Technology Dept. 1232 in reorganization. He was promoted to manager of Simulation Physics Dept. 1231 in 1986 and then moved to Simulation Technology Research Dept. 9341 in 1990. During this period, Jim managed research in radiation sources, radiation effects, and the development of coupled electron-photon radiation transport codes.

In 1998, he became program manager for Radiation Effects Science and Senior Manager (later Deputy Director and Level II Manager) of Stockpile Stewardship Dept. 9340. In reorganization in 1999, Dept. 9340 changed to Dept. 15340. The Radiation Effects Science program develops technologies needed to design and qualify nuclear weapon components that must survive severe radiation environments.

Last August, Jim moved to Stockpile Systems Program 1 Dept. 2810 as a deputy to the Stockpile Systems Program Director, where he was responsible for reentry systems and stockpile surveillance.

Jim has a BS in physics & mathematics from Iowa State University and a PhD in experimental high-energy physics from Caltech.

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LOCKHEED MARTIN

Sandia News Briefs

Blue Star Mothers collecting donations for troops

Rio Grande Valley Blue Star Mothers is collecting donations (money, supplies, letters, and cards) for troops — overseas and domestic — at 3801 Eubank NE (Family Life Radio Station). The donations will be mailed June 11, in time for July 4th (Operation: Happy Birthday USA). For a complete list of needed donations, see their website at http://www.nmrgvbluestarmothers.org/. The support group meets the third Saturday of every month at 10 a.m., Albuquerque Police Academy, 5412 Second St. NW. Membership is open to family members and friends of sons, daughters, and spouses serving in the military during time of war, whether deployed or not. The group is an official chapter of the Blue Star Mothers, Inc., formed during World War II. It shares concerns, worries, pride, and devotion for loved ones serving in all branches of the armed forces. For more information, call Marcia Anderson (9013), 844-2804.

Donations to buy prepaid phone cards for military members

The Albuquerque Professional Chapter of the Association for Women in Communications (AWC) and First State Bank are supporting a project called Operation New Mexico Phone Home to purchase prepaid phone cards for New Mexico members of the US armed forces serving in Iraq and Afghanistan and for veterans being treated at the Albuquerque VA Medical Center. The New Mexico VA Health System and Rep. Heather Wilson's office are also cooperating. Project founder and AWC Board member Karen Panciera says the goal is to raise $10,000, which will be enough to provide at least two hours of long-distance telephone calls for about 1,000 veterans and service members. Sandia employees may bring their donations to any branch of First State Bank in New Mexico, or mail checks to First State Bank, P.O. Box 3686, Albuquerque, NM 87190, Attention: Mail Teller. All checks must be made out to "Operation NM Phone Home."

Rep. Heather Wilson's office seeking student interns

Rep. Heather Wilson, R-N.M., seeks students who are interested in summer internships. Students work for her office a minimum of three months for a total of 65 hours. Students may begin their internship in May, June, or July and must have the flexibility to finish in less than three months or continue into the school year. All student internship positions are unpaid. For more information, contact Julie Dreike at 346-6781 or Ask.Heather@mail.house.gov.

Congratulations

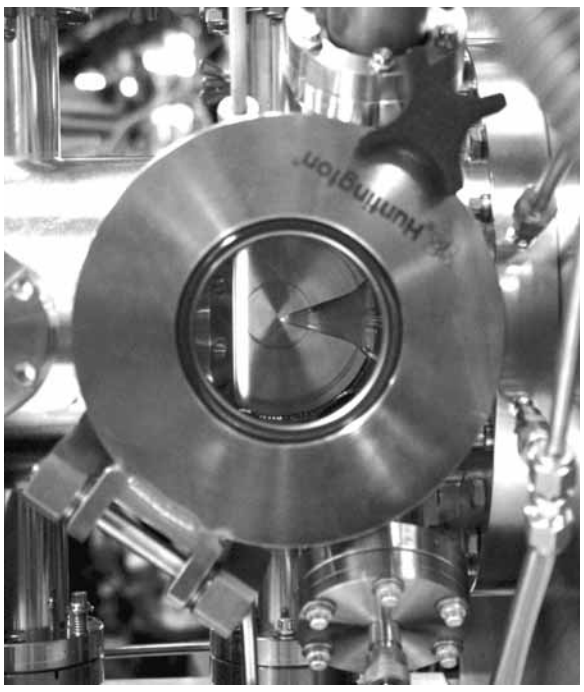
To Pam and Eric (1815) Coker, a son, Alexander, April 27.

Team discovers unsuspected intermediates in the chemistry of combustion

International group detects enols, a class of compounds previously unknown in flames

By Nancy Garcia

Combustion Chemistry Dept. 8353 researchers Craig Taatjes, Nils Hansen, Andy McIlroy, Jim Miller, Juan Senosiain, and Stephen Klippenstein are part of an international team that published a *Science Express* paper May 12 about the surprising detection of a class of compounds previously unknown in flames. This result could have implications for areas as diverse as understanding pollutant formation in combustion and modeling interstellar chemistry.



LIGHT WORK — In the apparatus used to sample molecules from flames, the fuel and oxidizer are introduced through the burner on the left; the flame is the vertical white line. Gases are sampled through a quartz cone, the tip of which can be seen glowing and are interrogated by light from the synchrotron. The burner can be moved horizontally so that gases can be sampled from different points in the flame. (Photograph by Daniel Strong)

The discovery of these compounds, called enols, is the biggest breakthrough so far from a powerful new flame chemistry probe, operated at the Advanced Light Source at Lawrence Berkeley National Laboratory (LBNL), that was developed by researchers from Sandia, LBNL, Cornell University, and the University of Massachusetts in late 2002.

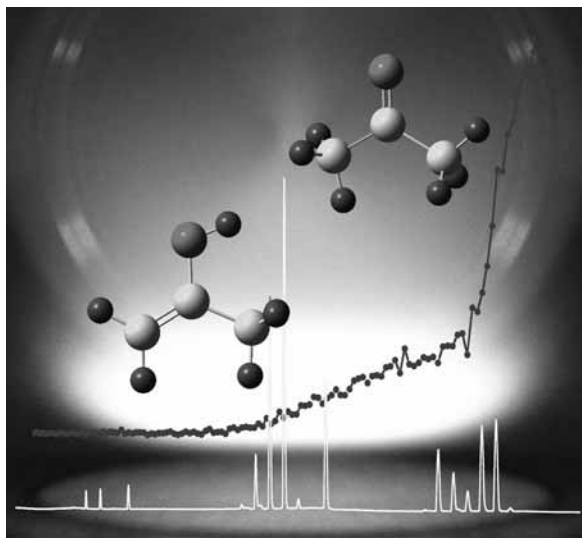
This machine, and a similar device operating at the National Synchrotron Radiation Laboratory in Hefei, China, investigate molecules sampled from flames by combining mass spectrometry (to reveal molecular weight) with ionization by vacuum-ultraviolet light emitted from a synchrotron. One key capability of the machines is that they are able to distinguish isomers — molecules made of the same atoms but in different arrangements — that can have very different chemical characteristics. Enols are less-stable isomers of other well-known combustion intermediates.

They were found when the team was looking for signatures of different isomers in flames. With this finding, enols can be added to predictive computer models currently used to improve combustion efficiency and cleanliness.

"It is remarkable that, even after 150 years of flame chemistry research, new compounds can be found in flames," Craig says. "Enols themselves are chemically interesting; they were predicted to be transient chemical intermediates in 1880, but the first direct observation of the simplest enol, vinyl alcohol, wasn't until 1973. Although these compounds have been elusive," he adds, "it turns out they are just sitting in flames."

The unanticipated detection of enols could also have a significant impact in refining models used to describe fuel cell operation and emission-free waste cleanup using supercritical water oxidation, Craig says. Astronomers have also observed ethenol (one of the enol compounds now identified in flames) in interstellar space. The new enol findings may provide clues as to how complex organic molecules form in interstellar space.

Besides the Sandia scientists, the team that discovered enols in flames includes researchers from Cornell University, the University of Massachusetts, the University of Bielefeld (Germany), and the National Synchrotron Radiation Laboratory in Hefei, China.



THIS ILLUSTRATION shows the molecular structure of two isomers, propen-2-ol on the left, and acetone on the right. The spectrum at the bottom is a representative mass spectrum, which sorts species according to their molecular weight. The line is the photoionization efficiency curve (the ionization signal as a function of photon energy), which can be used to distinguish isomers. The sharp rise on the right of the photoionization efficiency curve is from ionization of acetone, and the tail to the left is from ionization of propenols. (Courtesy of Fei Qi)

Sandia CaliforniaNews

Tom Hunter's first all-hands meeting draws big crowd

Tom Hunter spoke to a capacity audience of Sandians Monday morning in his first all-hands talk to employees as Sandia's new Labs Director. The session drew an overflow crowd to the Steve Schiff Auditorium. There were also live two-way video feeds to California, Nevada, Carlsbad, Pantex, and Washington, D.C.

Tom referred to it as a chance to get to know each other. He called it "an honor and privilege" to be the Labs' director. His April 11 appointment as the Labs 12th president and director went into effect April 29. He is only the second to come up through the ranks (he's been at Sandia 38 years).

Tom said he was born on the very day of the Hiroshima atomic-bomb explosion. This, he said, gives him an easy opening to talk about "how important the work we do is to the country." He said coming up through Sandia's nuclear weapons program, as he has — with safety, security, and reliability so essential — impresses upon you that "the whole world depends on your actions."

Said Tom, "The future is going to be exciting, challenging, and what we make of it." He noted Sandia's $2.3 billion budget, aggressive hiring program, and greatest period of infrastructure construction in the Labs' history. He said he expected a slight dropoff in nuclear weapons funding to be compensated for by funding in other areas and for employment to stay about level.

> *"I would like to think of Sandia as the place where the best in the country compete to participate, compete to come here."*
>
> **Labs Director Tom Hunter**

He asked for help in addressing the challenges of operational excellence (particularly safety and cost-effective security) while allowing time for "fruitful and meaningful" thought and work. He also talked of future internal challenges in controlling medical-support costs and making sure the retirement program remains in good shape.

He urged Sandians to pay attention to the current national debate about nuclear weapons policy and the related issue of what happens at Los Alamos and said to expect "the biggest transformation in the nuclear weapons complex since the early 1990s." Sandia, he said, is in a unique position with its ability to apply "seamless integration" from research to manufacturing. He made a renewed call for excellence in all things. "I would like to think of Sandia as the place where the best in the country compete to participate, compete to come here," he said.

In facing change he emphasized some guiding principles: the nation's interest comes first, Sandia comes first in corporate matters (over Lockheed Martin), and "everyone matters — each of us has inherent value."

He said some changes in the Labs' organization are planned, and he hopes to have most of the structural part of this plan in place soon. The *Lab News* will report on those changes as they occur.

— Ken Frazier

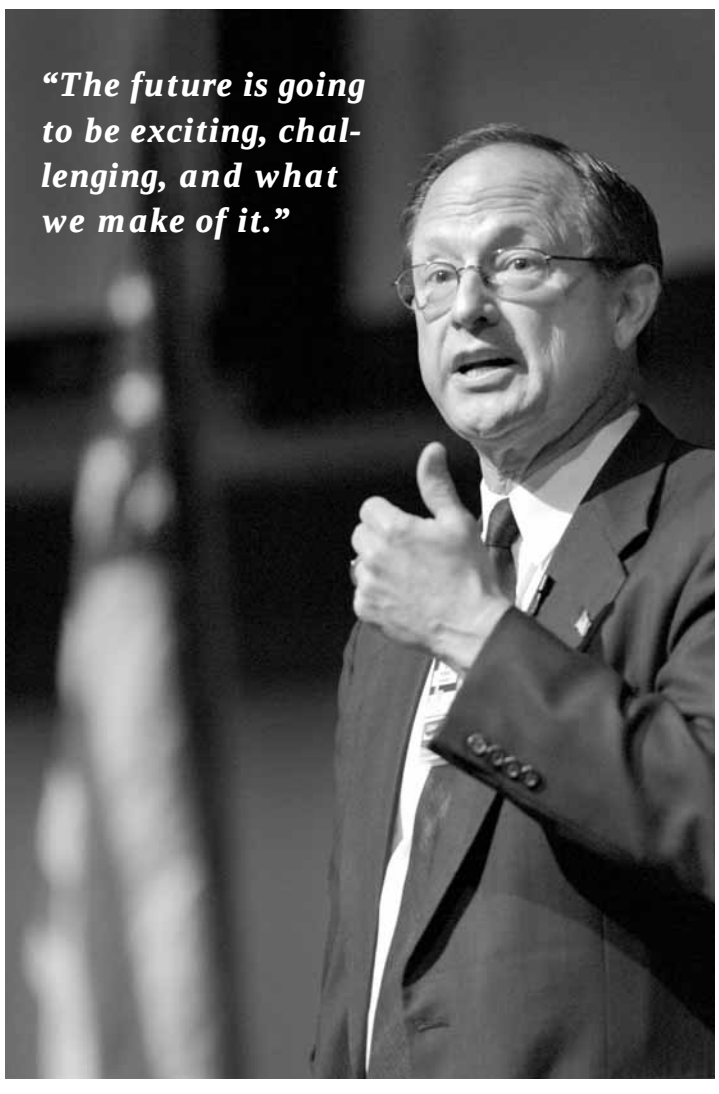


Photo by Randy Montoya

Energy

(Continued from page 1)

At the same time, Arnie says, China has had strong economic growth, a surge in personal vehicle ownership, and a surge in diesel electric power generation because of inadequate coal and nuclear electricity generation, increasing its oil imports substantially.

Rate of increase may cool

"Also because of sustained strong economic growth India has increased its oil imports, and US oil demand has been strong," he says. "In 2005 the rate of increase in China, India, and US oil demand is expected to cool, so oil prices might slip a bit over the nearer term."

Oil prices have already started falling and were at $48.10 last week, partly the result of a commitment by OPEC president Sheikh Ahmad al-Fahd al-Sabah, also Kuwait's oil minister, to boost supplies to world markets by 500,000 barrels per day this month. Production from the group's 10 members bound by quotas was expected to rise to 28.5 million barrels per day from just over 28 million.

Oil prices have fluctuated significantly over the years. While $50 a barrel is high in modern terms, it's not as high as it was in 1979-80. Adjusted for inflation, the 1979-80 price per barrel was in the $80 range. It dropped significantly after both non-OPEC oil supplies and global oil demand responded to this high price level, and by 1999 the price fell to $10 per barrel. Spurred by initial oil production cuts in 1999 by Saudi Arabia, Kuwait and Venezuela, oil price increased more than five times in six years to $56 a barrel earlier this year.

Arnie says for the short-term, absent new surprises like disruptions in Iran's production, oil prices should fall slightly — but still remain high compared to just a few years ago. The longer-term effect of higher prices will force people to be innovative about energy use.

"We'll be seeing more fuel-efficient cars, conversion of other forms of fossil energy into liquid fuels, growth in renewables and nuclear, and, in the longer term, perhaps hydrogen," he says.

Production to peak by 2040

With worldwide oil production expected to peak sometime between now and the year 2040 and then start to decline, these alternate energy sources will become more important.

Some of the other forms of fossil energy available in abundance include oil sands in Canada and Venezuela, converting cheap natural gas in the Middle East and Russia to clean liquid fuels, and oil shale and coal in the US. Exploiting any of those resources to make liquid fuels will require more sophisticated technology and potentially could be more expensive, slower, and more environmentally damaging than drilling oil wells.

In addition to increased costs, other concerns exist about many of these alternate energy sources.

"There's concern about dependence on oil from potentially unstable Middle Eastern countries; planned or unplanned cuts in oil production; and economic and political damage that terrorist attacks on energy infrastructures might impose," Arnie says.

Apprehensions aplenty

Other apprehensions center around the risks that might come with growing dependence on liquid natural gas imports, since natural gas will be a growing fuel for US electricity production; the heavy economic costs of transition to new energy sources if global oil production were to suddenly reach its peak and decline; and the potential economic, social, and political costs imposed by global climate change driven by the growing accumulation in the atmosphere of fossil fuel-generated carbon dioxide.

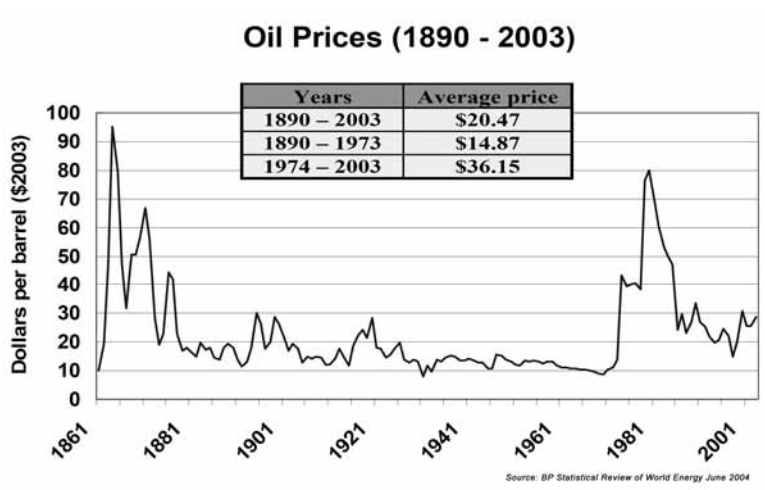
From a Sandia perspective, a world of dwindling and unstable conventional oil supplies and development of alternative energy sources mean big challenges for the years ahead. Sandia is already tackling the challenges in its renewable, fossil, nuclear, energy storage, and hydrogen energy research, through improving energy efficiency at its state-of-the-art Combustion Research Facility in California, and efforts with oil companies to investigate the use of oil shale.

"The bottom line," says Arnie, "is that demand for oil is going up and supplies are growing, but not enough. Oil and energy are the lifeblood of US and global economic development. Sandia has a role to play in reducing prospects for supply interruptions and to make sure that when we reach that peak oil, the alternate energy sources will be there."

Global proven fossil fuel reserves are geographically concentrated

Region	Oil	Gas	Coal
Key P.G.	64	40	*
Saudi	25	4	0
Iraq	11	2	0
Iran	10	15	*
Kuwait	10	1	0
UAE	6	3	0
Qatar	2	15	0
Russia	6	28	16
Venezuela	5	2	*
China	2	1	12
U.S.	2	3	25
India	*	*	9
ROW	21	26	38
Total	100	100	100

Source: EIA 2003. Conventional oil reserves, which excludes oil sands.
*Less than 0.4%



The changing face of energy demand

Energy facts: 2005

• The Persian Gulf and Russia contain about 60 percent of the world's proven oil reserves and 70 percent of the world's proven natural gas reserves.

• China is the second largest energy consumer and the third largest net importer.

• Russia produces more than 9 million barrels of oil a day, close to Saudi production, exporting about 6.5 million barrels a day.

Energy facts: 2025

• Global demand for oil is expected to increase by 40-some million barrels per day with most of the increase in supply to come from the Middle East.

• China's oil demand may be nearly 14 million barrels per day, with 75 percent of that imported, about as much as the US imported in 2004.

• Electricity demand worldwide will grow almost 60 percent, with developing countries — especially China — accounting for two-thirds of the increase.

• US electricity generation will grow by 42 percent, and US energy use will grow by 31 percent.

• US oil production will decline slightly while net imports will grow by 60 percent.

• US natural gas production will grow 13 percent while imports will grow 157 percent, most of which will be liquefied natural gas.

• World energy and carbon emissions will grow more than 40 percent, and developing countries will account for 70 percent of the increase. *— Arnie Baker*

Entrepreneur

(Continued from page 1)

in the Compound Semiconductor Research Department. The EIR program marks his return to Sandia after years of successful business ventures outside of Sandia.

As Entrepreneur in Residence, Tom is responsible for recommending policy and business practice modifications for the EIR program. He also "owns" licensing and intellectual property and business practice modifications to further refine approaches to creating companies based on Sandia intellectual property.

He says his work at Sandia consists of finding sources for technical commercialization for the Labs. He looks to Sandia for inside and mature technologies that may otherwise not be found.

Tom's goal is to make it easier for Sandia to work with the "outside world." To do this, he writes information concerning internal technologies in a "Wall Street" fashion and markets this information to corporations and private investors without creating conflict of interest.

When commercialized in start-up companies, these technologies may potentially contribute to Sandia's national security mission and support economic diversification in New Mexico, the Bay Area of California, and throughout the nation.

In the last two months, Tom has identified about 10 technologies that seem to have commercial value to outside markets. These technologies are then put through assessment filters that evaluate market opportunity, IP (Intellectual Property) position, encumbrances, funding to-date, technology maturity, management status, organization support, competition, and real and perceived barriers to entry.

"The initial contract is for six months, and depending on the success they will hire more EIRs or not," Tom says.

Kevin McMahon (1304), Sandia manager for licensing and intellectual property, named Tom the first entrepreneur for the program.

Tom is chairman of Medical Lighting Solutions (MLS). MLS uses solid-state lighting to treat disease.

"Tom is one of the most accomplished entrepreneurs in New Mexico," Kevin says. "He is uniquely qualified to become Sandia's first Entrepreneur in Residence due to his technical background, business acumen, knowledge and understanding of the Lab, and his extensive experience in high-tech entrepreneurial endeavors associated with both Sandia and non-Sandia developed technologies."

Prior to Tom's position at MLS, he was president and CEO of Zia Laser, focused on development of quantum dot laser diodes; founder and managing partner of Zircle LLC; vice president of EMCORE Corporation, focused on space-based solar power; and cofounder and co-president of MicroOptical Devices (MODE), focused on vertical cavity surface-emitting lasers. MODE was a start-up company formed from technologies licensed from Sandia. In his capacity at MODE, he raised more than $6 million in two rounds of venture financing and was integral to MODE's eventual sale to EMCORE Corporation, where he became vice president and general manager of EMCORE photovoltaics.

TVC's annual symposium matches entrepreneurs, investors in game of chance with big jackpots

By Bill Murphy

Technology Ventures Corporation's annual Equity Capital Symposium last week was a pitchman's dream.

The symposium provided 20 high-tech businesses a show-and-tell platform for an audience of venture capitalists with money in their pockets and profits on their minds. The challenge for each business presenter, several of them fronting for companies based on Sandia-licensed technologies (see "Sandia-based technologies . . ." below), was to convince investors — in 10 minutes or less — that they stand to make millions of dollars by getting in on the ground floor of an exceptional business proposition.

The presenting companies, selected in a rigorous process by TVC and coached for months by TVC experts on how to make their best case in this forum, are not necessarily start-up businesses. Some are, but many have been in business for a year or two or even longer. Start-up or up-and-running, the presenting companies have this in common: They are ready to embark on a new round of growth, a product launch, an infusion of R&D investment to refine a promising technology, or a new marketing push to create demand for an existing technology. To move to that next step, the businesses need a new infusion of cash.

The venture capitalists in the audience have the cash, but they are a demanding lot. They listen with absolute dispassion to the presentations.

TVC PRESIDENT Sherman McCorkle, right, visits with symposium presenter Jim McNally of TruTouch Technologies as TVC senior director Randy Wilson looks on.

They're looking for big profits, profits you don't realize in the conventional stocks and bonds market. They want to double, triple — quadruple! — their investment in five years. That's why each presenter offered an "exit strategy" for investors as part of their sales pitch. That strategy usually went something like this: "Invest in us so that we can expand our market. Within five years we'll be so successful that mega corporation x, y, or z will acquire us for umpteen million dollars, and you'll make a bundle of money."

Every presenter laid out their best-case scenario. The investors in the audience understand they're hearing the sugar-coated version. They also understand that things don't always go the way you want them to go. They understand that while the payoffs can be tremendous, the losses can be total. Equity investment at this stage of a company's life cycle is fraught with risk. They don't call it "risk" capital for nothing. As far as venture capitalists are concerned, when you're willing to lose everything, you're also entitled to big payoffs.

The presentations last all morning, with the investor community watching the presenters the way a crowd of race fans watches the parade of horses at post time. But, like those race fans, the investors aren't going to bet based on this showcase alone. They're going to meet the principals, take the business plan apart paragraph by paragraph and line item by line item. They're going to challenge assumptions, independently analyze the technology and the market. And then — if they're convinced of the opportunity — *then* they'll invest. And often not without strings. Sometimes, the investor will demand the business bring in a new CEO, a new marketing guru, a new technical lead.

Strings or no strings, risks, uncertainties, and intangibles notwithstanding, deals do get made. In fact, the TVC symposium over the years has racked up an astonishingly successful track record. Between 1994 and 2004, 142 presentations were made at TVC symposia. Of those, 49 received equity funding. That 35-percent success rate compares to a national rate where just one in a thousand start-ups receives seed funding. Through its rigorous processes, its coaching, and its reputation for presenting only the best of the best, TVC dramatically stacks the deck in favor of deals being made.

During a break in the presentation, a palpably ebullient Sherman McCorkle said, "Can you believe this? We have five investors for every presenter. Five! Remember how it was when we started? There were more presenters than there were investors."

McCorkle, president of TVC since its inception in 1994, has shepherded the symposium through growing pains and has nursed the New Mexico Venture Capital community from nonexistent in 1994 to robust in 2005. As investors and presenters mix during the intermission, McCorkle is already talking to a TVC colleague about next year's symposium. It'll be bigger and better than ever, McCorkle says.

No doubt.

Sandia-based technologies drive businesses

This year, five businesses presenting at the symposium have relationships to Sandia, either in the form of licensed technology or CRADA-based partnerships:

•**Arcxis Biotechnologies** plans to develop, produce, and distribute portable biological diagnostics with the ability to rapidly detect, analyze, and characterize infectious disease agents. The underlying technology grows out of the Labs' MicroChemLab work.

• **E M Optomechanical** provides the MEMS and nanotechnology microsystems market with a metrology instrument. The technology, developed by Sandia and licensed to EMOM, is used for measuring and characterizing the micro- and nano-scale motions of MEMS devices and other microsystems.

• **Peak Sensor Systems** is a seven-year-old New Mexico business that provides semiconductor manufacturers with wafer-by-wafer, fab-wide process monitoring and real-time anomaly detection and classification, by combining multisensor input with process and yield data. Its existing customer base includes AMD, IBM, Texas Instruments, and others.

• **TruTouch Technologies** has a unique noninvasive alcohol testing device for law enforcement, workplace, and transportation industries. The TruTouch device offers simple, accurate, rapid, and safe "touch-based" alcohol measurements coupled with biometric identity information. A likely follow-on product: a touch-based, driver-specific, nonintrusive ignition interlock.

• **Zia Power** is a solar wafer, cell, and module manufacturer with exclusive license to patents from Sandia. Using multicrystalline technology, Zia Power will address the industry's need for lower-cost modules by eliminating or reducing current manufacturing inefficiencies, lowering material costs through increased silicon use, increasing the efficiency of its solar cells, and developing a high-speed throughput process. The photovoltaics industry is growing at a rate of at least 30 percent per year.

Z machine

(Continued from page 1)

the velocity Earth travels through space (30 km/sec) in its orbit about the sun.

The point of the achievement, however, is not speed for speed's sake.

"Being able to send material so fast is not just for vanity or the Guinness Book of Records," says Marcus Knudson (1646), lead scientist on the effort. "This is presently one of the few ways on earth to get hard information on problems that concern efforts at the outer reaches of science, rather than having to rely on complex speculations that may or may not be correct."

Says Yogi Gupta, a professor known for his work in shock physics at the Washington State University in Pullman, "If you had asked me a few years ago if we could send something this fast, I would have said you were joking. But mankind is always trying to create conditions in the laboratory that imitate extreme conditions [found elsewhere]."

Data from the new work, made possible by an upgrade in Z's firing mechanism, will help engineers more optimally design deuterium capsules to achieve peacetime nuclear fusion, an eventual source of low-environmental-impact electrical power. The high-pressure regimes also provide data for stewardship of the nuclear stockpile — data formerly impossible to come by except through a nuclear explosion in underground experiments.

By creating states of matter extremely difficult to achieve on Earth, the flyer plates also provide hard data to astrophysicists speculating on the structure and even the formation of planets like Jupiter and Saturn.

Says Didier Saumon, an astrophysicist at Los Alamos National Laboratory, "The internal structures of Jupiter and Saturn are composed mostly of hydrogen, so knowing its equation of state [how hydrogen and its isotopes behave at pressures from one to 50 million atmospheres] is highly relevant to how we infer the interior properties of these planets. Z gave us hard data."

The results were reported at the March meeting of the American Physical Society.

The immediate purpose of these very rapid flights is to measure the response of materials at extreme conditions. Z's hurled plates strike a target after traveling five millimeters. The impact generates a shock wave — in some cases, reaching 15 million times atmospheric pressure — that passes through the target material. The waves are so powerful that they do not merely penetrate or even pulverize the materials. They turn solids into liquids, liquids into gases, and gases into plasmas in the same way that heat melts ice to water or boils water into steam. The difference is that in the heart of the 120-foot-diameter accelerator, the process takes place at far higher temperatures and in much shorter times than the kitchen stove could ever approach. The pressures produce states of materials rarely seen or measured in the laboratory.

The trick in accelerating the fragile, 850-micron-thick aluminum plates at 10 to the 10th Gs (force of Earth's gravity) without vaporizing them lies in the finer control now achievable of the magnetic field pulse driving the 30 mm by 15 mm fliers.

For Z's better known effect — vaporizing fine wires at its center to create nuclear fusion — the trick is to get current to travel down Z's 36 cables as simultaneously as possible, so that all the amperage strikes its target with as short a risetime as possible, approximately 100 nanoseconds.

To send a plate flying instead, the arrival of energy at the target is staggered over 300 nanoseconds, so that the amperage arrives less like a tidal wave surge and more in controllable increments.

This requirement was better achieved by a recent upgrade that removed a single laser formerly used to trigger current in all cables simultaneously. In its place, 36 laser switches were installed — one for each cable. This change permits researchers to shape the electrical pulse that arrives at the target, with a corresponding modulation in the magnetic field driving the plate.

An upgrade of Z planned for next year is expected to achieve plate velocities of 45 to 50 km/sec, says Marcus, driving targeted materials further into their plasma regime.

Z's former record in propelling plates was 21 km/sec, set two years ago.

Pulsed power and making an impact: Pace VanDevender, looking back on three decades, finds Sandia still a great place to work but with evermore complex operational requirements

Sandia's research VP and chief technology officer announces forthcoming retirement, contemplates past and future

By Ken Frazier

RETIRING VP Pace VanDevender helped define Labs' character over nearly three decades. (Photo by Randy Montoya)

In the three decades since now-retiring Chief Technology Officer and VP for Science, Technology, and Partnerships Pace VanDevender joined Sandia in 1974, he says the most important things about Sandia are unchanged, but one new thing poses challenges still unresolved.

What's unchanged, he says, are the Sandia culture, the strong sense of identity Sandians have, and the opportunity to make an impact. What has changed are new layers of operational oversight and regulatory requirements that in effect constitute an entire second new goal for Sandia, operational excellence.

How the mix between "mission excellence" and "operational excellence" turns out is still a bit unclear, but nevertheless, he says, Sandia is still a great place to work.

"Sandia was always a place where you could go to make a difference," says Pace, who announced in a May 3 letter to the Laboratory Leadership Team that he would leave his current position on June 2 to retire on July 14. He says he joined Sandia as a young physics PhD for two reasons. First, Sandia was where pulsed power was going to be applied to fusion, "which was my mission in life at the time." The other, he says, was to work where people want to make a difference in the world around them.

Wanting to make a difference

"The engineering culture and mindset of Sandia directly led to everyone wanting to make a difference," he says. "We call it these days a deliverable; we used to call it an impact."

Pace became a division supervisor in 1978, manager of the Fusion Department in 1982, and director of Pulsed Power Sciences in 1984, a position he held into the 1990s. Between then and becoming VP in July 2003 he was director of Corporate Communications, the National Industrial Alliance, Strategic Sciences, Integrated Information Services (Chief Information Officer), and Executive Staff. When he interviewed job candidates for roles in these centers, he would ask them what they wanted out of life.

"I'd give them three options: money, freedom, and impact," he recalls. "If they said money, I'd direct them to business. If they said freedom, I'd direct them to academia. If they said impact, I said, 'You're in the right place,' and we'd continue the interview," he says.

"That's actually broadly practiced across Sandia," he says. "As a result we have a cadre of wonderful people who are dedicated to exceptional service in the national interest, making a difference in the world."

He recalls that 30 years ago things were done, at least from a pulsed-power point of view, in a much more self-contained way. "We had our tribes," he says, and they went and did their jobs.

"Even so we still felt we were part of Sandia. This is the only place I know where we call ourselves by a special name — Sandians. You don't say, 'There's a Los Alamos-ite or a Livermorean . . . person — there's no name for it.

"We have transcended our tribes to have a corporate laboratory ethic and identity. And I'm very, very proud to be a Sandian. It means integrity. It means figuring out what's right for the country. It means putting the nation ahead of the lab, ahead of the organization, ahead of the individual. That's recently articulated but it has been long felt. So that's the kind of thing that has not changed."

A politically sensitive environment

"What has changed," he says, "is that we are in an even more politically sensitive environment. And the struggle to find a new relationship with NNSA and DOE is still a tough challenge.

"When we still had a visible, peer-competitor adversary, the Soviet Union, then our value was immediately obvious and well-felt by everyone. Since the end of the Cold War we've been in a transition period and our value is not as evident to everyone as it once was."

He says this loss of *perceived* value — he emphasizes that this is a misperception, not a loss of value in reality — requires educating others in Washington and elsewhere about what Sandia and the other national labs do. (He adds that competitors will come back eventually and the world is still a dangerous place, in a nuclear sense, and becoming more so.)

But there's a related change as well.

"I think we are being asked to uphold an operational standard that we didn't have to uphold before," Pace says. "So operational excellence has become 'job one' as opposed to mission success as job one. The emphasis now is really on operations — environment, safety, health, and security — and fiduciary accountability — all the *hows*. That's now job one. That is a big change, and we've not yet adapted."

That may be a bit uncomfortable for Sandians, he notes, but it nevertheless must be done and done correctly — while carrying out our mission.

"It is essential that we learn to work with SSO and NNSA headquarters so we can reach a new standard of regulatory excellence and mission success. We need to pull mission success as a priority back up to be at least on par with regulatory excellence.

A sophisticated strategy required

"Today's challenge is a far cry from what it was when I came," Pace says. "It's always easier to have one goal, and a motivating one. Multiple goals require a more sophisticated strategy."

Some internal studies have been done on the various functions that take up Sandians' time. "It's pretty daunting how much time we spend on nontechnical things," Pace says, "but it is not crippling." Research environment surveys conducted in 2001 and 2003 showed increasing frustration in not having uninterrupted time to do the technical work that drives Sandians.

"Although the focus groups that I have held with department managers and senior scientists have identified this problem, this issue, they have always ended with someone admonishing me that this is still a great place to work. In fact the 2001 and 2003 surveys both affirmed that Sandia is a great place to work. And that affirmation is significantly above the norm of the other institutions surveyed. So you have to keep that in perspective. Sandia is still a great place to work."

After former manager Paul McWhorter left Sandia for private enterprise and decided to stay with his company, Pace went and debriefed him about his decision, "to try to understand what he thought about Sandia." Pace says Paul told him, "Tell people back at Sandia that Sandia is the last great place on earth for a technical professional to work."

Pace repeats those words slowly for emphasis. "I think that still is something that Sandians need to keep in mind. And now the rest of Sandia has an obligation to maintain that environment."

(Continued on next page)

Physics of ball lightning attracts Pace's attention

One project that Pace VanDevender intends to devote much attention to is something he considers a fundamental physics mystery: ball lightning. It's a problem appropriately "outside Sandia's mission space" and one that poses fundamental issues. He actually started working on the problem on weekends six years ago when he mentored a local high school physics student on Saturday afternoons for the student's junior thesis.

Pace has studied all the literature and even visited one site in Ireland and independently confirmed the observer's report of extensive physical damage to the ground (a peat bog). He says ball lightning has never been adequately explained; none of the models are consistent with all the physical evidence. Nevertheless, he believes it is a real phenomenon and a "physical phenomenon," the solution to which may eventually prove important.

"I have a lead I want to follow," he says. He says he considers ball lightning and associated theory to be a 20-year problem, and he is already two years behind schedule.

"I am at heart, and always have been, not only a Sandian but also a scientist, and I love the thrill of discovery and the pursuit of new knowledge."

Retiring secretarial supervisor Sue Henderson will remember Sandia as the 'Best Place'

By Iris Aboytes

Secretarial Coordinator Sue Henderson's last day at Sandia is June 1. She is retiring after 25 years. After her college years, Sue married and worked as a secretary. She was also involved in volunteer work and taught piano and organ in her home. She was doing all this while raising two sons who are 17 years apart.

"I suddenly found myself a single mom with a nine-year-old son to support," says Sue. "A good friend of mine, whose husband worked at Sandia, convinced me I should come to work here. I enrolled for a one-month brush-up course at a local business college so I would be able to pass Sandia's entrance exams. The floor in my house had a carpet of shorthand notes as I practiced for the tests."

Big surprise! When Sue was finally ready to take the tests and called to schedule them, she was told there would be about a six-month wait. But she was given an option. She could come to Sandia every morning at test-time and wait to see if all scheduled applicants would be there for the exam. If an applicant did not show up, she could step in and take the test. So she was determined to be there every morning.

Sure enough, on the first Monday that she waited a person scheduled failed to show. So Sue was able to take her place. The typing tests were on electric typewriters. "I sat at one and started warming up," says Sue. "The woman sitting next to me said she had never seen the brand of typewriter in front of her. I asked her if she had ever used the one I had. She answered yes, so we switched typewriters. Immediately, the warm-up time was over, and I took the test on a typewriter I had never touched before."

HIGH-LEVEL SUPPORT for Sandia's Certified Professional Secretary review program resulted from a meeting of President Irwin Welber and CPS holders Sue Henderson, left, Rosely Baca, and Estelle MacKenzie.

The test over, all applicants sat in the lobby to await the test results. (Applicants were required to pass the typing test before they could proceed on to the other tests.) One by one, each applicant was called and given her results and they all left.

Sue was finally called. "I was told I passed the typing test by typing 80 words per minute with no errors," says Sue. "They had checked it several times to make sure the score was correct. I then proceeded to take the other tests successfully and was qualified to come to Sandia. The very next day, back in school, the best I could do was 40 words per minute with 15 errors — so I have always been convinced I was destined to come to Sandia."

SUE HENDERSON may be retiring from work, but she's rarin' to get on with life. (Photo by Bill Doty)

Sue still could not join Sandia. There was a hiring freeze. She went to work for Manpower Temporaries, and had just been named "Secretary of the Year" when she received the call to report to Sandia in May 1980.

One of Sue's first "floating assignments" after completing the training was to cover for a secretary who was on vacation. "There was not very much to do," says Sue, "so I read the Office Procedures Manual (OPM) all the way six times! Yuk!"

Sue has seen Sandia transition from typewriters, to Wang word processors, to present-day computers. She recalls her first experiences with Wang and printer rooms in Bldg. 821 when secretaries had to insert letterhead into printers "just exactly right." Sometimes it took a lot of tries to get that "just right."

"I met Sue in 1980," says Jeana Brosseu (3555). As division secretary (an OAA in today's lingo), Sue worked in a busy office and requested a floater (a new-hire secretary working in various organizations to gain secretarial experience) to help out. Through the years, our paths continued to cross."

Jeana worked in an organization 10 years and needed a change. "I approached Sue about becoming an SMA floater in her organization filling in for OMAs [office management assistants], SMAs [senior management assistants], and EAs [executive assistants]. Sue welcomed me and has provided support, encouragement, and confidence in what I consider to be the best job I've had at Sandia. Who would have thought when I met Sue as a fellow secretary 25 years ago that one day she would become my boss?"

In October 1993, Sue became Sandia's Secretarial Supervisor, and since that time, has been responsible for hiring more than 650 Sandia secretaries. "I believe that secretaries (now titled administrative assistants) are the backbone of Sandia," says Sue. "Since Sandia went to the GPS ('get people system' software for external hiring) resumé process last year, I have reviewed over 1,500 resumes/applications for the OAA position."

"I found Sue to be gently honest, firm, encouraging, hopeful, and full of options," says Joniva Mondragon (9616), newly hired secretary. "She is an excellent interviewer. She was very thorough and prepared."

Sue and her husband, Quint Henderson, will be moving from their home on 12 acres in the East Mountains to 40 acres in northwestern Montana.

"I have worked closely for Sue for three years and enjoyed every minute," says Sue's assistant Gloria Hill. "Sue has given me the room and guidance to grow and learn, and that is what it is all about — learning. She has been a great mentor. As I look back at the time I have spent in Secretarial Services, I am amazed at how my horizons have broadened."

Marlene Johnson (3555) has been named to succeed Sue.

"Marlene and the OAAs will do just fine without me," says Sue. "I learned a long time ago I am not indispensable. After graduation I thought the high school I graduated from would surely fall apart without me. When I visited the following fall, they were all so busy they hardly recognized me, let alone missed me! That is life as it should be. I've had 25 wonderful years at Sandia, and as I move into the next phase of my life, I take priceless memories with me.

"I am going to have a hard time saying goodbye," says Sue. "Secretaries have been a major part of my life for a long time. I am proud of all of them and my Secretarial Services staff. It makes me happy to look around a room full of administrative assistants and realize that I helped many of them come to Sandia. While Montana advertises itself as the 'Last Best Place,' I will consider Sandia as 'My Best Place.' Maybe someday I will see ya' in Montana!"

Pace retires

(Continued from preceding page)

Pace's highlights of working at Sandia start ultimately with the people. Says he: "Ron Detry [VP 4000] likes to say, and I'd like to quote him: 'Sandia has only its people and its reputation — everything else is owned by the government.' "

E.O. Lawrence Award

A visitor suggested perhaps Pace's receiving DOE's E.O. Lawrence Award in 1992 was one highlight. He was only the fifth Sandian to receive the prestigious award. He quickly points out that the Lawrence award is "individually conferred" because that's the way it is set up, "but I and the 300 other people in pulsed power knew that it was recognition of the excellence of pulsed power at the time. That was a high."

"The first shot of PBFA I [particle beam fusion accelerator 1, the first of the big pulsed power accelerators of which the Z machine is the current manifestation] was a high. It was on a Saturday morning at work." He says the crew wanted to immediately repeat the shot but that wasn't the plan. "I went to see the first Star Wars movie that day, which had just opened, and I looked around and there were probably 15 or 20 Sandians who were there also and still charged up over the morning activities."

The first shot on PBFA II, on Dec. 11, 1985, was "another great experience."

"The nice thing about pulsed power is that we are still only at the beginning. The achievements have been miraculous in the last 10 years, and there is still so much more science and engineering that's going to come from these people. I look forward to cheering them on.

Magnificent acheivements

Pace quickly reels off a host of Sandia contributions. He calls each "a magnificent achievement": the W88 AF&F and now the W76-1, the MTI satellite, MicroChemLab, decontamination foam, the progress in bio, each launch of the targets for ballistic missile defense, MESA, the Red Storm computer, the SCN [Sandia Classified Network], Oracle, solar-generated hydrogen with nanotechnology — all are examples of Sandia "magnificent achievements," he says.

"They are real accomplishments by teams of Sandians doing what would seem to be impossible things. It's a thrill, every one of them. Just reading the *Accomplishments* publication every year renews the high, so I've had the pleasure of tens of highs."

Will it be hard to leave Sandia? Pace points out that he did it once before. He went on a technology transfer leave of absence for two-and-a-half years, "and found that Sandia did just fine without me and will do so again."

"So I know what it feels like to terminate from Sandia," Pace says. "Industrial psychologist Harry Levinson told me, 'All change is loss and all loss has to be mourned.' I expect to mourn but it will be a gateway to a new adventure."

But he quickly adds:

"In fact, once you are a Sandian you are always a Sandian, at heart. Sandia will still be here and I will be watching it and cheering it on as I try to do something really different."

Manager promotions

Terry Aselage from DMTS, Long-Life Power Sources Dept. 2525, to Manager, Long-Life Power Sources Dept. 2525.

Terry joined Sandia in 1984 as a member of the technical staff in the Ceramics Department. He then moved to and worked from the early 1990s until 2002 in various departments in the Physical and Chemical Sciences Center. He worked on high-temperature synthesis and thermochemical properties of a variety of materials and on measurements of unconventional electronic and thermal transport in solids. In 2002 Terry moved to the Long-Life Power Sources department, where he primarily worked on thermoelectric power sources.


TERRY ASELAGE

Terry has a BS in chemical engineering from the University of Notre Dame and a PhD in chemical engineering from the University of Florida.

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Wendy Bechdel from Manager, NWSMU Business Office Dept. 10751, to Level II Manager, Controller Operations Dept. 10510.

Since joining Sandia in January 1981, Wendy has had a wide range of assignments within the business community. She started as a represented employee in General Accounting and then went out to the line, where she did neutron generator wave form analysis. She was selected for the MLS Training Program, working in Sandia's Policies and Procedures and Budgeting and Indirect departments. Wendy obtained her master's degree in 1984 through Sandia's Educational Programs.


WENDY BECHDEL

She was a programmer for the Facilities Organization, then in 1988 moved to the line to become center administrative assistant for the Materials and Process Sciences Center. She was promoted to Business Manager for Material and Process Sciences in 1992. She also served as the Division Business Manager for the Weapons Activities Department. In 1997, Wendy returned to the CFO organization, where she was the manager for Treasury and Travel, Indirect Financial Services, and WFO. She then became Business Service Manager for the Nuclear Weapons SMU in 2001 before being promoted to Deputy Controller.

Wendy has a BBA in accounting and an MBA in management information systems from the University of New Mexico.

* * *

Virginia "Ginny" Clark from Manager to Level II Manager, Division Business Operations Dept. 5050.

Ginny joined Sandia in March 1987 as a benefits planner in the Benefits Department. In 1989, she moved to the Design Engineering Center as the center administrative assistant. She transferred to the Semiconductor Components Center in 1990 and then moved with her director to the newly formed NW sector in the Manufacturing Engineering and Support Center in 1991.


VIRGINIA CLARK

Ginny continued her Sandia career from 1993 to 1998 in the MDE Program Management and Production Program Management organizations.

She joined the Revolution Deployment Center in 1998 and worked a temporary assignment in Livermore in student programs in 2001.

She was promoted to Division Business Manager for National Security and Arms Control Div. 5000 in 2002.

Ginny has a BS in nutrition from the University of Wyoming, a BBA in accounting, and an MBA in finance from the University of New Mexico's Anderson Schools of Management.

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David Clauss from DMTS, W76-0, W88 System Engineering Dept. 2138, to Manager, Security Risk Assessment Dept. 4141.

David first joined Sandia in August 1980 and spent his first five years in the Applied Mechanics group doing structural dynamics for wind turbines and stress analysis for solar collectors, core melt experiments, and reactor containment buildings. He spent the next five years in project management for containment integrity work.

David led efforts to assess the risk of transporting nuclear weapons and nuclear materials, with the focus on SST/SGT (Safe Secure Trailer/SafeGuard Transporter) transportation. He developed the ADROIT code and was lead for the Defense Programs Transportation Risk Assessment study, the first full probabilistic risk-assessment done for DOE's Transportation Safeguards Division.


DAVID CLAUSS

Over the next five years, he participated in the development of dispersal tools and consequence assessment codes for emergency response to WMD. He helped develop training for federal employees and contractors on consequence assessment tools.

Most recently, David was responsible for specifying shock and vibration requirements for Navy reentry bodies (W76, W76-1 and W88). He served briefly as W88 systems lead before being promoted.

David has a bachelor's degree and a master's degree in mechanical engineering, both from the University of Michigan.

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Rich Dondero from PMTS, Radiation and Reliability Physics Dept. 1762, to Manager, Rad Hard CMOS Technology Dept. 1748.

Rich joined Sandia in 2003 as a member of the technical staff afer working at Philips Semiconductors for 13 years. At Philips, Rich started as a device engineer, which led to process integration, project management, and then to development manager at the local Albuquerque plant.


RICH DONDERO

Rich has a BS in electrical engineering from the University of Delaware and an MS in electrical engineering from Arizona State University.

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Mark Hedemann from Manager, Materials Radiation Science Dept. 6744, to Level II Manager, Radiation Effects Sciences and Applications Dept. 6740.

Mark joined the Labs in August 1981 and has worked in the field of nuclear survivability his entire Sandia career. As a technical staff member, his specialty was the development of high-power X-ray sources, including the bremsstrahlung source on the Saturn accelerator today used for radiation effects experiments and tests. As a project leader and then manager, Mark helped rebuild Sandia's capability in mechanical responses to intense radiation bursts.


MARK HEDEMANN

He was named a Distinguished Member of the Technical Staff in August 1993 and was promoted to Manager in March 1995.

Mark has a BS in physics, Michigan State University and an MS and a PhD in applied physics, both from the California Institute of Technology.

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Elaine Hinman-Sweeney from PMTS, Advanced Manufacturing Engineering and Software Development Dept. 15233, to Manager, Intelligent Systems Principles Dept. 15231.

Since joining Sandia in October 2001, Elaine has been in Dept. 15233, working on engineering analysis of complex systems. She was project manager for an automation project to integrate Sandia-developed software with robotic systems in US shipyards; served as principal investigator on an Initiatives for Proliferation Prevention project with the Russian company Spektr-LLC and Stolar Horizon, a New Mexico company, to develop a robotic system for humanitarian demining; and was task lead for a countermine effort in support of the Army.


ELAINE HINMAN-SWEENEY

Before coming to Sandia, Elaine worked in the space program. She integrated software from international partners into the space station astronaut trainers, led the test team evaluating hardware for space station-robot compatibility prior to launch, developed robotic mission scenarios for space station assembly, and was PI for an experiment to evaluate microgravity performance of laboratory robotic systems. She also supervised development of an automated manufacturing and science facility for orbital materials handling and performed multibody dynamic simulations of space station and robotic systems for analysis of orbital logistics and proximity operations. She was also an adjunct professor at West Virginia University.

Elaine has a BS in aerospace engineering from the University of Michigan, an MS in the same field from the University of Tennessee, and a PhD in mechanical engineering from Vanderbilt University.

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Ron Kulju from PMTS, Systems Technology and Integration Dept. 5917, to Manager, Systems Research Dept. 5919.

Ron joined Sandia in February 1980. From 1980 to 1987, he worked on B61 component design (programmers). He worked on Permissive Action Link controller designs and was a project leader from 1987 to 1995.


RON KULJU

From 1995 to 2000, Ron was project leader for the Integrated Correlation and Display System Test Team and from 2000 to 2005 was project leader for several nonproliferation projects.

Ron has a BS in electrical engineering technology from DeVry Institute of Technology.

* * *

Lyle Kruse from DMTS, Monitoring Technologies Dept. 2565, to Manager, International Borders Technologies Dept. 6957.


LYLE KRUSE

Lyle first came to the Labs in 1966. He left Sandia for a consulting position at Oak Ridge National Laboratory in 1986 and returned to Sandia in 1990.

His work has been in pulsed power diagnostics, NTS diagnostics, nuclear measurements for safeguards and security systems and weapons programs, security systems engineering at DOE sites, and the US/Russian Cooperative Program for Upgrade of Russian Railcars. He has two patents, one for the nuclear portal radiation monitor and one for neutron detection for safeguards systems. He has tested and evaluated "dirty bomb" detection systems for DTRA, the Department of Homeland Security, and International Programs.

Lyle has an AS in electrical engineering from Central Technical Institute Missouri and a BS and MS in nuclear engineering from the University of New Mexico.

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Carl Leishman from PMTS, ASCI Program Dept. 9904, to Manager, Infrastructure Computing Systems Dept. 9324.


CARL LEISHMAN

Carl joined Sandia in September 1980. He has spent most of his Sandia career in what is now Manufacturing Science and Technology Center 14100, starting in electronic fabrication (mostly test and process equipment), then in advanced manufacturing projects. He was one of the leads of the MUSE and VMAS projects. He then worked in ASC visualization (deploying advanced visualization technologies, the 880 VIEWS Corridor, JCEL visualization labs, and designs for the MESA buildings currently under construction).

Before coming to Sandia, he was at the White Sands Missile Range — one year with what was then the Lockheed Electronics Company and one year attached to a deep space surveillance project for MIT/Lincoln Laboratories.

Carl attended the University of New Mexico. He received an associate's degree in electronics technology and scientific programming technology while on the job at Sandia.

* * *

John Moser from PMTS, Advanced Instrumentation Systems Dept. 2666, to Manager, Integrated Telemetry Systems.


JOHN MOSER

John has been working in Telemetry and Software Systems Dept. 2660 since he joined Sandia in July 1997. He came to the Labs from IBM in Austin, Texas. His work has included the design, test, and fielding of telemetry and instrumentation systems for several programs, including B61and B83 for the Aircraft Compatibility Department. He participated in advanced development and exploratory telemetry systems including Bomb Impact Optimization System (BIOS) and GT-29 demonstration flight of the High Explosive Radio Telemetry (HERT).

Most recently, John was the lead electrical engineer responsible for development of the GROW Reentry Vehicle and its associated payload deployment module, successfully launched in December 2004.

John has bachelor's and master's degrees in electrical engineering, both from New Mexico State University, where he specialized in electromagnetics and telecommunications.

Three selected as 2005 Sandia Truman Fellows

Committee names Ilke Arslan, Meeko Oishi, David Scrymgeour after a nationwide search

By Michael Padilla

President Harry S. Truman Fellowship in National Security Science and Engineering

After a nationwide search, three recent PhDs have been selected to receive Sandia's prestigious President Harry S. Truman Research Fellowship in National Security Science and Engineering. This is the second year of the program.

Ilke Arslan, Meeko Oishi, and David Scrymgeour have been selected for this year's program — the only Sandia distinguished postdoc position where a candidate can propose research of his or her choosing within a national security context, work on state-of-the-art equipment, and have the freedom to pursue their research area.

The Truman Fellowship honors the memory of President Harry S. Truman, who challenged Sandia in 1949, at its founding as an independent laboratory, to provide "exceptional service in the national interest."

The Truman Fellowships are three-year appointments. Candidates are expected to have solved a major scientific or engineering problem in their thesis work or have provided a new approach or insight to a major problem, as evidenced by a recognized impact in their field. The program fosters creativity and stimulates exploration of forefront science and technology and high-risk, potentially high-value R&D.

This year's Truman Fellows join Youssef Marzouk and Gregory Nielson, Sandia's first Truman Fellows (*Lab News*, June 25, 2004).

Sandia's University Research Office and Human Resources/University Partnerships teamed more than two years ago to create the new postdoctoral position and develop the processes necessary to implement it. The Truman Fellows contribute to the intellectual diversity of the Labs by meeting the challenges of that forefront independent research.

Applications were received from various universities throughout the country including Pennsylvania State University, Princeton, University of California-Davis, Georgia Tech, Stanford, University of Texas-Austin, and others. After initial screening by a selection committee, five finalists were selected to present their research proposals and interview for the position.

The Truman Fellowship selection committee chair was Ron Loehman (1843). Members of the committee included Jeff Brinker (1002), David Chandler (8350), David Gartling (9100), Lyndon Pierson (5616), Larry Rahn (8350), Anita Renlund (2554), and Norman Warpinski (6116). Final selection was made by Sandia's Chief Technology Officer Pace VanDevender (1000).

Current areas of research

- **Ilke Arslan:** Nanoscale to atomic-scale resolution techniques for 3-D surface and interface physics in the electron microscope.
- **Meeko Oishi:** Development of mathematical and computational techniques to verify the safety of complex systems with which humans interact.
- **David Scrymgeour:** Measuring the piezoelectric properties of nanostructured zinc oxide.

Ilke Arslan

Ilke will begin work next Jan. 2 in the Materials Physics Department. Kevin McCarty (8761) will serve as her mentor.

ILKE ARSLAN

Ilke received her PhD from the University of California-Davis. She has a BS and MS in physics from the University of Illinois-Chicago.

She is currently a National Science Foundation International Fellow and Royal Society USA Fellow in the Department of Materials Science at Cambridge University, UK.

"The Truman Fellowship represents an unparalleled opportunity to establish an independent research program that can simultaneously solve materials problems relevant to national security and be at the forefront of the international scientific community," she says.

Her current research in nanoscale to atomic-scale resolution techniques for 3-D surface and interface physics in the electron microscope ties very closely with Sandia's initiation of 3-D atom probe tomography and its application to the lab's areas of expertise in electrodeposited thin films, grain boundary structure and chemistry, cell membrane structures, and catalysts.

Meeko Oishi

Meeko will work in National Systems Modeling and Analysis Dept. 6221 beginning Nov. 7. Bob Glass (6221) will serve as her mentor. Meeko has a PhD from Stanford University, an MS from Stanford, and a BSE from Princeton. She was an NSF Graduate Research Fellow in 1998-99 and 2000-02. She received the John Bienkowski Memorial Prize at Princeton in 1998.

MEEKO OISHI

Meeko will create new computational and analytical techniques to better understand the US electrical power grid. She will develop mathematical and computational techniques to provide insight to human-automation interaction in the grid.

"My research focuses on the development of mathematical and computational techniques to verify the safety of complex systems with which humans interact," she says. "Through applications of existing hybrid systems techniques and development of new techniques to address the human element in complex system failures, I hope to predict where failures might occur, and to design recovery trajectories to guide the human operator out of such scenarios."

Meeko says mathematical modeling of these interesting and complex phenomena can provide important lessons for other safety-critical, highly interconnected systems such as the US water supply, information and communication systems, financial markets, and transportation systems.

"I'm honored to have been awarded the Truman Fellowship, and am very excited about this opportunity for independent research and collaboration with Sandia scientists and engineers," she says.

David Scrymgeour

David began work May 2 in Surface and Interface Sciences Dept. 1114. Julia Hsu (1114) is his mentor. David received his PhD and BS degree from Pennsylvania State University.

DAVID SCRYMGEOUR

"I am really looking forward to working with the top-notch people and capabilities here at Sandia in order to do cutting edge research," he says.

David is measuring the piezoelectric properties of nanostructured zinc oxide (ZnO). He says it is an incredibly useful material that has many uses in both the bulk and thin film form, but most of the material properties are not known at the nanoscale.

The piezoelectric effect, the expansion and contraction of a material with the application of an electric field, is used in many sensing applications. Demonstration of this property in nanostructures could be used to create ultra-sensitive detectors.

"Utilizing Sandia's ability to controllably grow these nanostructures in a variety of dimensions as well as being able to pattern them on surfaces into larger scale clusters of nanostructures will provide an ideal test bed for studying material properties and vibrations in confined structures, all with an eye toward uses as biological or chemical sensors," says David.

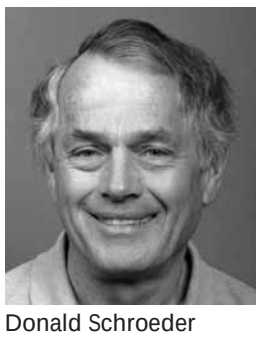
Weapon Intern Program accepting applications

MEMBERS OF THE CURRENT WEAPON INTERN PROGRAM class got a close-up view of a B-2 Spirit stealth bomber during a recent visit to Whiteman Air Force Base. They are, from left, Nancy Durgin (8941), Michelle Bruns (DOE/NNSA), Juan Quintana (DTRA), Alfonso Chavez (2125), Lynn Maestas (DOE/NNSA), Maj. Tammy Cobb (USAF), Anne Benz (14414), Chris Gillihan (Honeywell KCP), and Steven Trujillo (9112). The Weapon Intern Program is accepting applications for one-year internships. Since its inception in 1998, the program has provided broad-based education on nuclear weapons and prepared individuals to take greater responsibility in addressing the challenges of Stockpile Stewardship and maintaining a creditable nuclear deterrent. The deadline to apply for the WIP class of 2006 is July 1. For information or to apply, contact Brien Bopp (2916) at 844-6368 or wbbopp@sandia.gov.

Mileposts

New Mexico photos by Michelle Fleming
California photos by Bud Pellitier

Recent Retirees



Donald Schroeder
40 9000

Adrian Jones
35 6331

Darwin Newcom
30 5523

Jaye Bullington
30 6224

Michi Wada
30 1737

Billie Weatherly
30 10220

Marilynn Barr
25 9013

Fernando Uribe
27 14152

James Payne
15 5734

Tom Blejwas
25 2500

Brian Dodson
25 9116

Cathy Ottinger Farnum
25 6863

Mark Greenslete
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Chuck Jenkins
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Roxanna Salazar
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Gary Shannon
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Timothy Spears
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James Stanley
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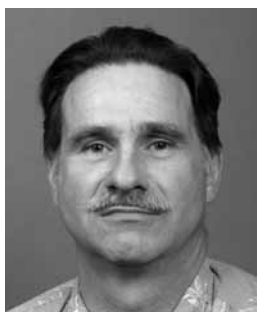


Robert Tooley
25 4152

Bobby Turman
25 15335

Roger Woodrum
25 2353

Lori Zarembo
25 2029

Michael Beeler
20 2523

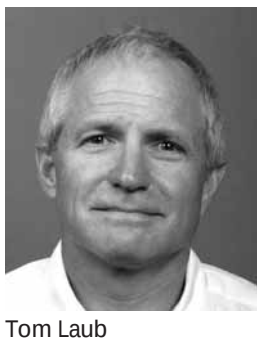
Randall Cygan
20 6118

Douglas Doerfler
20 9220

Steven Humphreys
20 6223

Sabina Erteza Jordan
20 4143

Albert Lau
20 8517



Tom Laub
20 6741

Barbara Mills
20 2348

Richard Ormesher
20 2354

Kent Pfeifer
20 1744

Jeffrey Anastasio
15 9329

Paul Beauchamp
15 2953

Kelly Bobbe
15 2

Diane Schafer Callow
15 15232

Laura Draelos
15 10863

Brian Geery
15 2125

Jill Glass
15 1825

'Dime con quien andas y te digo quien eres'

'Tell me who you are with and I will tell you who you are'

By Iris Aboytes

Frank Figueroa, VP 10000, received the C. Paul Robinson Heart of Diversity President's Award from Paul Robinson at the Fourth Annual Corporate Diversity Team and Division Council Forum, "A Journey of Achievement on a Path Toward Success."

In accepting the award Frank said he was surprised and grateful to receive it. He reminisced how his father, who has been gone 12 years, used to say, "*Dime con quien andas y te digo quien eres.*" (Tell me who you are with and I will tell you who you are.) "That is how I feel about being at Sandia," said Frank.

One of the forum highlights was a video tribute to Paul, who had just stepped down as Sandia's president, by various Sandians. Paul talked about keeping moving forward on our path. He used an analogy about riding a bicycle. "At rest there is no way for it to be stable. Once you get on it and take off, you have total stability as you go forward." Paul then passed the diversity baton to new President and Laboratories Director Tom Hunter.

PRESIDENT AND LABORATORIES DIRECTOR Tom Hunter, left, congratulates Frank Figueroa, VP 10000, upon receiving the C. Paul Robinson Heart of Diversity Award at the Fourth Annual Corporate Diversity Team and Division Council Forum. Diversity program leader Rochelle Lari looks on.

"As the new Laboratories' director," said Tom, "it is my privilege to accept the passing of the diversity baton and be the corporate owner and champion for diversity at Sandia. I pledge to all Sandians to do everything I can as a champion for diversity to make sure Sandia remains a place where everyone feels privileged to come to work every day, where each person is valued and respected, and where our country continues to turn to us for exceptional service in the national interest."

Tom said people are the lifeblood of the Laboratories. "My hope is that when people come to work," said Tom, "they do so with great energy, motivation, and enthusiasm. And when they leave our workplace, I hope they will know that they have made a significant contribution to the labs and this nation."

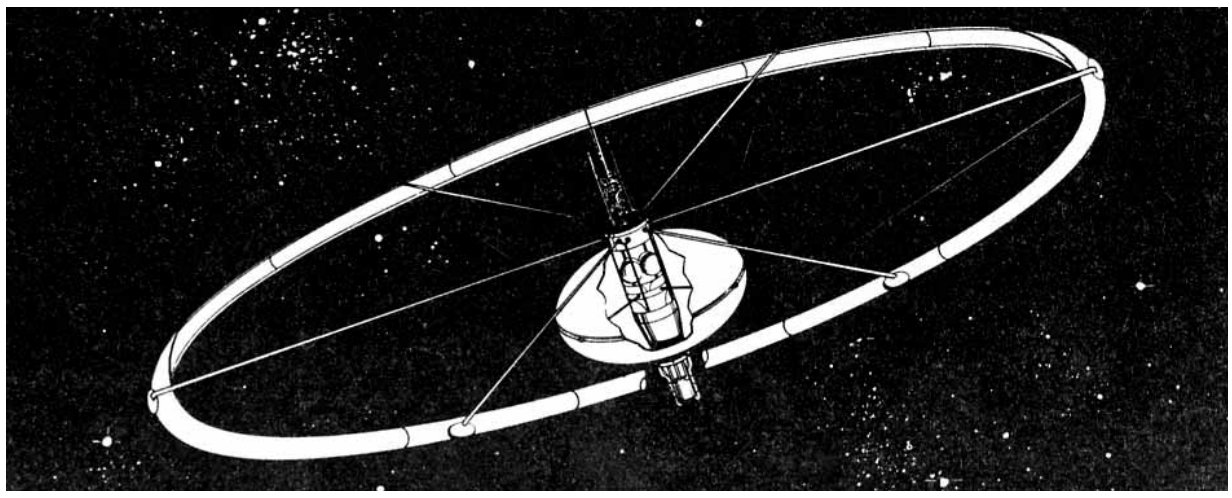
This monthly column highlights Sandia Lab News items from 50, 40, 30, 20, and 10 years ago, but each column does not necessarily include items from each decade.

50 years ago . . . Early-day Sandia-developed telemetering equipment found a variety of technical uses. The May 6, 1955, *Lab News* explained how such equipment was used to make the first test flight of the new F-101A Voodoo strategic fighter plane safer. Three Sandia engineers were in fact present for the inaugural flight of the McDonnell Aircraft Corporation's Voodoo at Edwards Air Force Base, Calif. Howard Austin, Harold Finch, and Richard Rudolph installed the telemetering equipment and interpreted the signals recorded on the ground.

F-101 VOODOO — The first test flight of this long-range fighter was made in the fall of 1954 at Edwards Air Force Base, Muroc, Calif. Telemetering instrumentation by Sandia enabled on-the-spot determination of the flutter stability characteristics of the airplane during the first and subsequent flights in California.

40 years ago . . . Plans for a new high-velocity 5,000-foot Sandia rocket sled track were announced in the May 7, 1965, *Lab News*. The new facility was designed to replace an aging low-velocity facility in use since 1954 and was designed to "simulate environments of missile launchings, jet plane takeoffs, and catapult launchings, and to test capabilities of systems and components upon impact." Sandia engineers hoped to attain speeds up to Mach 2.3, or about 3,700 mph on the new duo-track facility. Estimated cost was about $1 million.

30 years ago . . . Sandia had just launched a new research program "to answer basic questions about disposal of radioactive wastes in underground formations of salt through design and development of a pilot plant facility," according to the page-one story in the May 30, 1975, issue. Wendell Weart, then supervisor of the Underground Physics Division, was project manager. The program called for the extensive site characterization of salt beds in southeastern New Mexico. This project eventually led to the establishment and opening of the Waste Isolation Pilot Plant near Carlsbad, which began full-scale operations as a DOE facility in March 1999. Now retired, Wendell led Sandia's involvement in the project for many years, in the process earning the unofficial title "Sultan of Salt." Officially Wendell also became the first "Sandia Fellow."



A SPACE POWER CONCEPT (illustrating the kind of technology that was evaluated by Sandia for the Stategic Defense Initiative Office in 1985) shows an orbiting platform containing a nuclear reactor at the bottom of the center section. The cutaway center shows a turbine and electrical generating equipment. The center shell and outside ring radiate waste heat into space. The station rotates around a central shaft to produce an artificial gravity field. As envisioned, the technology for the SDIO Multi-megawatt Space Power Supply was to be developed over a seven-year timetable with contributions from many DOE, NASA, and Air Force organizations. Sandia is still involved in space power research.

THE CORONADO CLUB booked some big-name bands and entertainers in its early days. Band leader Jimmy Dorsey is seen in this May 20, 1955, *Lab News* photo taking a request from Sandia's Charles Hays and wife as they celebrated their first anniversary at a Coronado Club dance.

20 years ago . . . Sandia's new role of evaluating technology for possible use in the nation's two-year-old Strategic Defense Initiative (SDI) was featured in the May 24, 1985, *Lab News*. In cooperation with NASA's Lewis Research Center, Sandia was contracted by the SDI Office to evaluate concepts and technology for the planned multi-megawatt space power systems that were envisioned for SDI use. Sandia's role grew out of the Labs' earlier work as technical directors for nuclear systems used in space — the SNAP (Systems for Nuclear Auxiliary Power) devices that powered scientific instrumentation placed on the moon and on some satellites. (The old SDI program was recast several times by the federal government; some parts continue today under the National Missile Defense program, in which Sandia is still a key contributor.) *— Larry Perrine*

Feedback

Q: *Access to the Eubank gate can get quite confusing because the open lanes change during the day and sometimes from week to week. The movable "orange barrels" are usually set up too close to the gate to be useful and are not always set up correctly. It also seems that the personnel having to move these are being put into situations that are unnecessarily dangerous.*

Before the Eubank gate reconfiguration, overhead displays of the lane directions were available well before the gate. Could something like this be used to show which lanes are open at the gate? This would make the use of the movable "orange barrels" unnecessary and would keep personnel checking IDs rather than moving "orange barrels." It would also make it easier for people to enter the Eubank gate.

A: We appreciate your concern for the safety of the individuals placing the traffic cones during routine reconfigurations of the Eubank gate area. Unfortunately, Sandia does not own the land outside of the gate; however, we will present your suggestion to the USAF and the City of Albuquerque for consideration.

— Ed Williams