

Magnetic manipulation: Complex magnetic field processing leads to a new class of composite materials

Jim Martin's controllable magnetic particle composites show novel capabilities

By Neal Singer

On a computer screen in Jim Martin's (1122) lab is a model of particles suspended in a solid polymer. They're distributed randomly, to represent what industry achieves when it dumps particles into its product mixes to greatly improve the strength and durability of tires and of airplane and auto parts built out of toughened plastics.

How would the properties of particle composites benefit by having the particles organized into complex structures? And how expensive would it be to achieve this? Before Jim's work, the answers of the materials community were, not much, and very.

Jim, a physical chemist turned computer modeler, circuit designer, and device developer, hits a key to initiate a simulation of the effect on the random particle suspension of his low-powered, newly developed device — three circular magnets, of approximate diameters 9, 6, and 3 inches, nested like Matrioshka dolls, except that each is aligned along either the breadth, depth or height (for the technically minded, the x, y or z axis) of the suspension placed at their center. The overall structure of these magnets — cutting directly across each others' major axes — gives the feeling of a cubist sculpture, or of a junior version of the huge machine in the Carl Sagan-based movie *Contact* that takes the young woman sci-

The arrangement creates some very remarkable effects that have led to an entirely new class of composites.

tist through an Einsteinian worm hole. But this is reality, not fiction, and this magnet is only about a cubic foot and it doesn't spin, make noise, or send anyone into space (though Jim assures me he's been working hard on that).

The arrangement creates some very remarkable effects that have led to an entirely new class of composites. Simply put, the magnetic fields lead to highly organized particle structures in the solidifying polymer resin. Electrically nonconductive suspensions are rendered conductive, magnetic properties are greatly enhanced, and solid composites show an unprecedented tendency to contract in magnetic fields.

First came magnetic watermark

Jim explains: "A few years back Bob Anderson (1843) and I started to investigate the benefits of using magnetic or electric fields to create polymer composites with embedded particles formed into chains — the kind of structures that iron filings form between the ends of a horseshoe magnet. We found we could increase the dielectric properties of ceramic particle composites severalfold, and with the help of Gene Venturini [1122] we found similar increases in the magnetic properties, most notably an increased tendency to magnetize in a magnetic field, and to retain a lot more of that magnetization when the field is removed. Retained magnetism is called remanence. This observation led to a patent on a magnetic watermark, with Anderson



MAGNET POWER — The controllable magnetic particle composites that Jim Martin has developed may reduce identity theft, sensitize robots, and improve artificial muscles. (Photo by Randy Montoya)

and Chris Tigges [1742], intended to discourage credit card theft."

Jim hits a button on his computer keyboard
(Continued on page 4)

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Managed by Lockheed Martin for the National Nuclear Security Administration

Team develops new integrated approach to managing Sandia's intellectual property

SIPM to streamline patent, copyright, trademark processes

By Chris Burroughs

It's time to think strategically in dealing with intellectual property (IP).

That's what a team composed of the Licensing and IP Management Dept. 1304, the Intellectual Property Center 11500, and California Site Business Office Dept. 8529 is saying.

In collaboration with the Strategic Management Units (SMUs), they have developed an integrated approach to managing Sandia's Intellectual Property (IP) assets that is consistent with DOE/NNSA requirements and Sandia's business and technology maturation objectives. The program is called Strategic Intellectual Property Management (SIPM).

"In the past many Sandia organizations would automatically maintain patents, even though the technologies developed at the Labs may have been eclipsed by better technologies or ceased to have

the importance to programs once envisioned," says Carole Lojek (1304), who is helping to manage the SIPM project. "This new system requires collaboration among the SMUs, ST&E [Science, Technology and Engineering Foundation], line organizations, Legal Division, and Corporate Business Development & Partnerships [CBD&P] to determine if it is in Sandia's best interest to apply for and then maintain IP."

Sandia holds about 600 patents, and funding limitations extend only so far as to enable the preparation of 250 new patent applications a year.

Besides establishing a sound corporation-wide process for decision-making based upon technical and business merit, SIPM is also a way of holding, attracting, and retaining beneficial commercial partnerships. In addition, it represents a strategy for productivity improvement by focusing on technologies important to Sandia's future.

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Truman Lectures: Norm Augustine, Susan Eisenhower, and Roald Sagdeev

Susan Eisenhower, granddaughter of President Dwight Eisenhower, and her husband, physicist Roald Sagdeev, delivered a Truman Distinguished Lecture on US and Russian perspectives on President Eisenhower's famous Atoms for Peace proposal. The story is on page 6. In California, retired Lockheed Martin CEO Norm Augustine delivered a Truman Lecture on the indispensability of effective leadership. That story is on page 3.



Security standdown coming in November

The following memo by Labs President and Director C. Paul Robinson was distributed electronically to all Sandians Tuesday afternoon. It is published here in full. For additional details about the upcoming security stand-down, watch the Sandia Daily News.

Last March we instituted a number of management and organizational changes to improve our security performance and address several key issues. We have made advances in these areas, but I am still concerned about the pace at which we are progressing. The Department of Energy (DOE) Office of Independent Oversight and Performance Assurance (OA) recently completed a comprehensive audit of Sandia's security practices. The findings confirm that we need continued improvement. While we have made major progress in our security performance over the past six months, problems previously highlighted still exist. We cannot fulfill our missions if we are perceived to be less than 100 percent vigilant in the

(Continued on page 5)



4 Labs announces Truman Fellowship to attract top science, engineering talent

▶ 12 Linda Lovato-Montoya recognized as champion in fight against breast cancer

What's what

The invitation to try mimicking the neon purple invective that distinguishes North Korean diplomatic language inspired a couple of Sandians. The other Paul Simon (5356), who joined Sandia in January, credits his familiarity with Pyongyang's brand of striped-pants chitchat to "many a year as a State Department official dealing with North Korea." His offering:

"As a former stooge and hoodwinked hireling of the not-quite dead Great Leader, Revered Father Marshall, Iron-Willed, Ever-Victorious Commander Kim Il-Sung, the friend and father of young people, I remain a slavish devotee of the Juche Idea, under his son, the Architect of the Potato Crop Miracle and First Coffin Dam in the fight against soil erosion, Dear Leader Kim Jong-Il.

"As such, I submit the following sample of classic KCNA prose to lambaste you for your snide comments about North Korean news releases. 'You, sir, are a craven lackey of the peerlessly vicious, nation-selling flunkey puppet traitor regime in Seoul, which is condemned to the dustbin of history for its subservient dances to the tunes of its imperialist paymasters in Washington and Tokyo! Your failure to sincerely apologize to the people of Chosun for your tyrannical acts makes you irrelevant.'

Whew!

And Jason Zuffranieri (6413) was cruising in rarified air when he took poisoned pen in hand (computer keyboard on desk, actually) and spewed: "Your request for venomous commentary is a most tortured display of intellectual impotence, stewing turgidly in a filthy cauldron of rancid vomit. Anyone nonsensical enough to unwittingly stoop to your asinine solicitation must be the inbred offspring of an incompetent boob and a disfigured freak."

Hoo-wee! We'd better keep these two away from the grant-application office.

* * *

Recently retired Pat Eicker, who still comes out for occasional consulting work, strolled back on campus one day last week right out of the '50s. He looked pretty cool in penny loafers, white socks, new Levis, black pocket t-shirt, and chartreuse baseball cap. The only thing missing was James Dean's turned-up-collar red nylon jacket. Of course, James Dean wouldn't have been anywhere near that chartreuse cap.

* * *

"Marketing" is the bizbuzzword nowadays. We market everything from Ron Popeil's food dehydrators to government programs to employee benefits (uh, . . . rewards; I forgot) to ballpark brats. And good marketing can do wonders for anything. Remember the New Coke fiasco to Classic Coke triumph? And Victor Kiam's Remington razor resurrection?

Well, here's a real opportunity for Sandia/California. The *Tri-Valley Herald* reported last week that a mountain lion was spotted near Bldg. 966. Now, everybody knows that two aspects of life "out West" are lead-pipe cinches to get the attention of reporters from the media giants "back East" — nuclear weapons labs and wild animals.

Hey! . . . Sandia/California's got it all! (There might even be a movie in this. Or at least maybe a few lines and a chuckle from Charlie Gibson on GMA?)

* * *

Steve Crowder (12323) got one of those "one of the 50 is missing" startlers that *New Mexico Magazine* prints regularly. This one came from the *European Journal of Operational Research* to him at "Saudi Arabia Laboratories." Even so, it got here. Zip codes work.

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

Jack Houston, Al Romig elected AAAS Fellows

Sandians Jack Houston and Al Romig have been elected Fellows of the American Association for the Advancement of Science (AAAS). That word came Oct. 1, from AAAS Chief Executive Officer Alan Leshner in letters on behalf of the AAAS Council.

Each year the AAAS Council elects as Fellows members whose "efforts on behalf of the advancement of science or its applications are scientifically or socially distinguished." The honor of being elected a Fellow began in 1874.

Jack, of Surface and Interface Science Dept. 1114, was elected in the Physics section. His citation reads: "For research advances, particularly the development and exploitation of interfacial force microscopy, leading to fundamental understanding of the interaction of solid surfaces with the environment."

Al, until recently VP for Science, Technology, and Partnerships and now VP for National Security and Arms Control (5000), was honored "for outstanding contributions to the science, technology, and profession of materials and for inspirational leadership of innovative research and development for defense systems."

The honors will be awarded Feb. 14 at the AAAS meeting in Seattle.



JACK HOUSTON



AL ROMIG

Feedback

Q: I have recently found out that the United Way of Central New Mexico no longer allocates funds to the Boy Scouts. I have always been under the impression that the Boy Scouts of America was one of their most important agencies and that a portion of my ECP donations were funding them. Could you please tell me when the Scouts were cut off and explain why this happened?

A: We do, in fact, continue to provide funding for the Great Southwest Council of the Boy Scouts of America [GSWC, BSA]. We have been funding them since 1934. We do not fund any agencies, but we do fund programs within agencies. Go to www.uwcnm.org/organizations/greatsw-boyscouts.htm on our web site and see for yourself. This year, the program received \$40,000 for the ScOutreach Program, a prevention program, serving high-risk youth in Albuquerque's South Valley. The description of the program used by GSWC, BSA in their funding application is as follows: "ScOutreach: ScOutreach is an at-risk youth emphasis program that instills values in young people preparing them to make ethical choices over their lifetime."

The grant awarded to GSWC, BSA was the result of a volunteer review process that is used for all organizations that seek funding from United Way of Central New Mexico. The review process includes over 250 volunteers who examine programs in groups of 12-15 people each. Their job is to review organizations to see if they are serving the most vulnerable members of our community in the focus areas of increasing self-sufficiency, improving health and wellness, and helping children and families succeed. These focus areas were established based on local donor research done by Research & Polling. The ScOutreach program was funded under the focus area Helping Children & Families Succeed.

Relative to other organizations, GSWC, BSA received more funding than 72 other programs [out of 123], placing them in the top 41 percent of organizations who received funding. So, as you can see, the Great Southwest Council of the Boy Scouts of America does receive funding from United Way's Community Fund/[ECP]. Any statement to the contrary is incorrect. — Joanne Fine, Chief Communications Officer, United Way of Central NM

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Employee death

Karl Samuelson of Project & Miniature Machining Team 14186-2 died Oct. 22 from injuries suffered in a motorcycle accident.

He was 62 years old.

Karl was a trades trainee and had been at Sandia since May 2001.

He is survived by his fiancée Sharon Gordon and his sister and brother-in-law Jan and Lawrence Pollack.



KARL SAMUELSON

Lab News now recyclable

The *Lab News*, now printed on a better grade of paper, is recyclable along with standard white copier and printer paper. Hazardous & Solid Waste Dept. 3124's Pollution Prevention folks remind Sandians they can dispose of the *Lab News* in the blue recycle bins in their workplaces.

Reader survey response

A couple of weeks ago, several hundred Sandians were asked to participate in a survey of reader attitudes regarding the *Lab News* and *Sandia Daily News*. If you were among those asked to respond, please try to find a few minutes to complete the survey. It'll help us serve you better.

Augustine reflects on lessons learned in national service

By Nancy Garcia

Norm Augustine, retired chairman and CEO of Lockheed Martin, has learned a few things in his career — not the least of which is that things will go wrong and you need to be prepared.

"When I was at Lockheed Martin," he said, "I used to carry around a 3 x 5-inch card of the worst things we could think of that might happen. We used to practice for them."

Augustine gave Sandia/California's fourth Truman Distinguished Lecture on Monday, speaking about lessons learned from mistakes he has made or seen made. He separated his talk into points about both leadership and technology.

"Leadership does matter a great deal," Augustine remarked, recalling that while he was on the board of Procter & Gamble in 1999, the decision to change the CEO sent the stock price tumbling after 150 years of upward growth. When the CEO was replaced, the stock price began climbing again.

Aspects of leadership he found important were being a good judge of people, setting clear goals, and a strategy ("hope is not a strategy," he noted). Character is the foundation for leadership. For instance, Johnson & Johnson was advised by its lawyers and the FBI alike against recalling all 31 million bottles of Tylenol after a handful were tampered with and poisoned. However, Johnson & Johnson's CEO, Jim Burke, found the decision was easy because it was the right thing to do to protect

situations, the principal players decided in hindsight they would have done better to hasten the process, he said.

In tandem with speed, he added, is the need for communication to "stitch things together."

Leaders understand better how things are going, and in turn they owe their employees candor.

"It's so important to really tell it like it is." Augustine joked that engineers speak in code and acronyms all too often. "Engineers speak of anomalies, mishaps, and events, never of explosions, crashes, and collapses."

His bottom line? "People are very good at dealing with bad news if they know what has to be done and believe it has to be done."

Technology, while accomplishing great things, provides some important lessons, he commented.

Pointing to his laser-pointer he recalled attend-



"LEADERSHIP DOES MATTER a great deal," says Norm Augustine, retired chairman and CEO of Lockheed Martin, during his Truman Distinguished Lecture at Sandia/California. To bolster his case, he talked about the leadership shown by Antarctic explorer Ernest Shackleton and others. (Photos by Bud Pelletier)

ing a talk about the coming importance of lasers and then never saw another one for 20 years. "Today you can't walk two feet without being affected by one," Augustine said. "Technology is overestimated in the short term, but underestimated in the long term."

In managing technology, he has learned that you

really have to understand what business you're in and whether changing technology will still allow you to deliver value to your customers. For instance, Western Union turned down an exclusive offer to the rights to the telephone, and in the 1940s IBM predicted a world market for only five computers.

One challenge is getting the details right. The Mariner spacecraft, for instance, went off-track and "has never been heard from since" due to a missing hyphen in its software code. "Anytime you deal with humans," Augustine said, "you'd better get the details right."

Along the same lines, he believes that no change is small. During the Vietnam War, for instance, it was discovered that an aluminum sticker applied to rockets prior to shipping overseas (to warn of live explosives) was detaching in flight and setting off the rockets prematurely.

In another instance, three independent engines ran out of oil on an aircraft. The failure was traced to a single operator who forgot to add O-rings to a part used in each of the separate engine systems.

Sometimes the hardware itself will flag its potential failures in advance if the team is attentive and listening carefully to all the data, trusting the test results. The space shuttle failure, for instance, was presaged by seven bipod ramp incidents, which might allow a complacent conclusion to be that dodging bullets successfully means they aren't

dangerous.

"That's a hazardous lesson," Augustine said.

On the other hand, he has concluded that "the greatest risk of all is to take no risks."

One of his worst meals ever was with a group of leading military contractors called to a dinner where they were told there would not be enough business for all of them since the Berlin Wall had come down and the Pentagon would not decide which ones would not get contracts. That disruption led to the merger of Martin Marietta and Lockheed.

He concluded with a video showing a building industry challenge to create a home in move-in condition — something a trained team of 700 workers accomplished in under three hours. "People when challenged can accomplish truly great things," he said.

Joking about his "\$10 billion education," he said he certainly could have saved his employers a lot of money if he'd been paying attention to all these lessons.

"I do consider myself to be tremendously fortunate to have lived in this little sliver of time," he added. Commenting on the pace of change during follow-up questions, he noted that his mother arrived in Colorado in 1893 and met folks who'd come across the prairie in covered wagons, as well as his friends who'd gone to the Moon.

Looking to the future, Augustine spotted a couple of challenges. He believes the Department of Homeland Security should strive to take a sys-



"When I was at Lockheed Martin, I used to carry around a 3x5-inch card of the worst things we could think of that might happen. We used to practice for them."

the customer, regardless of the expense. "Today when people talk about ethical companies," Augustine said, "this is usually the first company that comes to mind."

Reputations are fragile, he added. For instance, Enron was deemed the "most admired" energy pipeline company by *Fortune* magazine in 2001, only to end up in shame on its front cover months later. The reward of being in charge "is to have the opportunity to lead," Augustine advised, "not to have a bigger tent."

Paradoxically, staying in front can be challenging because the status quo that brought you to the forefront is bound to change. "If you don't change it, someone else will," Augustine said. "Change is inevitable."

How to manage it? His advice is to make change fast. In nine out of 10 mergers and acqui-



TRUMAN DISTINGUISHED LECTURER and retired Lockheed Martin CEO Norm Augustine, left, with California Site VP Mim John, Sandia President and Laboratories Director C. Paul Robinson, and Senior VP (and former California Site VP) Tom Hunter.

"Technology is overestimated in the short term, but underestimated in the long term. . . . I do consider myself to be tremendously fortunate to have lived in this little sliver of time."



tems approach to combating terrorism, and globalization means this country will have to be "terribly efficient and terribly innovative if we're going to compete at all."

Augustine was thanked by Paul Robinson, who said he made a point of taking him up on his offer of a visit the week after Paul was picked to head Sandia. He was introduced by Mim John, who serves with him on the Defense Threat Reduction Advisory Board. For more details about Augustine's public service career, see www.ran.sandia.gov/dls. At Sandia/California, the Distinguished Lecture Series is organized by the Distinguished and Senior technical staff, with a lot of help, to stimulate thinking about some of the most challenging issues facing the world.

New materials

(Continued from page 1)

that starts a simulation of particles forming chains. The chains form quickly and then clump together to form columns.

The magnetic watermark should up the ante for identity thieves who use handheld scanners to record names, account numbers, and other identifying information from the magnetic stripes on a credit card. The information ordinarily could be downloaded onto a personal computer and used to make phony cards. But if the magnetic stripe on the credit card were embossed with a difficult-to-duplicate magnetic watermark, created by magnetic field structuring, the scam would be much harder to pull off. This nonerasable watermark would encode data only in variations of the magnetic remanence magnitude of the stripe, and is a layer of information in addition to the normal magnetization direction data.

Chains, strains, and a remarkable finding

"By structuring particles into chains we can also make composites conduct electricity, the current traveling through the chains," says Jim. "Remarkably, we find that this conduction is highly sensitive to any kind of swelling or deformation of the polymer. For example, a reversible 6 percent compressive strain can change the conductivity by 11 orders of magnitude, and a slight amount of swelling by a chemical vapor can change the conductivity by 10 orders of magnitude. So Bob Hughes [retired], Bob Anderson, and I obtained a Sandia patent on these materials as sensors.

"We soon tired of making particle chain composites and wanted to do something new. Working with T. Halsey, of the James Franck Institute at the University of Chicago, we discovered that it is possible to organize particles into layered sheet-like structures by placing suspensions in a field rotating in a plane, a so-called biaxial field. So now we could make chains and sheets, but that seemed to be all we could possibly make, since if we applied a field rotating in three dimensions, the magnetic interactions causing the particles to attract should vanish."

Jim shows me a simulation of sheet formation in a rotating magnetic field, explaining further, "The biaxial magnetic field interactions that give particle sheets are just the opposite of the interactions in a uniaxial field. So the sum of both — a triaxial field — would cancel all interactions. Kind of a fancy way to do nothing. But as it turned out we built a triaxial magnet anyway, as a way to use feedback to control the conduction of particle-based chemical sensors, an LDRD program developed with Rod Williamson [1835]. Building the triaxial magnet was not too hard, since we had already designed the rotating field magnet and so just had to add another coil."

"We were completely surprised when we discovered all kinds of interesting particle structures at the balance point of the triaxial magnet, where all three field amplitudes are equal. The lack of a 'null' effect was a complete surprise to us, and for a while we thought something was wrong with our magnet. But when we became convinced the fields were indeed balanced, long-time collaborator Bob Anderson and I got busy trying to understand what was going on."

Surprising, strange particle interactions

"It turns out that strange second-order particle interactions of surprising magnitude remained, interactions that are purely many-body effects, so that to determine how any two particles interact you have to know where all the other particles are. Really just as complicated and weird as things can be."

To illustrate the strange phenomena that can emerge, Jim takes me to his lab and turns on the triaxial magnet, which causes a particle sediment to blossom like a rose. Adjusting one field component frequency causes the rose to transform into a pulsing structure, something like the view inside a washing machine. Another adjustment causes a kind of controlled chaos — particle sheets that change orientation abruptly and discontinuously. One more tweak of a knob and the

suspension explodes into whirling vortices that seem to be ready to head off for a trailer park back East.

All of this is interesting, but I can't help wondering what can be done with this. "That's the really neat part. When we apply the right kind of triaxial field all of the particles arrange themselves to optimize the magnetic properties of the suspension. But this also optimizes a lot of other properties, such as the thermal and electrical conductivity. So now we can make highly optimized particle composites. For example, a chemical sensor made with this technique has 1,000 times the conductivity of one made with a uniaxial field."

Jim shows me one composite made in his lab where the particles have been formed into a honeycomb structure. "Gerald Gulley [visiting faculty from Dominican University], Gene Venturini,

"We were completely surprised when we discovered all kinds of interesting particle structures at the balance point of the triaxial magnet, where all three field amplitudes are equal. The lack of a 'null' effect was a complete surprise to us, and for a while we thought something was wrong with our magnet."

and I spent several months studying the magnetic properties of these materials, and this honeycomb structure has the best magnetic properties of any sample we were able to make." I take his word on it and smile obligingly, but don't know what to make of it.

A superfast artificial muscle?

Jim leads me over to an optical table and shows me the product of a current LDRD, a sort of rubber worm suspended in a magnet by the arm of a balance. "With this apparatus we are trying to develop a superfast artificial muscle, something Bob Anderson and I had theorized about a couple years ago. The idea is to fill a polymer with magnetic particles, stretch it, and see how much it contracts when you turn on the magnetic field. By using fields to optimize the magnetic properties of the composite we get a fivefold increase in the contraction, and we really believe we can still do better, much better than existing materials. We even believe we can develop artificial muscles that will remain contracted after a brief magnetic pulse, then release after another pulse."

The same materials could be used to make extremely sensitive sensor pads to give robots an imitation of the sensation afforded by the human sense of touch, Jim says. "Used in little soft finger pads, the harder the robot pushes, the more electricity is conducted."

At the heart of this research is the triaxial magnet. While it cost Jim about \$20,000 to build it, the same machine custom built by professionals would cost at least \$150,000, and would not be as good, says Boris Khusid, mechanical engineering professor at the New Jersey Institute of Technology in Newark.

Khusid says that although it is easy to make magnetic fields that oscillate at low frequencies, it is difficult to make magnetic fields at the roughly kilohertz frequencies needed, because the power demand is so high. "It could easily require 20,000 watts of power to drive just one coil," he says, "so Jim has connected each magnet coil to a capacitor bank to create a resonance where the energy just sloshes back and forth between the coil and the capacitor bank. Then, only an ordinary audio power supply is needed to compensate for the modest heat output of the coils. The problem with duplicating this system is that Jim has not published the design of the capacitor banks, which is the key to making this system work."

"Why should anyone pay \$150,000 only to be able to try to duplicate Jim's results poorly?" Khusid adds.

The design of the capacitor banks presented Jim with a major problem. "To be able to make each coil resonate over a broad frequency range required capacitor banks with essentially continuous tunability. To do this with a conventional design would have required a tremendous number of expensive capacitors for each coil. On a zoo

outing with my kids it suddenly struck me how to build a much more efficient bank. This design needed only a dozen capacitors to give 354,000 capacitance values spanning three decades of capacitance. The bank has a fractal distribution of states, which is really what we needed. Jess Wilcoxon [1122] helped interface the bank to a computer, and Larry Shapnek [15322] did a beautiful job building the banks and ensuring we would not fry ourselves with the high voltages that occur."

A novel approach for novel materials

Says Khusid, "I strongly believe Jim's methods will be widely used for producing composites as soon as his setup for generating multi-axial magnetic fields becomes commercially available. Jim's studies originated a novel approach toward

producing materials with tailored microstructures. His composites demonstrate unique properties and have the potential of enhancing sensors for a wide range of applications."

Back at the computer screen, a simulation shows the washing machine motion I had seen in the lab. The pulsing speeds up, and almost miraculously the particles form into a fibrillating honeycomb, as odd a birth as I have witnessed.

The structures on the computer screen then form in shapes no one has observed before, transforming in apparently unpredictable ways.

"In a triaxial magnetic field," says Jim, "things happen that are reminiscent of quantum physics, not classical physics, because of the strong many-body effects. For example, if one applies an attractive interaction to a popcorn ball of particles, these clumped particles should hold together. But in a triaxial magnetic field the clump explodes, six 'arms' shooting out like little mushroom clouds. Likewise, particle clusterings similar to organic molecules (ballecules?) are stable. It is a kind of magnetic chemistry with rules we still don't fully understand." He changes the relative frequencies of the magnets; weird new structures result.

In fact, Jim says, "We can create a variety of particle structures that cannot be produced by any other known means, which has led to a patent application for this process."

Lucky and surprised

The potential byproducts, all unexpected, amuse Jim. "If we had been asked to make such complex composites we would have said it is impossible," he says. "So I think we are just lucky, and as surprised as anyone."

Says Paul Fleury, Dean of Engineering at Yale and a former Sandia research VP, "I think the work is scientifically very creative and interesting. Jim has devised a controllable model system that can be used to explore a number of structural configurations as well as magnetic states. . . . As to commercial application, it is quite early α but there may be possibilities of scaling up so as to control magnetic and other microstructures with the large enhancements in susceptibility that he has achieved in the lab."

Khusid adds that Jim also uses the multi-axial fields "as a [science] tool to study the elusive nature of many-body effects in systems governed by the long-range particle interactions. . . ."

The results are discussed in detail in papers for the *Journal of Chemical Physics* (Jan. 15, 2003), written by Jim with Bob Anderson and Rod Williamson, and in *Physical Review B/Condensed Matter and Materials Physics* (March 2003) with Bob, Judy Odinek (2522), Douglas Adolf (1811), and Jennifer Williamson (past summer student).

The work was supported by DOE's Division of Materials Sciences and Engineering, Office of Basic Energy Sciences.

IP management

(Continued from page 1)

Through continuous pruning of portfolios, SIPM saves tens of thousands of dollars each year in licensing and maintenance fees.

Kevin McMahan, Dept. 1304 Manager, says IP goes through a life cycle of four phases —

Application of technology to IP management

A critical element applied to SIPM is the use of data visualization tools. Nabeel Rahal (1304) has assembled a collection of some of the most advanced data visualization tools available to help Sandia align its intellectual property (IP) with its mission and to assist in identifying strategic partnership opportunities.

"The tools being applied to SIPM are the same tools that are currently being used by the intelligence community to counter terrorism," Nabeel says. "The use of our tool set allows us to get mind-boggling insight into the technical, business, intellectual property, and competitive perspectives of a technology area."

For example, application of the tool set allows for the identification of strengths and gaps in a technology area, insight into where other entities are developing IP portfolios, and the ability to map out an entity's entire technology portfolio and compare that portfolio with an unlimited number of other entities, to name but a few applications.

"The tools' capabilities are as limited as your imagination," says Nabeel. "We have done analysis on everything from where federal research and development funding is going to a map showing the geographic location of startup companies within a specific technology area."

creation, protection, utilization, and enforcement.

"We analyzed each phase and identified a number of key gaps that are limiting our ability to effectively manage IP as a corporate asset," Kevin says. "These gaps include weaknesses in incorporating SMU and ST&E planning information, as well as deficiencies in business practices necessary to achieve effective management of IP assets."

The SIPM Project addresses these gaps, and the fixes include:

- The creation phase that focuses on IP portfolios in support of significant technical programs within Sandia. For example, in FY03, five intellectual property portfolios (a pilot program) supporting strategically important technical programs within Sandia were identified to serve as test platforms under the SIPM program — microsystems and microchem-lab, nanotechnologies, water surety, and augmented cognition.

- The protection phase that represents a strategic approach, including all stakeholders, to determine which inventions will be patented. The SIPM program is a Labs-wide process for patent decision-making based on strategic forecasts. This method was derived by benchmarking industry and other national laboratories, gathering internal historical information, and applying best practices to create our new process.

- The utilization phase that provides the technical line organizations, the SMUs, and the ST&E councils better knowledge of technology commercialization options and IP options to enhance applications of IP in support of Labs' missions and to generate licensing revenue.

- The enforcement phase that includes a "cradle-to-grave" compliance and collections approach to managing commercial license agreements in accordance with the terms and conditions of the specific license agreement. Receiv-



NABEEL RAHAL has assembled a collection of some of the most advanced data visualization tools available to help Sandia better manage its intellectual property.

ables for commercial licenses dropped from \$542,000 in October 2002 to \$200,000 in September 2003 due to the new approach. Also, a graded approach for dealing with infringement by companies that are using Sandia technology without paying a licensing fee has been documented and applied. Examples of implementing this graded approach include a number of "stick" licenses that were executed with potential infringers of one of Sandia's key technologies. A stick license is one in which the potential infringer is persuaded that paying licensing fees for rights to IP is a better strategy than pursuing infringement actions.

In recent months Carole, Nabeel Rahal (1304), and Kevin have taken SIPM "on the road," presenting the program to various Sandia line organizations. In most cases they have recognized the merits of a Sandia-wide, corporate process and become engaged and supportive.

"We anticipate that as the different organizations see how effective SIPM is, more and more will adopt it," Carole says.

Security

(Continued from page 1)

protection of our classified assets — this is a responsibility shared by all Sandians.

For example, while we are securing our classified documents and electronic media as required, we are not doing nearly as well in formal markings or record-keeping (accountability) of these materials. Further, we need to increase everyone's understanding of our security responsibilities. Therefore, we will be conducting a formal security standdown by all organizations to address these problems. I fully expect every organization to focus intently on their own work environment and to perform a careful introspection of their security responsibilities — ensuring that all employees comprehend and accept these responsibilities. To allow as much flexibility as possible, every Center will conduct the standdown on two days of their choosing during the period November 17-26. Plans should be made so that customer commitments are not broken and employees are not required to forego planned vacations; make-up sessions may be used for this purpose. Tools and training materials will be available prior to the standdown and further guidance will be issued within a week. Contract employees who work in your organizations must also participate; however, every effort should be made to allow other contractors, such as those doing construction work or equipment installations, to continue their work during the standdown.

Let me emphasize again how important this is. Overall confidence in Sandia can be no better than our area of weakest performance. We are engaged in transforming our relationship with the DOE/National Nuclear Security Administration, one that will provide greater freedom to manage our affairs. Maintaining confidence that we are meeting our security obligations is key to that transformation. Our nation places a great responsibility in our hands each day, based on trust that has been painstakingly earned by more than 50 years of exceptional service. That trust is now being questioned. I ask you all to move decisively to make Sandia security second-to-none.

— C. Paul Robinson

New Sandia Truman Fellowship program seeks nation's top postdoc talent

A prestigious postdoctoral research fellowship announced by Sandia offers the nation's outstanding new PhDs in science and engineering an opportunity to conduct independent research of their own choosing within a national security context.

The President Harry S. Truman Research Fellowship in National Security Science and Engineering represents a continuation of Sandia's long-standing practice of seeking out the best science and engineering talent in the nation to work on problems of pressing national interest.

Sandia has focus areas in biotechnology; chemical and earth sciences; computing, mathematics, and information sciences; electronics and photonics; microsystems and engineering sciences; manufacturing science and technology; materials sciences; pulsed power and directed energy; and robotics and intelligent systems. In addition, Sandia has primary responsibilities in the stewardship of the nation's nuclear weapons stockpile and is playing an increasingly important role in R&D activities related to homeland security, counterterrorism, infrastructure surety, energy supply, and other current and emerging national security challenges.

Candidates for the fellowship may have expertise in any of the Labs' research focus areas. They should have earned a PhD within the last three years (or will have completed a PhD by the time the appointment commences in October 2004). Applicants are expected to have solved a major scientific or engineering problem in their thesis work or will have provided a new approach or insight to a major problem, as demonstrated by a recognized impact in their field. Other eligibility criteria include US citizenship and the ability to obtain a DOE "Q" clearance. Applicants must be seeking their first national laboratory appointment.

In their application package, candidates should present a research proposal (of no more than 10 pages plus appendices) describing the scientific importance of the proposed work and a description of the research plan and data to be obtained. The proposal should be written for a broad technical

audience. Application packages will be reviewed and candidates interviewed by a team of Sandia senior scientists and engineers. Final selection will be made by the Chief Technology Officer of Sandia.

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

Says Laboratory S&T manager Chuck Meyers, "We want to attract the top researchers and provide an environment where they can build a laboratory, work in a strong team setting, and create the new science and engineering the nation needs to address the national security challenges of the 21st century. The flexibility to pursue any line of research that fits within Sandia's national security mission space represents an unparalleled opportunity to develop truly new and innovative ideas. Truman Fellows also have the potential to advance those ideas through development and testing by collaborating with Sandia's major programs."

The Truman Fellowship is a three-year appointment generally commencing on Oct. 1, although exceptions can be made to accommodate special circumstances. Application deadline for the 2004 Truman Fellowship is Dec. 31, 2003. The salary is highly competitive, reflecting the nature of the position(s) and may be adjusted annually.

The number of appointments per year is limited. Candidates not selected as Truman Fellows may be considered for other employment opportunities within the Labs.

For information about the Truman Fellowship and the application process, visit the Truman Fellowship Web site at <http://www.sandia.gov/employment/employment/special/truman/index.html>.

For more details on the Truman Fellowship, including specifics on how to apply, read the PDF document at www.sandia.gov/employment/employment/Truman_fellow.pdf

— Bill Murphy

50 years on, 'Atoms for Peace' still resonates

Truman Lecture speakers Susan Eisenhower and husband Roald Sagdeev offer insights on famous speech

By Bill Murphy

A self-described "odd couple," Susan Eisenhower and her husband, Roald Sagdeev, last week provided anecdotal, highly personalized perspectives on the US, Soviet, and world community response to President Eisenhower's landmark "Atoms for Peace" speech at the United Nations 50 years ago this December.

Their Truman Lecture — the first time a lecture in this distinguished series has been presented by two speakers — was held at the International Programs Building before an audience of more than 100 Sandians.

Ms. Eisenhower, granddaughter of President Eisenhower and distinguished historian of the Cold War and of her grandfather's legacy, is chairman of the Eisenhower Institute. Sagdeev, Distinguished Professor of Physics at the University of Maryland, was one of the youngest scientists ever elected a full academician of the USSR Academy of Sciences. He served as director of the Soviet Space Research Institute for 15 years and, in the last days of the Soviet era, was a science adviser to Mikhail Gorbachev and served in the Soviet House of Deputies supporting a radical reform agenda.

President Eisenhower's "Atoms for Peace" speech at the United Nations represented his attempt to address, at the policy level, "the fearful atomic dilemma" by finding some way by which "the miraculous inventiveness of man would not be dedicated to his death, but consecrated to his life." Eisenhower proposed that the three nuclear powers of the time, Great Britain, the US, and the USSR, give a portion of their stockpiles of fissionable materials to an international agency where scientists would study ways to use atomic energy for peaceful purposes. This would reduce the amount of material that could be used to produce weapons, serve as the basis for more significant future disarmament, and create mutual trust between the two superpowers. The Soviets initially balked, but ultimately, as Sagdeev noted in his comments, embraced a role in some of the institutional outcomes of the speech, notably the establishment of the International Atomic Energy Agency (IAEA), which has served a useful function in global nonproliferation and treaty verification efforts.

'Naive' not a word to describe Ike

Susan Eisenhower noted that, in the days after the speech, some observers dismissed Atoms for Peace as "naive," while others — not least including Winston Churchill — called it brilliant strategic thinking. Susan Eisenhower allowed that there is room for analysis about the significance of "Atoms for Peace," but, reminding her audience of the highly political/diplomatic/strategic role her grandfather played as head of Allied Forces in Europe in World War II, said, "President Eisenhower might be described in many ways, but 'naive' is not one of them."

In fact, although more than a few skeptics may have scoffed at the concepts advanced in the speech, the 3,500 people in attendance recognized its sweep, its boldness, its vision, she said. She quoted a contemporary account of the event: "The speech was



TRUMAN LECTURE SPEAKERS Susan Eisenhower and her husband, Roald Sagdeev, take audience questions following their talk about the long-term impact of President Dwight Eisenhower's famous Atoms for Peace speech. (Photos by Randy Montoya)

received with an indrawn breath . . . then there was a collective sigh from the large audience, followed by wave after wave of sustained applause."

Little red stars

Susan Eisenhower recounted the beginnings of her lifelong fascination with things Russian. During Soviet Premier Nikita Khrushchev's 1959 state visit to the US, he became charmed with the President's grandchildren, including 9-year-old Susan. Just as he was departing for the last time from the President's Gettysburg farm, he gave each grandchild a little red star pin — a symbol of the Soviet Union.

"The minute the helicopter was gone," Susan recalled, "my mother held out her hand and said 'Give me those stars!' She threw them away, of course." Susan said her parents explained to her that Khrushchev — even though to Susan he looked like "a Santa Claus figure" — was not a friend of this country and did not wish the country or the president well.

"I've been fascinated with Russia ever since," she said.

Susan noted that the Soviet Union's ability to join the nuclear club was eye-opening for the president. He had seen first-hand how utterly devastated the Soviet Union had been by World War II; the scope of destruction was almost unimaginable to most Americans. The Soviets were profoundly poor and with only a small science community. Even so, they were able to marshal the resources and the

will to produce a nuclear weapon. This told Eisenhower that proliferation could be pervasive if it were not checked somehow. "Atoms for Peace" was one way to try to check that proliferation.

Mixed legacy but many positives

Although the grandest visions expressed in the Atoms for Peace speech were not realized — the arms race went on for almost four more decades — the speech did result in a number of highly publicized international science conferences in which the Soviets were very much engaged. The worldwide acceptance of the Nonproliferation Treaty, supported by the IAEA, resulted in a world of far less nuclear proliferation by the turn of the century than many observers back in the 1950s had feared would be the case.

Susan Eisenhower noted that her husband, Sagdeev, first became involved with the West as a participant in the first Atoms for Peace conference. In fact, she noted, in order to participate in the conference, "the Soviets had to declassify an entire field of nuclear science; they knew they couldn't declassify paper by paper, so they literally declassified a whole section of science."

Ending on a personal note, she said, "If it were not for Atoms for Peace, Roald Sagdeev and Susan Eisenhower would not be married today, because Roald went to his first trip to the west to participate in the Atoms for Peace conference in 1958. It was Roald's field of science that was declassified as a result of this initiative. So I have both personal and professional reasons for thinking the whole thing was just a terrific idea."

Sagdeev said Khrushchev ultimately embraced aspects of the Atoms for Peace proposal because he saw it as a way for the Soviet Union to be seen as

Susan Eisenhower on nuclear energy:

There is still a tremendous amount of [public] unease. . . The scientific community has a role to play in reminding the public how far technology has advanced since Three Mile Island and Chernobyl."



the strategic equal of the US.

He recounted that as a young scientist on his first trip to the west for the Atoms for Peace conference, he met Americans for the first time. "They looked like extraterrestrials; they were from this completely different world." As such, he said he and his colleagues found it remarkable that the Americans had made almost exactly the same basic discoveries about controlled fusion that the Soviet scientists had made.

Speaking of visits to the US, Sagdeev recounted the familiar story of the first post-Cold War visit of Russian scientists to Los Alamos National Laboratory. As he tells it, everyone is sitting around talking, when one of the Russians says, "Gee, I can't believe it. Here we are talking to you so easily, and for all those years, we thought you were our enemy." And the Los Alamos guy answers, "Hey, come on. We never considered you guys the enemy . . . Now, Livermore, they were the enemy!"

Sagdeev drew another laugh when he recounted that, post-Cold War, he has become an advisor to media magnate Ted Turner on one of Turner's nonproliferation projects. Subsequently, he ran into Mikhail Gorbachev at a conference, and looking to make light conversation, said, "I used to advise you; now I'm advising Ted Turner." To which Gorbachev replied, "Me, too."



Roald Sagdeev on nuclear energy:

"There was hope that this administration would push new research for a new generation of advanced reactors [for safe nuclear energy]. But everything is moving very slowly."

KAFB/DOE/Sandia exercise tests emergency response



Sandia, Kirtland Air Force Base, DOE, and other agencies participated in a “full-spectrum” exercise Oct. 20 that tested the organizations’ ability to deal with complex crisis scenarios involving injuries, criminal activities, and security threats. The exercise scenario had a group of radicals exploding “dirty” bombs at several locations around KAFB. The exercise stretched the skills and tested the ability of first-responders, hazmat teams, security and medical personnel, crisis management experts, and communicators to address and contain the threat.

Photos by Randy Montoya

(Note: Injury in photo at right is simulated)



Sandia's Business Development and Partnerships Center 1300 wins national recognition

Professional association cites Center for 'Excellence in Technology Transfer'

The Association of University Research Parks (AURP) has honored Sandia with its 2003 Excellence in Technology Transfer Award.

The award was presented at the AURP 2003 Annual Conference in Vancouver, B.C., Canada. Jackie Kerby Moore, manager of Sandia Science and Technology Park, accepted it on behalf of Sandia.

The technology transfer award is presented annually to an individual, agency, or program

"When one part of Sandia receives an award, it's something we all participate in. And that's particularly true for this Center [1300]. This award adds to the stature and the recognition of the labs and we should all take pride in it."

demonstrating great success in taking technology from the laboratory and nurturing it into a viable and growing business or businesses. AURP's mission is to promote and support the development and operation of university research parks worldwide.

The AURP award to Sandia recognizes the successes of Sandia's Corporate Business Development and Partnerships Center 1300.

In a brief presentation ceremony in the reception area of Bldg. 800, many members of Center 1300 staff watched as Jackie presented the AURP award she had picked up in Vancouver to Center Director Dave Goldheim. Also present was Div. 1000 VP Pace VanDevender.

Over the past five years, Sandia has participated in 183 new cooperative research and development agreements (CRADAs) with industry partners to jointly develop technology that is then incorporated into commercial products. It has issued 1,472 Technical Advance Disclosures; signed 639 new Non-Federal Entity agreements to assist partners in addressing specific technical challenges; and has issued 415 commercial licenses that have transferred technologies developed at the Labs to the private sector.

Recent Patents

Paul Wessendorf (1732): Active Shunt Capacitance Cancelling Oscillator Circuit.

Stewart Griffiths (8752): Compact Micro-channel System.

Samuel Miller (5913) and Murray Steven Rodgers: Apparatus to Position a Microelectromechanical Platform.

Wei-Yang Lu (8754): Acoustic Sensor for Real-Time Control for the Inductive Heating Process.

John Shelnett (1141), Weiliang Gong, Abdeslam Abdelouas, and Werner Lutze: Reductive Precipitation of Metals Photosensitized by Tin and Antimony Porphyrins.

Take Note

Retiring and not seen in *Lab News* pictures: **Betty Cavender** (2997), 21 years; **Ed Gullick** (3554), 30 years; **Rose Fischback** (6852), 25 years; **Paul Klimas** (6200), 27 years; **George Allen** (9700), 27 years; **Judy Howard** (6135), 19 years; **Paul Tsutsumi** (14186), 30 years; **Roger Lizut** (2950), 20 years; and **Donald Lewis** (12332), 48 years.

Sympathy

To Mark Vaughn (15222) on the death of his father, Harold Vaughn, in Albuquerque, Oct. 7.



SANDIA DIV. 1000 VP Pace VanDevender, left, Sandia Science and Technology Park Manager Jackie Kerby Moore, and Corporate Business Development and Partnerships Center 1300 Director David Goldheim talk to Center 1300 staff during a celebration of the Center's recognition for its tech transfer efforts. (Photo by Randy Montoya)

In accepting the award, Dave said to his Center 1300 staff, "You're a dynamite organization and together with Sandia Science and Technology Park, you've done a marvelous job. This is a real honor for Sandia. I want to thank all of you for making this a reality."

Dave also thanked Jackie and her colleague, Jim Clinch, and a team that Jim put together, for doing the legwork involved in nominating Sandia for the award.

Pace, new to his role as VP of the Division that includes 1300, also congratulated the group.

"When one part of Sandia receives an award, it's something we all participate in. And that's particularly true for this Center. This award adds to the stature and the recognition of the Labs and we should all take pride in it."

"Benchmarking is one way we tell how well we're doing compared to everyone else. And this

is one way to benchmark — competition, international recognition. For that kind of success, I want to congratulate you.

"I've known you in many aspects: as a budding entrepreneur, trying to leave Sandia and as one who came back . . . I'm very happy to get to know you in a whole new relationship. The more I know about you, the more I understand what Dave was saying is true: you're an outstanding organization, and a great staff."

Pace charged the Center staff to keep up the good work, noting that in the years ahead, as the funding for nuclear weapons work at the Labs may flatten, the importance of research partnerships will become increasingly important to Sandia.

"Plan ahead," Pace said. "We all will."

— Bill Murphy

Sandia, National Instruments sign contract for measurement software standardization

The Hardware and Software Maintenance Service Center in Organization 9622 has completed a contract with National Instruments that wants employees to know about. Under this Labs-wide contract users of National Instruments software such as LabVIEW can buy and maintain their products without having to enter into their own procurement and annual maintenance contracts.

The contract eliminates the need to enter the usual procurement process, gives a Labs-wide negotiated discount, and provides NI Developer Suite, NI's premium software bundle and subscription program. NI Developer Suite bundles LabVIEW, LabWindows/CVI, Measurement Studio for Visual Studio, LabVIEW Real-Time, and a wide variety of add-on toolkits for analysis, reporting, and programming. Subscribers also receive automatic upgrades four times a year and supplemental support materials. For a complete list of products included in NI

Developer Suite, see www.ni.com/suite.

The service center says it encourages all Sandia users of National Instruments software to take advantage of this contract. You can add new licenses or upgrade older ones. You can also use it to renew expired maintenance contracts. Later in the fall of 2003 all the current users will be contacted by representatives from National Instruments as they prepare the user database for the first contract year, which is calendar year 2004.

In the meantime, all purchases made before Dec. 31 include free software maintenance and support for the rest of the year. Users who migrate existing NI software to NI Developer Suite also receive an additional 10 percent off during this period.

For more information about this new contract call Max Marrs (9622) at 845-8875 or Jamie Olive at National Instruments. His number is 505-890-8769 and his e-mail is jamie.olive@ni.com.

Five Albuquerque students awarded Savings Bonds

In Labs' first "It's the Write Thing to Do" contest, students write essays on tough science questions

Five Albuquerque high school students have been awarded \$2,000 in US Savings Bonds as winners of the first "It's the Write Thing to Do" contest, sponsored by Sandia and the Lockheed Martin Corporation. The awards were made in a series of presentations to the winners at their schools, beginning last week.

"The contest was created to encourage students to pursue careers in science, math and engineering," says Sandia's Cheryl Garcia, who organized the essay contest for the Corporate Outreach Dept. 1260. This was the first year for the competition and 22 students from nine high schools submitted essays, she said.

The awards were presented to the winners in classroom ceremonies at the high schools. "We presented the awards in the classroom in front of the students' peers to encourage other students to engage in science, math, and engineering," Cheryl said.

Lockheed Martin provided funding for the contest prizes. The five U.S. Savings Bond winners are:

- Deborah Burchard Del Norte High
- Jonathan Clark Sandia High
- Brian Jorgensen Cibola High
- Vincent Metzger Cibola High
- Aurelio Sanchez Albuquerque High

The contest challenged high school students to write a 500-word essay in answer to one of four challenge questions in science, math, and engineering. The Sandia-posed questions involved:

- The growing reliance on desktop computing and how it can undermine basic education if not properly understood,
- Supercomputers and what can be learned by applying them to study biological systems,
- The use of computer codes to predict results in high-stress environments and their relationship to actual physical testing, and
- MEMS (microelectromechanical systems) and how they can be used in the future to help society.

"I thought the contest was a really good idea," said Len Duda, a nuclear engineer in Sandia's Vulnerability and Risk Analysis Dept. 6414, who



ESSAY CONTEST winner Deborah Burchard, left, of Del Norte High School in Albuquerque discusses a chemistry project. She was one of five high school students to win savings bonds in Sandia's first "It's the Write Thing to Do" essay contest. Deborah's teacher, Miranda Fleig, is a winner of Sandia's Excellence in Science Teaching awards, announced last May.

(Photo by Randy Montoya)

helped judge the contest. "It emphasizes that literacy and writing are integral parts of science and engineering." Duda pronounced the winning essays as "well-written."

"This is an exciting concept and I would like to see more schools participate in it next year," said Joe Jung, Manager of Sandia's Structural Mechanical Engineering Dept. 9126, who also participated as a judge. "It provides an opportunity for all students, not just exceptional students, to step back and look at some of these topics, do some research, use their own imaginations and think of directions and future benefits."

A winning way with words . . .

"The implications of a new technique of using computers to calculate the exact shape of an unknown protein are immense. Microbiological technology such as this could impact the medical field greatly."

Aurelio Sanchez, Albuquerque High

"The supercomputer will be able to combine the natural biological chemicals with synthesized chemicals, allowing a scientist to see the reaction and results on the screen. This will have the potential of saving time by eliminating unnecessary treatments [and] the cost of those treatments . . ."

Deborah Burchard, Del Norte High

"Like any new technology, MEMS has its own problems to overcome. This does not mean that MEMS are not worth the invested time and money that will be invested in the future."

Jonathan Clark, Sandia High

Rebecca Williams, an electrical engineer in Navigation, Pointing, and Control Dept. 2338, found some of the papers to be very good. "The contest increases awareness about science and math among all the students, not just those who are already interested in math and science," she said. "Each student had to write the essay independently, with no help from parents or teachers. The winning essays went through a rigorous judging process."

Melissa Heller (2338) and Sarah Leming of Mechanical Design and Analysis Dept. 2332 also participated in the judging.

Sandia graduates two more Weapon Intern Program classes



The Oct. 17 Lab News featured an article about the latest two classes to graduate from Sandia's highly regarded Weapon Intern Program. This year marked a transition from a two-year program to a one-year program. Thus, this year two classes graduated at the same time. Here are the photos of the graduates, their teachers, and program mentors:

117 is the one-year class. From left to right in the back row are Bill Patterson, Ben Benjamin, Harold Rarrick, Bobby Baca, Hal Walling, Byron Ristvet (hidden behind Leon Smith), John Stichman, Paul Robinson, Steve Henry, Linton Brooks, Maj. Joe MacCaffrey, Capt. Todd Broyles, Dan Cantu, Gabriel Pugh. Front row left to right, Osman Inal (NM Tech), Tom Schultheis, Leon Smith, Mark Anderson, Mary Abt, Sharon Arp, Julie Beachner, Capt. Jackson Crocker, Marisa McGregor, Rupal Patel, Jimmie Wolf, Barb Reser, John Hogan, Andy Rogulich.



121 is the two-year class. From left to right back row are Bill Patterson, Hal Walling, Ben Benjamin, Dave Harding, Brent Blankenship, Paul Robinson, Dave Walsh, John Stichman, Bob Houck. Middle row left to right Harold Rarrick, Steve Henry, Scottie Walker, Jon Eberhart, Linton Brooks, Maj. Phil Opela, Mark Ekman, Bernard Whitaker. Front row left to right Osman Inal, Maj. (s) Mark Glissman, Tom Schultheis, Leon Smith, Bryan Adams, Lysle Serna, Siv Limary, Maj. Warren Nuibe, Barb Reser, John Hogan, Cecily Romero, Andy Rogulich. (Missing from this class photo are Shung Lin and Bob Galloway.)



Mileposts

New Mexico photos by Michelle Fleming
California photos by Bud Pelletier



John Jackson
25 1312



Alex Maish
25 15252



Paul Romero
20 3127



Edward Chavez
15 4211



Susan Pickering
15 7030



Steve Rohde
15 1738



Ruth Smith
15 1100



William Suderman
15 3124



Eric Tomlin
15 6524



John Vonderheide
15 5933



Sandy Warner
15 8945



Ron Weagley
15 10022

Recent Retirees



Sil Candelaria
38 2912



John Jewell
37 1741



Paul Hommert
27 15100



Bill Moore
27 1645



Eugene Lujan
25 1636



Max Harcourt
21 6233

Lockheed Martin photo team shoots Labs R&D work



LIGHTS, CAMERA, ACTION. Lockheed Martin corporate Director of Photography Eric Schulzinger takes pictures of Paul Johnson (4111) with blast-suppression foam developed by Sandia. Schulzinger's recent trip to Sandia was to shoot photos to appear in the Lockheed Martin annual report. Mark Naro (4111, at right) is artfully smearing foam designed for chem.-bio-rad blast mitigation. Dan Auber (center), a lighting specialist, accompanied Schulzinger on the photo shoot. (Photo by Randy Montoya)

Management promotions

New Mexico

Paul Veers from DMTS to Manager, Wind Energy Technology Dept. 6214.

Paul has worked in wind energy since joining Sandia in August 1980, at first part-time in the Applied Mechanics departments and then full-time starting in 1988 in the Wind Energy Technology Department.

His wind energy work includes research on fatigue, structural dynamics, random vibrations, reliability, and simulating the stochastic field of atmospheric turbulence. Over the years Paul has worked on weapons components, reactor containment, centrifuges, and solar energy, as well as wind energy.

He has a BS and an MS in engineering mechanics, both from the University of Wisconsin, and a PhD in mechanical engineering from Stanford.

Mark Ladd from PMTS, Exploratory Real-Time Systems Dept. 15351, to Manager, International Borders Technologies Dept. 5357.

Mark joined Sandia in October 1995. His work has been in sensors: real-time signal processing, pattern recognition, detection and estimation theory, networked sensing, array processing methods, real-time systems, and systems analysis.

He led multidisciplinary, multi-organizational teams that developed next-generation sensor systems.

Before coming to the labs, Mark worked at Applied Research Laboratories at the University of Texas as the lead engineer for the development and evaluation of the classification portion for an automated detect, track, and classification system for an active sonar.

Before that, he served as an officer in the US Air Force as a Reserve Officer Training Corps (ROTC) instructor and as an electrical engineer designing security systems for nuclear storage areas.

Mark has a BS in electrical engineering from Virginia Tech, an MS in management science from the State University of New York, and an MS and PhD in electrical engineering from the University of Texas, Austin.



PAUL VEERS



MARK LADD

Linda Lovato-Montoya recognized by Yoplait

Yogurt company names Sandian one of its 25 'champions' in the fight against breast cancer

By Iris Aboytes

Yoplait, *SELF* magazine, and the Susan G. Komen Breast Cancer Foundation have selected Linda Lovato-Montoya (3133-1) as a "Champion" doing extraordinary things in the fight against breast cancer. She was selected as one of 25 Yoplait Champions. Nominated by one of her brothers, Mike Anzures, "because of her compassion, instinctive nature to help others, and for her many efforts in promoting breast cancer awareness."

"For me, the diagnosis of breast cancer became a giant magnifying glass, enlarging and bringing sharply into focus the important parts of my life," says Linda. "I might call it a 'twist of fate' or an opportunity to have more profound feelings about my faith, self, and family. I was diagnosed with breast cancer at the age of 37."

"At age 37 and having been married for just eight months, I found a lump. Lumps were not uncommon for me. I had been finding them since I was 21. Finding a lump that was different to the touch was not quite as much a surprise as I thought it would have been. But this lump was the one that carried the cancer."

"Cancer not only attacked me; it also brought my family and friends along for the ride. They shared my pain and struggles. I remember the sobs that came



AUTO-GRAPHED — Linda holds her daughter Victoria in front of a car signed by breast cancer survivors nationwide. At left is Linda's niece Patrice Anzures.



LINDA LOVATO-MONTOYA at home with her husband Martin Montoya, also a Sandian (9529).

from my husband and the sadness on my parents' faces as they managed to find smiles for me. I felt the fear in my brothers' hearts."

"On a lighter side, my experience with breast cancer also brought out my creativity! I learned to roll a pair of socks just right to use as breasts since mine were still under construction. However, I didn't attach them quite right one day and the pair of socks moved to the center of my chest. I then took on the look of a unicorn! Not a 'look' that I was looking for, but one that brought strange glances from people and a lot of laughter from me. I found humor in what I was doing as often as I could. Humor helped to lighten the situation and helped others to deal with 'it' and with me.

"A quick reflex was also a handy trait! You learn quickly to put your hand on

the top of your head when the wind picks up so that you're not chasing something in the parking lot resembling a huge hairball coughed up from a cat.

"After 1-1/2 years of surgeries, treatments, and unexplainable fatigue, I thought I was at the end of my rough ride. I was wrong. I learned that my left breast was looking suspicious and made a decision to have it removed. Luckily, it was not cancerous so the second ride was not as rough. I realized that the two breasts I was born with were only on loan. It was time to trade them in for a new set."

"I used a journal to record my deepest and darkest feelings. Writing my thoughts was therapy for my soul. Should I not survive to share my experience with my daughter, Victoria, my booklet would be the means for her to really know this about me."

This journal became "One Day at a Time," a revealing booklet sharing her story, which she hoped would prove to be an effective means of communication. She hopes to inspire many women to seek this outlet as a way for them to cope with this disease.

As member of "Comadre a Comadre," a women's organization for breast cancer survivors; "Caminando Juntos" (Walking Together), an organization for cancer survivors — Linda provides support, advocacy, education, and awareness about breast cancer to New Mexico Hispanics. Linda has advocated the importance of mammograms and survival after cancer using videos, television spots, and live radio programs. She now wants to take her resources to the middle and high schools for young women to learn the importance of self-examinations, which should also help spread the information to women's homes.

"I am a breast cancer survivor — four-to-six years to be exact," says Linda. "I am a survivor who gained an insight for life that I might not have experienced had it not been for the cancer invading my right breast."

In her brother's words, "Linda is not only a breast cancer survivor, she is a wife, mother, a sister to eight brothers, a dedicated caregiver, a career woman, an advocate of breast cancer awareness, and a friend to many."

"My experience with breast cancer has made me stronger. Having cancer has not robbed me of any part of my life. It certainly changed my life, but never defined it or me," she says.

For available resources or her "One Day at a Time" booklet contact Linda via e-mail at lflmont@sandia.gov.

Feedback

Why not use Sandia Radio 1640 AM more effectively? Also, what's Labs' policy on fundraising solicitations?

Q: I was unfortunate enough to be stuck in traffic after work on Thursday, Aug. 20. Apparently (some, all?) gates were closed. Maybe there was an accident on Eubank near I-40, maybe the Louisiana gates were unaffected. I have heard lots of stories.

I tuned into 1640 AM, the Sandia radio station that broadcasts info about what is going on, hoping to hear if all gates were closed (so just relax and stay put) or which gates were open. All I heard was a recording made at 3 a.m. that morning.

Bottom line is, there were literally thousands of people lined up trying to get off base in several miles worth of lines.

It seems like the 1640 AM radio station is a valuable asset. It also seems we should practice using it in case a serious emergency should occur. It seems to me that yesterday would have been a good time to practice while keeping thousands of stranded motorists informed and maybe prevented a few of the dangerous U turns I saw by frustrated motorists.

With all the brainpower and resources at Sandia, isn't there a way to insert optional announcements about real-time events into the broadcast stream?

A: Thank you for your inquiry about Sandia's 1640 AM radio station. The radio station utilizes a 10-watt transmitter and is designed to provide motorist on the base with up-to-the minute travel and weather information utilizing their standard car radios. Messages on this system are updated each morning and as conditions warrant by the Sandia Emergency Operations Center. It takes several minutes to update messages.

Periodically, the Kirtland police will shut down all gates to both inbound and outbound traffic. This is usually associated with some type of law enforcement situation. Typically, Sandia is not informed of the reason for this action. This was the case for the event you experienced. On that day, the EOC first learned that the gates were shut down when they started receiving phone calls. We contacted the Base Command Post but even they could not provide us with any information. As we were preparing to formulate a message advising motorists, traffic through the gates was restored.

If we are given information on a situation occurring on base that could affect Sandia/Kirtland motorists, the Emergency Operations Center will make every effort to get information on the air in a timely as manner as possible.

— Al West (3100)

Q: What is the policy for advertising and fundraising at Sandia? In the Daily News we continually see ads for Shandiin Child Development Center. It is noted that this is a nonprofit day-care center/preschool located on Kirtland AFB and used by many Sandians. Today's Daily News notes that they are selling entertainment books. I too am selling entertainment books for a nonprofit school used by many Sandians, located just outside of KAFB. Can the Sandia parents from this nonprofit, private school get equal coverage in the Daily News for our fundraisers?

A: The Sandia Daily News guiding principle covering fund-raising says: "Fund-raising (if covered at all) must be Labs-sanctioned and -sponsored." Although Shandiin and La Luz day-care center/preschools are not official Sandia organizations, publicizing their fund-raising efforts a few times a year is considered acceptable because many Sandians use both facilities for childcare. All rules must be tempered by occasionally divergent interpretation, because of extenuating circumstances, and the one or two — certainly not "continually" — times a year when facilities that provide many Sandians with childcare services ask for a little help with fund-raising publicity, their requests are granted. All such requests are considered, and if the school referred to by the writer is not ideologically oriented or exclusionary, its requests would be considered.

— Howard Kercheval (12640)