Los Alamos NATIONAL LABORATORY
NewsLetter
Week of April 26, 2004 Vol. 5, No. 9

Helping industry by simulating circuit failures from cosmic rays

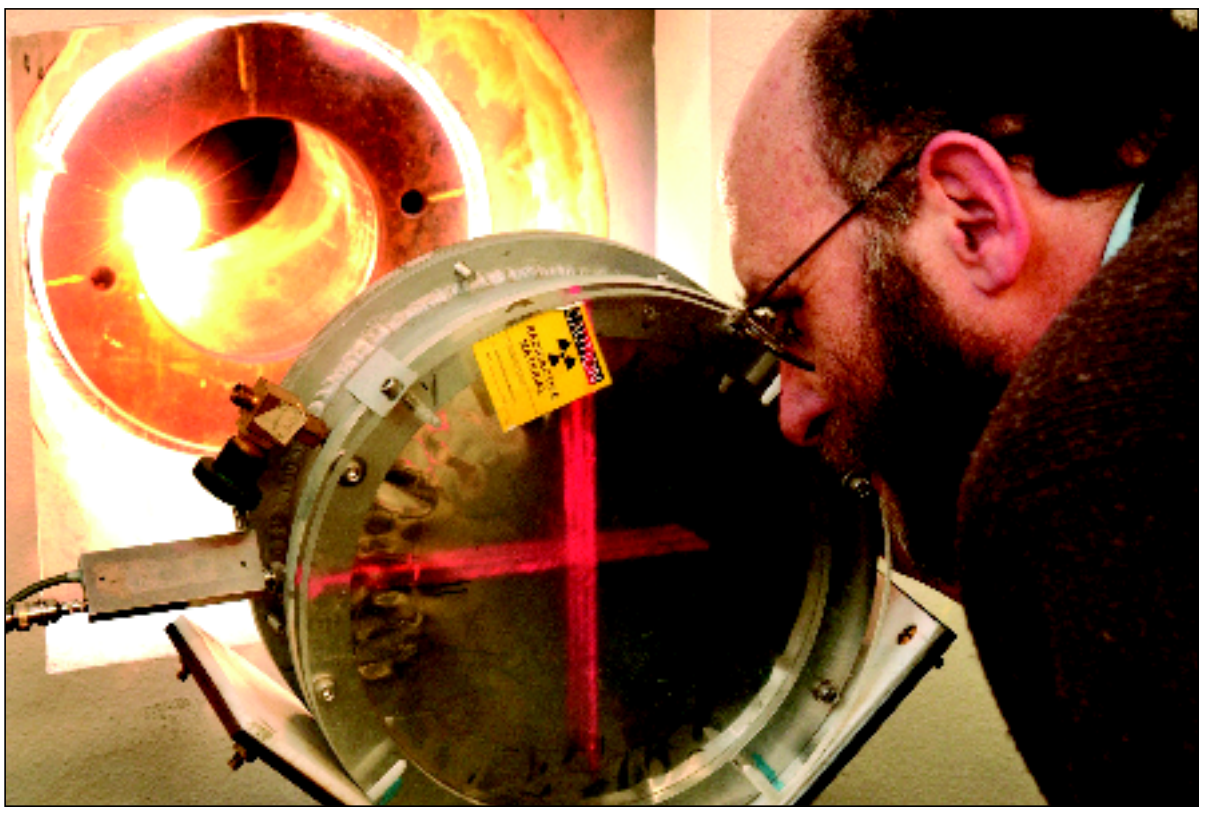
by Jim Danneskiold

Life today runs more and more on circuits. Electrons racing through increasingly tiny transistors now control our airplanes, deposit money in our checking accounts and keep our houses warm.

But these miniature devices face an invisible enemy from outer space that can strike computer chips, miniaturized controls and other complex integrated circuits, spoiling the digital work that permeates 21st century human activity.

Researchers at the Los Alamos Neutron Science Center (LANSCE) are using a powerful proton accelerator to speed up the potential for failure, battering circuits in a single hour with hundreds or thousands of years of the harmful neutrons created by cosmic rays. Aviation, computer and related companies, along with the National Aeronautics and Space Administration, are putting circuits through the rigors of the LANSCE neutron testbed, located in a modest steel structure known as the ICE House, for Irradiation of Chips and Electronics.

"We can generate essentially the entire neutron spectrum produced naturally by cosmic rays but with neutrons a million times more intense than in nature," said Steve Wender, who leads Neutron and Nuclear Science (LANSCE-3).



Steve Wender of Neutron and Nuclear Science (LANSCE-3) adjusts the fission ion chamber that is used to measure the number of neutrons that pass through it to the devices that are being tested. When the neutrons pass through the chamber, a fission reaction is detected and a signal is generated that is used by the experimenters to determine the number of neutrons that strike their devices. *Photo by LeRoy N. Sanchez*

When cosmic rays from deep space strike Earth's upper atmosphere, they ultimately create neutrons that shower down on Earth's surface. These neutrons pose little health hazard because the radiation dose is relatively low. However, each neutron can interact with silicon and other elements in integrated circuits to produce charged particles, with potentially disastrous impacts on memory and chip function.

"We can't fully predict the effect of these interactions, which makes having a standardized way to test circuits extremely valuable," Wender said. "Very similar devices show radically different failure rates due to neutron interactions, and we have some evidence that the smaller transistors and lower operating voltages in newer devices produce higher failure rates."

Each individual neutron has an exceedingly small probability of damaging a single bit and thus disrupting circuit performance. However, since new electronic devices require more and more bits, manufacturers are seeing errors more frequently. Neutrons go through devices one at a time, but the increased intensity available in the ICE House greatly reduces the time between neutrons and the failure that they cause.

In the case of the latest, totally computer-controlled aircraft, these tiny cosmic

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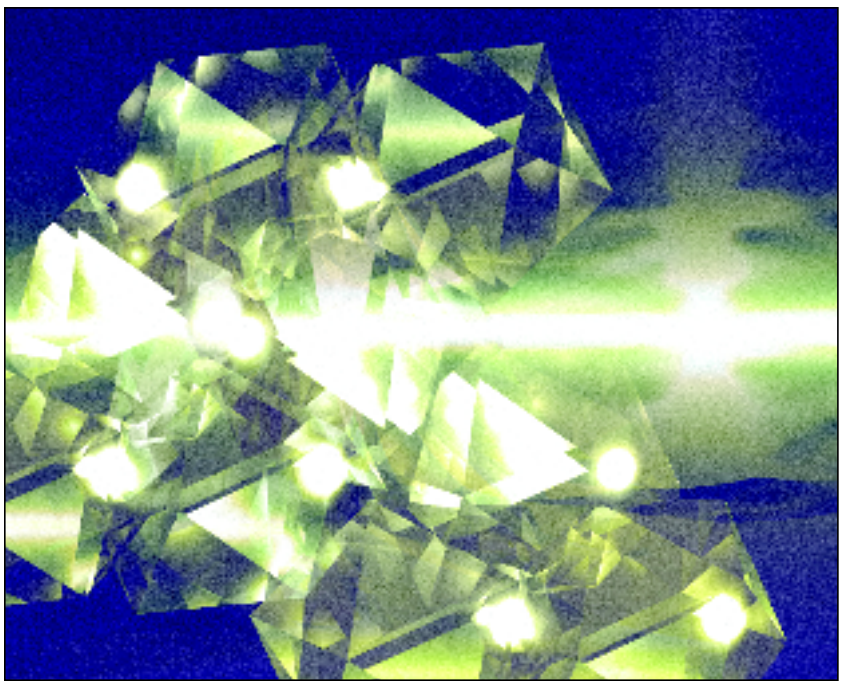
Superdiamonds?

Scientists discover superconductivity in diamond



by Todd Hanson

Scientists working at the Russian Academy of Sciences and the Laboratory recently announced the discovery of superconductivity at ultracold temperatures in cubic diamond. The discovery offers the potential for a new generation of diamond-based device applications and even suggests that superconductivity in silicon or germanium, which also forms in the diamond structure, may be possible.

In findings published in the scientific journal Nature, the Russian-American team of scientists report their discovery of superconductivity in a boron-doped diamond-structured carbon material that had been synthesized at very high pressures and temperatures. The diamond material was fabricated in Russia by scientists working at the Institute for High Pressure Physics (IHPP) at the Russian Academy of Sciences and brought to Los Alamos, where superconductivity in diamond was discovered.

According to Vladimir Sidorov of Condensed Matter and Thermal Physics (MST-10) and IHPP, "gem diamonds are desired for their sparkling brilliance and extreme hardness. This discovery of a totally unexpected new facet of diamond enhances its desirability, not to the well-attired, but to science and technology."

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New west parking structure helps alleviate parking woes

The new 337-space TA-3 West parking garage is open. The structure will help address concerns about parking from Lab employees who work in and around Technical Area 3. . . . . **Page 5**

The toughest race in track and field

The 400-meter hurdles are afforded the notorious title "the toughest race in track and field" by many observers for the sheer mental toughness and grit an athlete needs to succeed in this brutal event. Among the top contenders in the 45-49 age category is Mike Pannell of Industrial Hygiene and Safety (HSR-5). . . . . **Page 8**

Los Alamos NewsLetter

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Los Alamos enhances global security by ensuring safety and confidence in the U.S. nuclear stockpile, developing technologies to reduce threats from weapons of mass destruction and improving the environmental and nuclear materials legacy of the Cold War. Los Alamos' capabilities assist the nation in addressing energy, environment, infrastructure and biological security problems.

NNSA National Nuclear Security Administration

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FROM THE TOP

Dynes' Desk on a possible VERIP

Editor's note: Dynes' Desk is a way for anyone to e-mail a comment, idea or suggestion to University of California President Robert Dynes. While he is not able to respond personally in most instances, Dynes does read each e-mail submitted. In each edition of "Our University," a UCOP newsletter, he responds to a couple of Dynes' Desk e-mails addressing issues of broad interest to the UC community. To submit an e-mail to Dynes' Desk, go to* www.universityofcalifornia.edu/president/desk.html *online. Below is President Dynes' response to a recent question concerning a possible voluntary early retirement incentive program.

University of California President Robert Dynes

E-mail: Will the University consider offering faculty and/or staff a voluntary early retirement incentive program (i.e., a VERIP) in the near future?

Robert Dynes: The short answer is "no." I know many faculty and staff are eager for some form of early retirement incentive program under the UC retirement plan, but it just doesn't make sense for the university right now, or even in the next several years, for a number of reasons.

• UC has been growing and, even considering the state budget constraints, we believe we will need to retain the majority of our faculty and staff to support the core academic mission. We're already facing major challenges and costs in recruiting faculty.

• Offering a VERIP, even if only to targeted groups, would represent a significant cost to the UC Retirement Plan, and we must be very careful about how much we burden the plan. A recent actuarial analysis found that the likelihood of having to resume contributions to UCRP within the next five years has increased substantially. Funding a VERIP would cause employer and employee contributions to the university's retirement program to begin sooner than would be the case without a VERIP. We are particularly concerned about doing anything that could cause contributions to resume during a time when the state is not providing adequate funding for faculty and staff salary increases.

So, the bottom line — while I certainly understand the wishes of many faculty and staff on this subject — is that the university will not offer a UCRP retirement incentive, like the former VERIP programs, for the next three years, and has no current plans to offer such a program after that time.

For Your Safety

Ergonomic hazards

Employees should be aware of the following "Hazard/Activity — Ergonomics hazards based on requirements to perform work":

- Repetitive motion of body parts
- Excessive force applied
- Awkward body postures
- Static body postures
- Contact stress on body parts
- Vibration of equipment, tools or work environment
- Work systems that do not make reasonable accommodations for the physical limitations of qualified employees who are disabled.
- Heavy, frequent or awkward lifting.

Controls/requirements/guidance

• Ergonomic hazard is a physical state of the work environment that is incompatible with the physical or psychological capabilities and limitations of people and which may cause injury to employees.

• Look for alternate locations to perform work, alternate equipment or limit time an employee performs a given task.

• Obtain a workplace evaluation of computer workstations, jobs and other tasks that create ergonomic hazards to work from a qualified environment, safety and health representative. To receive a workstation evaluation, send your name, Z number, telephone number and location to *ergonomics@lanl.gov.* If you are experiencing discomfort/pain, state so in the e-mail (for example, write "experiencing discomfort.")

• Provide ergonomically correct furniture for individuals engaged in extensive keyboard or computer use.

• Have employees take appropriate rest breaks.

• Have employees report to Occupational Medicine (HSR-2) if any symptoms, such as pain or soreness, develop in wrists, arms, shoulder, neck, etc.

Superdiamonds …

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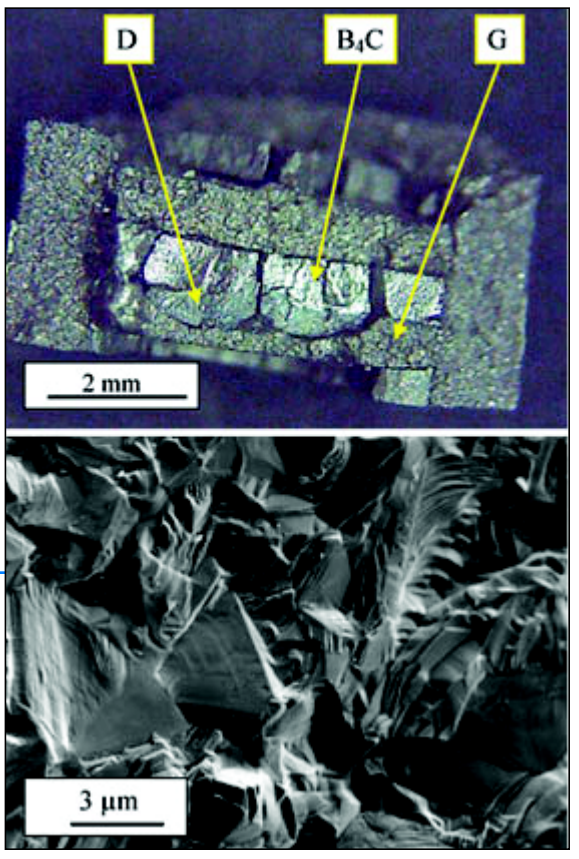
Diamonds conduct heat more effectively than copper and can withstand very high electric fields. These properties are the result of the ways in which electrons arrange themselves in the atomic structure of diamond. This same electron arrangement makes it impossible for diamond to conduct electricity. However, by subjecting a graphite and boron-carbide mixture to pressures of nearly 100,000 atmospheres and temperatures of roughly 4,000 to 4,600 degrees Fahrenheit, scientists were able to transform diamonds from a 'supergem' to a superconductor that carries electricity with no resistance at a temperature of minus 450 degrees Fahrenheit.

Boron atoms have one less electron than carbon atoms, and because of their small atomic radius, boron atoms are relatively easily incorporated into the diamond atomic structure. Separately, both boron and diamond are not electrical charge conductors, but instead are quite good insulators. Once they are combined, the resulting diamond becomes doped with electrical charge carriers. Incorporating a small number of these charge carriers in diamond allows fabrication of transistors, but adding more carriers creates superconductivity.

While there is a great deal of research yet to do, the discovery of superconductivity in diamond-structured carbon suggests that new forms of diamond-based integrated circuits may be possible.

Silicon or germanium, which also form in the diamond structure, may also exhibit superconductivity under certain conditions. Although it is highly speculative at this point, this means that someday scientists might be able to create a form of superconducting silicon that would allow computers to operate even faster than imagined.



At right are optical and scanning electron microscopy images of the cubic diamond material. Top image shows cubic diamond material synthesized by subjecting graphite and boron carbide (B4C) to high pressure, high-temperature conditions. D is diamond and G is graphite. Bottom image shows scanning electron microscope view of the synthesized boron-doped diamond. *Images courtesy of Vladimir Sidorov*

Helping industry by simulating circuit failures …

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gremlins could cause trouble, especially because the problem gets worse as atmospheric shielding dwindles at higher altitudes. At sea level, the shielding provided by the air is equivalent to more than 10 feet of concrete shielding. The neutron flux at LANSCE, 7,000 feet above sea level is approximately three times greater than at sea level; and at 40,000 feet, the cosmic-ray neutron flux is several hundred times greater than the neutron flux seen on Earth's surface.

Circuit manufacturers understand the risk posed by cosmic ray neutrons and try to design around it, so LANSCE's ICE House increasingly is becoming an international standard for putting new circuits through their paces. In fact, the Joint Electron Device Engineering Council established JESD89, a standard for integrated-circuit testing, based on the suite of experimental capabilities at the ICE House.

Los Alamos has been putting circuits through their paces at LANSCE for more than a decade, and researchers there have published significant research on the extent of the problem.

A typical static random access memory, or SRAM, chip will generate roughly 1,200 errors per hour when subjected to the intense neutron flux at the ICE House, which can range as high as a million neutrons per square centimeter per second.

Companies hold as proprietary the precise number of errors. The Laboratory supplies statistical information about the amount of neutron flux that generated the errors, so the companies leave Los Alamos with data showing the number of errors per neutron.

Once they know how many errors neutrons will generate, chipmakers can decide if error correcting, redundancy or other protective measures are needed to compensate for the neutron-induced errors. This ensures that any unreliability at the device level is compensated for at the system level.

"No one's been able to make this problem go away for key electronic applications; in fact, even the codes people use to predict failure rates are becoming less accurate," Wender said. "But if somebody eventually comes up with a possible solution, they'll have to bring the new design here to test it out."

Los Alamos currently is testing flight systems provided by NASA. The focus for this testing, through NASA aviation safety and security initiatives, is commercial aviation, with possible application to the next-generation Space Shuttle and similar systems for U.S. Air Force fighters. The Laboratory and NASA recently placed a complete aircraft control system in the LANSCE beam and linked it locally with a computer simulation for a Boeing 737.

A future experiment will examine whether pilots can compensate for control-system upsets during simulated flight, by remotely linking a computer undergoing tests in the ICE House to the flight simulator located in the NASA System Airframe Failure Emulation Testing and Integration Laboratory at the Langley Research Center. The Laboratory is collaborating in NASA's development of the SAFETI Laboratory, with networked links to individual NASA labs for aircraft structures, cockpit motion and propulsion systems.

Customers who have brought electronic devices to LANSCE's ICE House represent a who's who of the global electronic and avionics industries. Repeat experiments have been run by Boeing Co., Honeywell, Sun, LSI Logic, Fujitsu, Intel and Saab, among others.

"Neutron-induced soft errors hurt how customers see circuit-based products because it's so hard to predict their impact on our systems," said Rob Baumann, Distinguished Member of the Technical Staff at Texas Instruments. "We look at dozens of potential circuit failure modes, but the rate of soft errors is significantly higher than that of all the other modes combined. As we build improved circuits with higher densities, higher speeds and lower power consumption, the soft error rate will go up."

"For my industry, the service Los Alamos provides is unique and essential because of the similarity of the LANSCE spectrum to actual terrestrial cosmic rays, as well as the ease of use: just pop it into the beam and you get your answers," Baumann said.

Richard Hess, chief fellow with Honeywell Aerospace Electronic Systems, said, "Honeywell has relied on this unique, world-class facility to help identify atmospheric neutron effects and associated effect rates for the electronic components used in our commercial aviation products.

"Linking the NASA SAFETI Laboratory facilities with the ICE House facilities has created a new, unique world-class facility for the study of neutron effects on aircraft electronic systems. ICE House is a vital resource in understanding the atmospheric neutron effects on Honeywell's aerospace electronics and enables products that are tolerant of radiation in the atmosphere," Hess added.

Demand for the testbed has grown so much that the waiting list is several months long, Wender said. Typically, companies will test circuits for up to five days, though some have used the testbed for twice that long.

News from UC

Marye Anne Fox appointed UC San Diego Chancellor

Marye Anne Fox, a nationally known chemist and academic leader who currently serves as chancellor of North Carolina State University, has been appointed the seventh chancellor of the University of California, San Diego, by the UC Board of Regents.

Acting on the recommendation of UC President Robert C. Dynes, the regents appointed Fox to the UCSD post effective Aug. 16. She replaces Dynes, who became president Oct. 2, 2003.

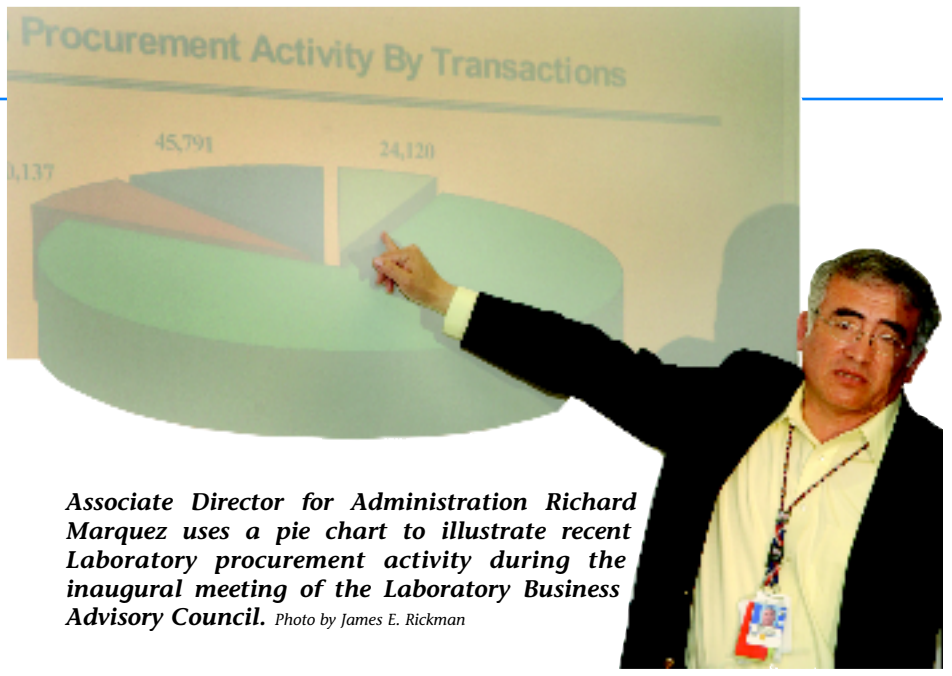
Fox has served as chancellor of North Carolina State University since 1998 and previously was vice president for research at the University of Texas at Austin. As one of the nation's most distinguished physical organic chemists, she has been elected to membership in the National Academy of Sciences. She also is a member of President Bush's Council of Advisors on Science and Technology and is a recipient of numerous distinguished awards for teaching and research.

In making the selection, Dynes was assisted by an advisory committee of Regents, faculty, staff, students, alumni and community representatives. The committee reviewed approximately 50 applicants for the position, drawn from a national pool of more than 300 potential candidates.

Fox, 56, holds a bachelor's degree from Notre Dame College, a master's degree from Cleveland State University and a doctorate from Dartmouth College.

New committees strengthen Laboratory/business supplier relationships

by James E. Rickman



Associate Director for Administration Richard Marquez uses a pie chart to illustrate recent Laboratory procurement activity during the inaugural meeting of the Laboratory Business Advisory Council. *Photo by James E. Rickman*

The Laboratory has created three separate committees comprised of Laboratory managers, regional business leaders and representatives of major Laboratory subcontractors to enhance and strengthen the Laboratory's ongoing business improvement initiatives and foster greater economic development in Northern New Mexico and the state.

During the mid-March and early-April timeframe, Laboratory leaders hosted inaugural meetings of the Senior Management Procurement Council, the Laboratory Business Advisory Council and the Consortium of Major Laboratory Subcontractors.

"These committees will give the Laboratory a three-pronged approach to the acquisition of goods, services, construction and equipment," said Richard Marquez, associate director for administration. "Laboratory procurements have a major economic impact to the Northern New Mexico region and the entire state. These committees are an excellent way to make sure we meet our contractual responsibilities to promote economic development, while maintaining efficient and effective business practices at the Laboratory."

The Senior Management Procurement Council brings together on a regular basis senior Laboratory managers who have responsibility for significant resource management or procurement activities at the Laboratory. Council members will examine and determine methods and opportunities for acquiring goods and services from an institutional, rather than organizational, point of view. With the council providing advanced planning and forecasting for acquisitions, the Laboratory will leverage and maximize opportunities for regional businesses and suppliers — particularly small businesses, small disadvantaged businesses and minority- and women-owned businesses. The council also will provide corporate oversight of vendor quality.

The Laboratory Business Advisory Council gathers its membership from New Mexico business leaders. This council will advise the Laboratory on the effectiveness of the institution's business practices, specifically in how those practices affect regional business stakeholders. The council also will recommend other improvements to facilitate improved relationships between suppliers and the Laboratory. The Business Advisory Council also will assist the Laboratory in economic development activities and work to strengthen relationships between the Laboratory and its suppliers. The Laboratory Business Advisory Council will serve as the focal point for dialogue between the New Mexico business community and the Laboratory regarding how the Laboratory's mission and programmatic requirements are affecting the business climate of the state and region.

The Consortium of Major Laboratory Subcontractors brings together Laboratory subcontractors who have provided economic development proposals as part of their contracts with the Laboratory. The consortium provides a venue for integrated planning and resource-management activities that will promote and leverage regional economic development and will increase small-business procurement opportunities with smaller Laboratory subcontractors.

All three committees meet regularly and will report their findings and recommendations to Marquez on a regular basis.

"These committees demonstrate the Laboratory's commitment to improving business practices through enhancement of business relationships with suppliers and expansion of opportunities for New Mexico suppliers," Marquez said.

Los Alamos helps Intel, National Hispanic Cultural Center open new Española distance-learning lab

James Esparza, Española School Board vice president, left, visits with Min Park of Cell Biology, Structural Biology and Flow Cytometry (B-2), center and Rod Sanchez, Intel's Community Solutions worldwide manager. Sanchez, an Española native, was instrumental in bringing together the funding and resources needed for creation of the Española TechSitio.

At left, Johnnie Martinez of the Community Relations Office (CRO) looks at a demonstration of the TechSitio's peer-to-peer conferencing capability, as Shelle Luaces, director of education for the National Hispanic Cultural Center explains the educational opportunities and connections possible at the new Española TechSitio. *Photos by Edwin Vigil*

by Edwin Vigil

Intel Corp. and the National Hispanic Cultural Center (NHCC) recently opened the Española TechSitio or technology site, a new distance-learning laboratory located at the Carlos F. Vigil Middle School in Española.

The new facility allows students in the Española school district, as well as community members, the opportunity to communicate and connect with other Hispanic and Latino communities throughout the world.

A joint project with Intel, NHCC and Española Public Schools, the center is one of five proposed TechSitios. Two other TechSitios currently are up and running: at the NHCC in Albuquerque and at El Museo de la Coria in Trujillo, Spain. Additional sites are planned for Mexico and Costa Rica.

The facility currently consists of six real-time conferencing workstations provided by Intel allowing peer-to-peer or person-to-person conferencing. Ten additional workstations donated by Los Alamos' Laboratory Educational Equipment Gift program will come online shortly, bringing the total number of workstations to 16.

New west parking structure helps alleviate parking woes

The new 337-space TA-3 West parking garage is open. The structure will help address concerns about parking from Lab employees who work in and around Technical Area 3. Meanwhile, a task force created by Jim Holt, associate director for operations is addressing near- and long-term parking issues within TA-3. The TA-3 West parking facility is located on West Mercury Road on the west side of TA-3, west of SM-31. Next month, an additional 80 surface parking spaces will be available when the company that built the parking garage removes its equipment. "The new parking structure has something employees said was important during informal surveys over the past few weeks," said Randy Parks of Infrastructure, Facilities and Construction (IFC). "Cars entering and leaving the facility will be counted electronically. When the garage is full, information will be displayed on a sign at the entrance, saving employees the time of hunting from level to level for a space that doesn't exist," he said.
Photos by LeRoy N. Sanchez

Enterprise Project's Phase I scope, schedule and budget baseline in place

The scope, schedule and budget baseline for Phase 1 of the Laboratory's Enterprise Project is now formally in place, thanks to the recent signing of Enterprise Project baseline documents by Director G. Peter Nanos; Richard Marquez, associate director for administration; and Carolyn Zerkle, ADA principal deputy.

"Because of the complexity of putting a system like the Enterprise Project in place, reaching this milestone is a real achievement and represents a significant accomplishment in our ongoing process to improve Laboratory business practices," Marquez said.

The Enterprise Project's initial purpose is replacing the various, disconnected business software systems across the Laboratory with a single, integrated system that will allow for better management of Laboratory resources. In addition, the project will use the latest software and hardware architecture to maximize the Lab's business process re-engineering efforts.

Laboratory Director G. Peter Nanos, left, looks over project baseline documents for the Laboratory's Enterprise Project with EP Leader George Hansrote and Carolyn Zerkle, principal deputy associate director for administration, before signing the documents. The baseline shows that the readiness of the Enterprise Project has been thoroughly reviewed and validated and that the EP mission need and program requirements have been thoroughly developed, justified and documented. *Photo by James E. Rickman*

The baseline documents consist of the project's mission statement, project management plan, program requirements and functional requirements, which together define work the project team will complete through April 2005, including more than 7,300 scheduled activities.

The project includes a number of formal project-management principles, said Zerkle, including the following:

- an experienced management team;
- formal processes for managing risk;
- systems for reporting and tracking project controls; and
- internal and external oversight mechanisms.

In addition, the Enterprise Project has benefited from higher visibility and expanded management involvement, and all senior project positions have been filled.

While Phase 1 of the project centers on the Lab's business systems, the project plans to apply software and hardware capabilities to other areas of the Lab's scientific, manufacturing and program and project management operations, Hansrote said.

"There are many ways this system can be applied to resource and information management throughout the Lab, and we want to get the maximum benefit out of it," Hansrote noted. "These documents represent the official commitment we've made to the Lab on what we plan to accomplish over the next year. It took a tremendous amount of work to get to this point. However, there are greater challenges ahead, and we've assembled a team that can rise to meet them. We have some of the best people from the Lab, IBM and Oracle all working together to put this system in place."

The project also has received support from Information Management (IM), Human Resources (HR), Supply Chain Management (SUP), Project Management (PM) and the Chief Financial Officer (CFO) divisions among many others. The expertise these organizations are lending to the project is critical, Hansrote said.

The EP baseline was developed with the full ongoing involvement, integration and agreement of the University of California, the Department of Energy and Laboratory program authorities, Zerkle said.

EP is building a business architecture to enable Lab personnel at all levels to do their jobs more effectively. In the process, the EP will provide consistent, integrated data to managers for improved decision-making; move the Lab toward best business practices; integrate project management with finance and human resources information; provide a sound basis for facility management; and modernize the Lab's administrative computing infrastructure.

For more information about the Enterprise Project, go to *http://erp.lanl.gov/* online.

Beugelsdijk recognized as founder of the Association for Laboratory Automation

Tony Beugelsdijk of Technology Transfer (TT) Division recently was honored by the Association for Laboratory Automation for his role as a founding member.

"The award signifies wide recognition of the importance of the work done here at Los Alamos for the advancement of laboratory sciences and technologies," said Beugelsdijk.

Beugelsdijk has been at the Lab for 20 years, beginning his career in 1984 as a spectroscopist in the former Analytical Chemistry Robotics (CHM-1) group. Beugelsdijk also has worked in the Materials Science Technology (MST) and Engineering Sciences and Applications (ESA) divisions.

Beugelsdijk is a 1995 recipient of a Laboratory Distinguished Performance team award.

Beugelsdijk received his bachelor's degree from Wichita State University in chemistry; a master's degree from the University of Illinois in analytical chemistry; a second master's of business administration degree from the University of New Mexico; and a doctorate from the University of Illinois in bioinorganic chemistry.

Wilmot new NNSA Los Alamos Site Office manager

Edwin Wilmot is the new manager of the National Nuclear Security Administration's Los Alamos Site Office.

Edwin Wilmot

Wilmot replaces Ralph Erickson, who is retiring.

Wilmot most recently was manager of NNSA's Savannah River Site Office, where he was responsible for all defense program activities at Savannah River.

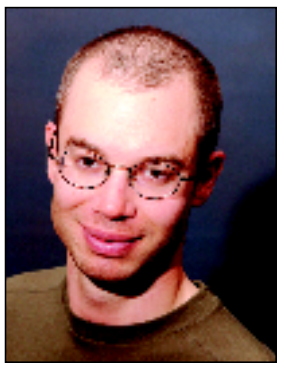
From May 2000 to December 2003, Wilmot was NNSA deputy assistant administrator for military applications and stockpile operations.

He also has worked at Department of Energy facilities in Idaho, the Yucca Mountain Project in Nevada, the Office of Civilian Radioactive Waste Management, and Sandia National Laboratories in Albuquerque, among others.

Wilmot has bachelor's and master's degrees in ceramic engineering from the University of Washington.

Mark Boulay

Jian Xin Zhu



Matthew Hastings

Charles Reichhardt

Postdoctoral Distinguished Performance Awards

Mark Boulay of Neutron Science and Technology (P-23) and **Jian Xin Zhu** of Condensed Matter and Statistical Physics (T-11) are the individual winners of the fiscal year 2003 Postdoctoral Distinguished Performance Awards. **Matthew Hastings** and **Charles Reichhardt** of Complex Systems (T-13) garnered the small-team award.

The Postdoctoral Distinguished Performance Awards recognizes outstanding and unique contributions by Lab postdocs that result in a positive and significant impact on the Laboratory's programmatic or scientific efforts or status in the scientific community. It also recognizes unusual creativity, innovation or dedication and a level of performance substantially beyond that which would normally be expected.

The Postdoctoral Distinguished Performance Award winners were presented with a certificate and monetary award at a banquet last month. The award winners also will have the opportunity to present their work during a colloquium this summer.

Andrew Hime of P-23 nominated Boulay, currently a postdoctoral research associate. Boulay was recognized for his outstanding performance and central and pivotal role in the research efforts on the analysis of data from the Sudbury Neutrino Observatory (SNO), the results of which resolve the long-standing solar neutrino problem and provide direct evidence for neutrino flavor oscillations. According to Hime, Boulay's individual contribution and impact on the SNO are rare for a large collaboration. His creative and dedicated approach to the science has naturally led to a leadership role.

Boulay led the analysis of the data from the SNO project (100 scientists) and was the principal author of the three most recent papers. These papers have more than 1,000 citations in 2003, the largest number in all of basic science. The SNO Collaboration honored him by nominating him for an American Physical Society invited talk in Spring 2003.

Alexander Balatsky of T-11 nominated Zhu, a postdoctoral research associate and previous Director's Postdoctoral Fellow. He was recognized for his outstanding research achievements, productivity, innovativeness, independence, interactive research and extraordinary publication record. In 2003, Zhu was first author on four articles in Physical Review Letters, the most prestigious of physics journals, and has submitted another three to PRL. His previous work has been widely recognized as important in the field of condensed matter theory as evidenced by more than 450 citations to his published papers. His work has been characterized by its originality and its role in stimulating experimental work toward important discoveries, particularly in the area of high-temperature superconductivity.

Eli Ben-Naim of Los Alamos' Center for Nonlinear Studies (T-CNLS) nominated Hastings and Reichhardt, previous Feynman distinguished postdoctoral fellows, who recently converted to Lab technical staff members. They were recognized for their outstanding contributions to the statistical physics of soft matter and for their high-impact creativity in multidisciplinary theoretical and computational physics, performed in close collaboration with experimentalists working on micro- and nano-electronics and the nonequilibrium dynamics of soft matter.

Last year, their joint work appeared in three articles in Physical Review letters, one of which was selected to be highlighted in the Physical Review Focus (June 20, 2003). During 2001-2003, Hastings had 18 publications, all in first-rate journals, including seven in Physical Review letters. Reichhardt had 28 publications, including 10 in Physical Review letters. Much of the research of this highly productive team was done in collaboration with Cynthia Olson Reichhardt, a previous Director's Postdoctoral Fellow and staff member in Theoretical Chemistry and Molecular Physics (T-12) since September 2002.

A committee of nine technical staff members reviewed all of the nominations submitted and a final recommendation was made to Laboratory Director G. Peter Nanos and Deputy Director for Science and Technology Bill Press, who approved the committee's recommendations.

Dave Clark of the Nuclear Materials Technology (NMT) Division, review committee chairperson and the Lab's Seaborg Institute leader, said, "It is very satisfying to see the outstanding postdoc talent that resides at the Laboratory as was reflected in all of the nominations. The impact and quality of work that these individuals have accomplished is very impressive, and these awards provide another opportunity to recognize the truly outstanding talent the Postdoctoral Program brings to our institution."

In addition to those selected for these awards, a number of the nominees were identified for honorable mention. They are **Dmitri Babikov** of T-12, **Anatoly Efimov** and **Michael Rivera** of Condensed Matter and Thermal Physics (MST-10), **Sascha Kreiskott** and **Xiaozhou Liao** of the Superconductivity Technology Center (MST-STC), **Susan Kurien** of Mathematical Modeling and Analysis (T-7), **Shawn McGrane** of Materials Dynamics (DX-2), **Hugh Nymeyer** of Theoretical Biology and Biophysics (T-10), **Gyuhae Park** of Weapon Response (ESA-WR), **Thom Rahn** of Hydrology, Geochemistry and Geology (EES-6), and the small-team nomination of **Ryan DaRe** and **Chris Kuehl** of Actinide, Catalysis and Separations Chemistry (C-SIC).

The award winners, and those given honorable mention, presented posters in the Administration Building Auditorium lobby at the Director's State of the Laboratory address last month.

April service anniversaries

35 years
Gloria Brooks, PS-DO
Arthur Herrera, NMT-16
Len Margolin, X-DO
Nick Romero, FWO-DECS
Armando Vigil, ESA-WR

30 years
Bruce Crowe, RRES-ECR
Robert Fresquez, DX-1
Otoniel Garcia, P-22
Allen Herring II, C-INC
Marian Martinez, CER-1
Jerry Montoya, HSR-1
Joel Moss, P-25
Felix Olivas, LANSCE-2
Don Rodriguez, DX-1
John Romero, X-2
Marcene Roybal, S-2
Linda Salazar, HSR-DO
John Seal, LANSCE-12
Laron Smith, D-1
Simon Suina, S-5

25 years
John Blaylock, CCN-7
Rosella Gallegos, DX-1
Thomas Gamble, C-ADI
Evangeline Hodge, FWO-WFM
Sarah Hoshizaki, CCN-7
Gordon Jarvinen, NMT-DO
George Kyrala, P-24
Michael Lopez, NMT-11
Bernadette Martinez, NMT-3

20 years
Katherine Anderson, IM-1
William Baird, N-2
Tony Beugelsdijk, TT
Wendee Brunish, EES-11
George Daly, SUP-1
Douglas Hatch, MST-7
Phillip Hemberger, N-4
Randy Hoebelheinrich, DX-7
James Hollins, EES-7
Scott Kinkead, DX-2
George Martinez, FWO-DECS
Mary Jo McGrath, HSR-DO
Paul Montaño, ISR-4
Ghazar Papazian, DX-DO
Bruce Robinson, EES-6
Leonard Sanchez, ESA-EDE
Cynthia Sandoval, ESA-WMM
Jay Spore, D-5
Richard Thomsen, CCN-12
Mabel Willaman, N-DO

15 years
Bruce Barrus, CFO-SYSTEM
Stanley Cohen, LANSCE-6
Charles Dorsey, POL
Richard Elphic, ISR-1
Kathleen Gomez, SUP-2
Karl Hahn, DX-5
Norman Hamer, D-3
Todd Heineman, DX-1
Paul Hoover, HSR-DO
Kevin Hubbard, MST-7
Patricia Leyba, RRES-DO
Dennis Mack, SUP-1
Gerard Martinez, ESA-WR
Richard McKeever, HSR-4
Yvonne McKelvey, EES-6
Stephen Morgan, LANSCE-7
Patrick Ortiz, PS-1
Geoffrey Reeves, ISR-1
Mary Ann Reimus, NMT-9
Edward Rodriguez, CCN-2
Franklin Salazar, SUP-2
Lorena Salazar-Garcia, IM-2
Miquela Sanchez, P-23
Alex Sandoval, NMT-10
Karen Velarde-Lashley, RRES-ECR

10 years
McIlwaine Archer III, MST-7
Kristi Brislawn, CCN-12
Baolian Cheng, X-4
Robert Field, MST-6
Thomas McCleskey, C-SIC
John Morrison, D-4
Robert Murphy, HSR-4
Merrell Nelson, CFO-3
John Oertel, P-24
Cheryl Olson, HSR-12
Reuben Peck, NMT-DO
Garth Reader, ESA-ESA
Mark Smith, MST-7
Peter Smith, SNS-DO
Rita Svensson, B-1
John Szymanski, ISR-RD

5 years
Rogelio Anaya, HSR-7
Julie Bennett, DX-5,
Debbie Brown, HR-S
Debra Bryan, RRES-EA
Gordon Burrows Jr., CCN-2
Barbara Bushong, RRES-PP
Theresa Chavez, HR-S
Carla Cooke, S-6
Anthony Drypolcher, NMT-4
Lorrie Fernandez, DX-6
Regina Fuchs, HSR-1
Shirley Godfrey, HR-B
Kimberly Gonzales, D-DOD
Howard Granzow, PM-DS
Santiago Jaramillo, NMT-11
Rose Anne Leyba, CCN-2
Yvette Manzanares-Valdez, NMT-7
Margaret Marshall, OEO
Julie Martinez, ESA-WMM
Josie Martinez, NMT-6
Jacque McClory, HSR-8
Donna Medina, DX-2
Terry Morrison, FWO-TA-55
Richard Munson, SUP-1
Laurence Nilsen, PM-DS
Josina Ortiz, NMT-11
Andrea Pistone, B-DO
William Pyburn, FWO-TA-55
Yvonne Quintana, PM-4
Nancy Riebe, P-DO
Rebecca Rodriguez, DX-4
Christopher Romero, MST-11
Jane Ross-Lujan, NMT-15
Antoinette Sanchez, PM-DO
Daniel Shell, ESA-WDS
Chris Smith, FWO-EAST
Quellyn Snead, CCN-2
Paul Snow, ISR-4
Joan Stockum, PM-1
Steven Stokes, HR-EP
Carl Stone, STB-RL
Nancy Torres, EES-6
Manuel Troncoso, FWO-DX-ESA
Pamela Trujillo, C-AAC
Tim Tucker, MST-6
Kevin Veal, N-NP
Rosie Vigil, DVO
Yvonne Vigil, NMT-2
Nathaniel Wardwell, LC-ESH
Clayton Watson, FWO-IIM

NMT-15 welcomes home one of its own

After a 13-month deployment in Iraq, James Garcia, right, of Pit Disposition Science and Technology (NMT-15) is welcomed back to work at Technical Area 55 by Steven McKee, NMT-15 group leader, and other NMT-15 employees. Garcia is one of several Laboratory employees to return home after extended military leave. Also on hand to welcome Garcia at TA-55 were T. J. Trapp of NMT-DO and Richard Vann Bynum of the Nuclear Weapons Engineering and Manufacturing Directorate (ADWEM). Garcia is an Army reserve staff sergeant with the 52nd Combat Engineers out of Fort Carson, Colo. While in Iraq, Garcia was stationed primarily in the Mosul area and at the Quayarah Airbase in support of the 101st Airborne Division. Since 2002, approximately 15 University of California Laboratory employees have been granted military leave. About 10 Protection Technology Los Alamos personnel also have been on military leave annually since the start of U.S. operations in Afghanistan. Garcia is married and lives in Rio Rancho with his wife and three sons. *Photo by Kevin N. Roark*

This month in history ...

April

1691 — French explorer LaSalle reaches the Mississippi River

1860 — The Pony Express begins delivering the mail.

1861 — The Civil War begins.

1866 — The American Society for the Prevention of Cruelty to Animals is established.

1904 — J. Robert Oppenheimer is born April 22 in New York City to successful textile importer Julius Oppenheimer and his wife, Ella.

1906 — The Great San Francisco earthquake hits, killing 700 people.

1912 — The Titanic hits an iceberg in the Northern Atlantic ocean and sinks.

1937 — The first Social Security checks are distributed.

1943 — A contract is concluded with the University of California to manage Los Alamos, acting as paymaster, accountant and procurement agency.

1945 — Franklin Delano Roosevelt, the longest serving president in American history, dies of a cerebral hemorrhage three months into his fourth term.

1947 — Jackie Robinson joins the Brooklyn Dodgers.

1949 — The North Atlantic Treaty Organization (NATO) is signed.

1954 — Mass testing of Jonas Salk's polio vaccine begins as more than half a million children nationwide, dubbed "polio pioneers," are inoculated.

1964 — At the 1964 World's Fair, Ford Motor Company Vice President Lee Iacocca introduces the Mustang, a sporty car designed for baby boomers. More than 22,000 orders come in the first day.

1968 — Martin Luther King Jr. is assassinated.

1985 — The Laboratory's Aurora project sets a new world record with the test firing of the most energetic short-wavelength excimer (excited molecular gas) laser beam ever reported.

1997 — The New Mexico State Corporation Commission (now the Public Regulation Commission) receives incorporation forms for the Los Alamos National Laboratory Foundation, an independent, philanthropic corporation organized by the Laboratory and the University of California to foster and support educational and outreach opportunities in Northern New Mexico.

1998 — The Bradbury Science Museum celebrates five years in its downtown Los Alamos location. Previously it had been located behind the Theoretical (T) Division building off Diamond Drive in Technical Area 3.

2000 — Energy Secretary Bill Richardson announces that Technical Area 18 will be closed by the end of 2004 and that an environmental impact study on the proposed transfer of TA-18's capabilities and materials to another location will begin immediately.

2001 — A U.S. spy plane crash-lands in China.

2002 — The online Daily Newsbulletin reports that researchers from the Laboratory and the University of South Carolina have provided a hypothesis that "black holes" in space are not holes at all but are more akin to bubbles.

*Carey Sublette, "Chronology for the Origin of Atomic Weapons" from www.childrenofthemanhattanproject.org/MP_Misc/atomic_timeline_1.htm

The information in this column comes from several sources including the online History Channel, the Newsbulletin and its predecessors, the atomic archive.com, Echo Vitural Center, Science & Technology and Real History Archives.

Submissions are welcome. Please be sure to include your source.

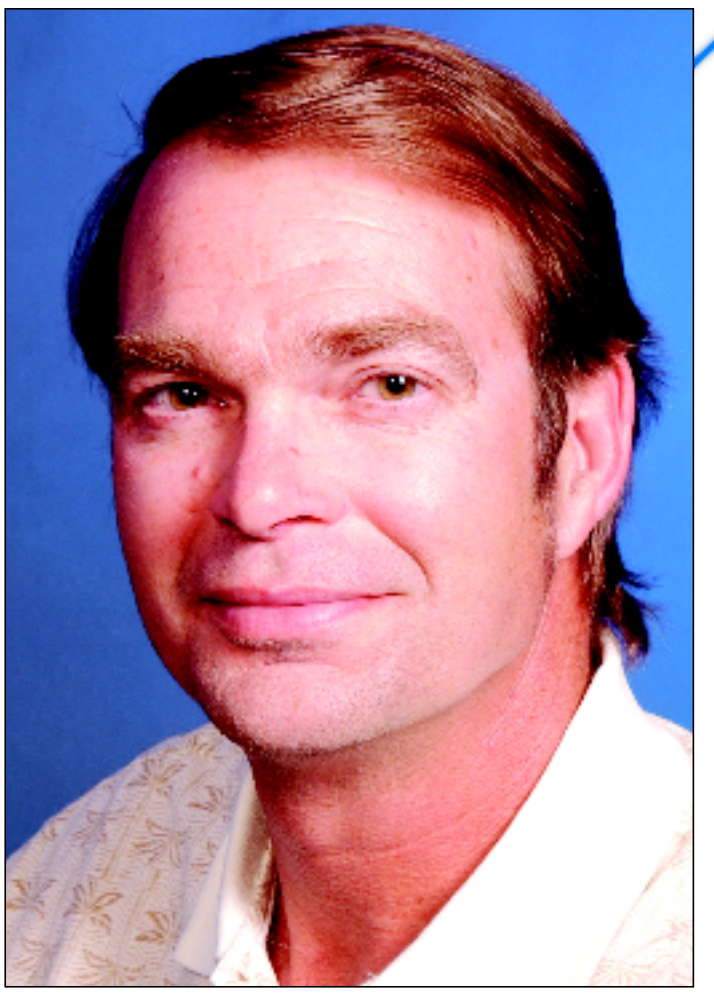
The toughest race in track and field

by Ed Kellum

The 400-meter hurdles are afforded the notorious title "the toughest race in track and field" by many observers for the sheer mental toughness and grit an athlete needs to succeed in this brutal event. Among top contenders in the 45-49 age category is Mike Pannell of Industrial Hygiene and Safety (HSR-5), who won his eighth national title last August in Eugene, Org., at the National Masters Track and Field Championships.

Pannell began running seriously in high school and continued on into college with a scholarship to Mississippi State. He ran there until he was injured and transferred to the University of Central Florida in Orlando, where he graduated and eventually joined the U.S. Air Force. While stationed in Albuquerque, he read about a masters track and field event. His interest piqued, he attended and remembers seeing two 80-year-old women competing. "It was then I knew I wasn't too old to start competing again," he recalled.

With a new desire, Pannell began training with the Air Force track team in the 400-meter hurdles, as it was the only opening on the team. "It is the toughest race in track and field. No one else really wanted to do it," Pannell said. "Most races you can run just on intestinal fortitude, but with hurdles you have to stay mentally focused to keep the right stride length and steps," he continued.



Mike Pannell

Pannell has earned the nickname "The Ambassador of Track" from his peers, derived from his pre-race ritual of shaking hands and talking to officials and other competitors. "I like to be relaxed at meets. This calms me and keeps me focused and controlled so I can have a good race," he noted.

Crediting his success to his training, Pannell proves that, as college basketball coach Bobby Knight put it, "The will to win is not nearly as important as the will to prepare to win." Pannell trains toward this ideal, with intense workouts, cross-training and serving as an assistant coach for the Los Alamos High School track and field team. "It's hard to slack off when the kids are working hard to beat me in practice. There are a lot of talented kids on the team, and they prepare me well for my competitions," Pannell said. "I think it makes me feel younger," he added.

This year Pannell moves up to the 50-54 age category, which could hold some exciting possibilities for his performance. Pannell's goal is the current 400-meter hurdles world record of 58.10 seconds. The best opportunity to meet his goal is the 2004 National Masters Championships in August. And in this age group, the United States Association of Track and Field lowers the hurdles by three inches. "Sometimes growing old is a good thing," Pannell joked. Now striving toward his ninth national title, Pannell will compete in the national meet in Decatur, Ill.

Photo courtesy of Pannell

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