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NewsLetter
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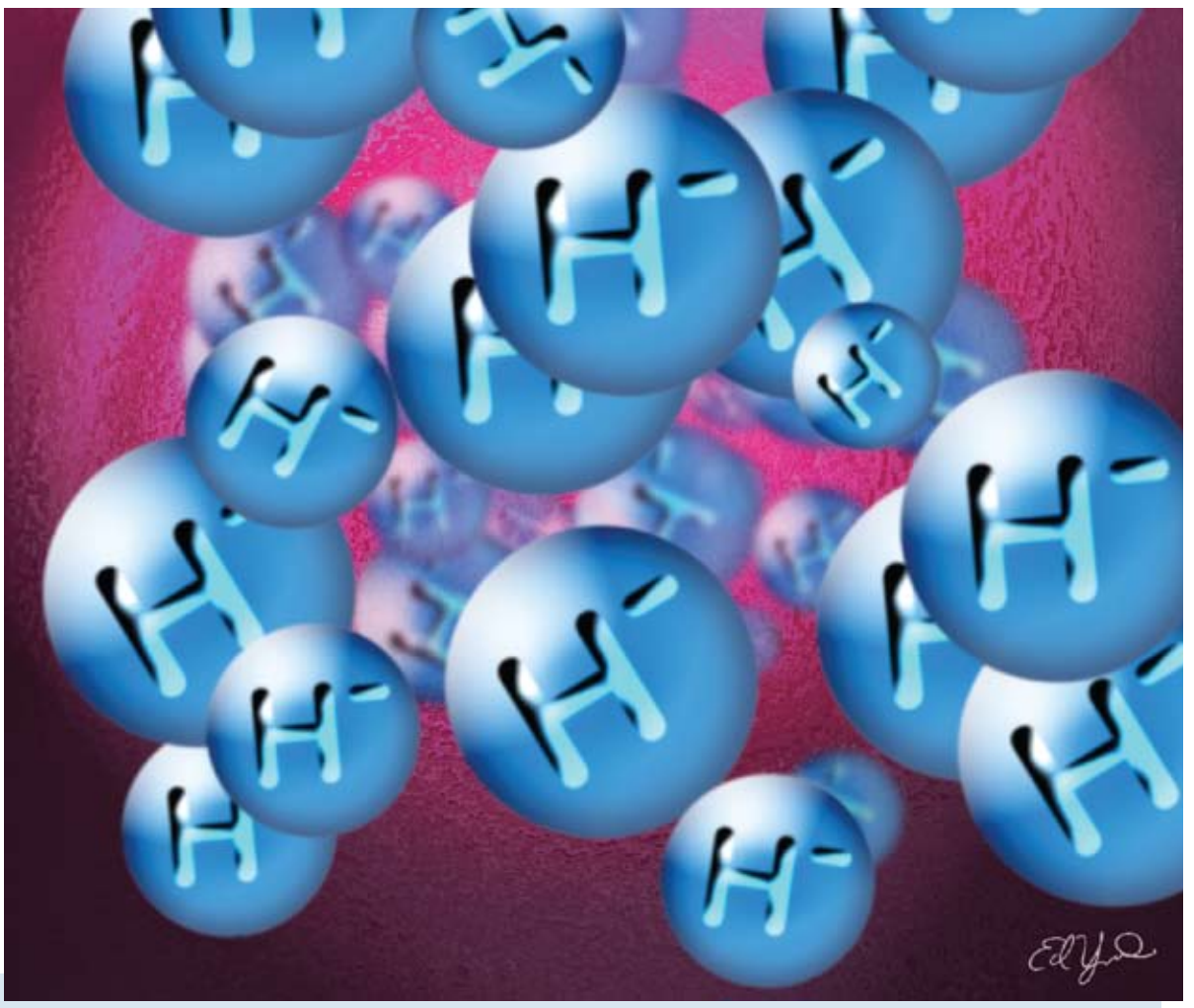
Negative ions and the making of a milestone

by Todd Hanson



For many Laboratory employees, August 7, 2007, was just another day at work. But that was not the case for postdoctoral researcher Olli Tarvainen and the H^- Ion Source team in Accelerator and Beam Science (AOT-ABS) at the Los Alamos Neutron Science Center. That day produced a milestone that could literally change the way LANSCE operates.

That milestone marked the first production of a 3.4 milliamp beam of negatively charged hydrogen (H^-) ions using a method called helicon discharge. Negatively charged hydrogen ions are hydrogen atoms with an extra electron.

To understand the importance of the milestone, it helps to know a bit about how LANSCE currently produces the negative hydrogen ions using the half-mile-long 800 megaelectronvolt (MeV) linear accelerator. Negatively charged hydrogen ions are hydrogen atoms with an extra electron and are produced at LANSCE using converter ionsources. Inside these sources, tungsten metal filaments are heated to white-hot temperatures by 100 amp electrical currents, causing them to emit electrons. These electrons produce a plasma discharge that is then supplemented by the addition of cesium vapor from a reservoir.

The H^- ion source currently used at LANSCE is capable of producing an ion beam with a current of 16 milliamps using added cesium. The source's output is only 1.3 milliamp without the addition of cesium under otherwise normal operating conditions, and only 3.5 milliamp if the filaments are heated to a point where they would burn out. Often filaments won't last the required 28 days under standard operating conditions. In view of this problem and also to meet demands for higher beam currents in the future, research in Accelerator and Beam Science has been aimed at creating a better H^- ion source that doesn't rely on filaments.

In the search for a more efficient and reliable alternative method of producing H^- ions, Tarvainen, along with Jim Stelzer, Ernie Geros and Jonathan Ferris of AOT-ABS, worked with staff from other groups in the Accelerator Operations and Technology (AOT) Division and with members of High Power Electrodynamics (ISR-6) to produce the first test beam based on the use of a helicon discharge, sustained by radio frequency power and, therefore, not requiring hot filaments. Starting with the initial test, the new ion-source technology looked promising. The beam current during the first day's test reached 1.8 milliamps without the use of cesium. On the third test day [August 7], the new helicon-ion source was tuned to deliver a record-breaking 3.4 milliamps, again without any cesium.

Helicon plasma generators are widely used for industrial plasma processing applications due to their long lifetime and capability of creating high-density, low-temperature plasmas very efficiently. Exciting the helicon wave mode requires the presence of a magnetic field produced by permanent magnets for the novel H^- ion source design.

The next step for Tarvainen and his team is to improve the performance of the source prototype and enhance H^- production on the converter surface by pursuing two different approaches: introducing cesium to the source using an oven presently being tested or fabricating the converter from barium metal. Barium has been shown to yield H^- production rates comparable to those obtained with cesiated surfaces, and a barium-based converter would eliminate problems with high-voltage sparking that can occur with cesium.

Until that prototype is tested, the H^- Ion Source team's work days probably will be business as usual but with an eye toward another milestone day.

Positive applications for negative hydrogen ions

Negatively charged hydrogen ion beams are needed for a wide array of applications that make use of the neutrons generated when the beams hit different spallation targets. Examples are neutron-scattering experiments at the Lujan Center and the Weapons Neutron Research facility, proton radiography investigations, and research with ultra-cold neutrons. Negative ions are needed whenever high-energy beam pulses have to be accumulated in the Proton Storage Ring to compress the pulse length to less than one millionth of a second and to increase the pulse current in proportion.

The H^- Ion Source team expects that the new ion source will provide longer source lifetimes due to the lack of consumable parts and create even higher plasma densities in the future. In turn, this should result in significantly higher beam currents than are presently produced by the filament-driven source. This is important because the upgraded LANSCE accelerators that will serve the future MaRIE facility will require higher intensity H^- beams.

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For Your Safety

Fire safety at home

Clock change means battery change

Will your smoke detector alert you to a fire in the middle of the night? Regularly testing and replacing batteries are keys to saving lives. According to the U.S. Fire Administration, in 2006, fire killed more Americans than all natural disasters combined, and 81 percent of fire deaths occurred in residences.

Daylight Saving Time ends November 4 and it's a good time to replace smoke detector batteries when setting clocks back. Also consider replacing smoke detectors every ten years. The National Fire Protection Association also recommends testing units monthly and cleaning them according to the manufacture's instructions.

Nuisance activations are the leading cause of disabled smoke alarms, according to the NFPA. Never deactivate a smoke alarm because of a nuisance activation—if the alarm chirps, that is an indication it's time to replace the batteries.

The importance of home escape planning is equal to that of maintaining smoke alarms. Join the "Great American Fire Drill" by creating and practicing a home escape plan. Templates for creating a plan are available on the NFPA Web site at *http://www.nfpa.org/index.asp*.

The USFA recommends practicing a home escape plan by conducting a walkthrough in daylight and activating the smoke detector manually at night, when family members are sleeping. More information is available at *http://www.usfa.dhs.gov/*.

Regular attention to smoke detector maintenance and simple planning can help avert tragedy and provide the comfort of knowing both you and your family are prepared in the event of a fire.

Los Alamos NEWSLETTER

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Los Alamos enhances national security by ensuring the safety and reliability of the U.S. nuclear stockpile, developing technologies to reduce threats from weapons of mass destruction, and solving problems related to energy, environment, infrastructure, health and global security concerns.

National Nuclear Security Administration

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Editor's note: The following article is by Roland Knapp, the Laboratory's Contractor Assurance Officer, who manages the Contract Assurance Office.

Process Improvement Projects under way at the Laboratory

Roland Knapp, left, of the Contractor Assurance Office talks with Mike Strevell of Project Management Services at an after-hours celebration following a day of Black Belt training. *Photo by LeRoy N. Sanchez, Records Management/Media Services and Operations*

Eleven Laboratory employees are currently receiving Lean Six Sigma Black Belt candidate training. Nine are Black Belt Candidates and two are Green Belt candidates.

Lean Six Sigma is a key part of our Laboratory's goal to implement a performance-based management system that drives mission and operational excellence. Lean Six Sigma integrates elements of the Lab's Human Performance Improvement and Performance-Based Leadership initiatives to foster a work environment that achieves our Laboratory goals.

The Black Belt candidates go through an intensive Lean Six Sigma training and certification program over the next five to eight months. Certification requires candidates to complete the training, pass related tests, and demonstrate their Lean Six Sigma competency by successfully completing two process improvement projects.

Process improvement projects being led by Laboratory Black Belt candidates include

- Reducing the cycle time of the Issues and Corrective Action Management process, led by Sharon Atcher of Process Management and Continuous Improvement (CAO-PMCI)
- Increasing the number of employee termination departure forms submitted on time, led by Tonya Grace of CAO-PMCI
- Reducing the percentage of overdue subcontract and purchase order close-out assignments, led by Monica Andersen of CAO-PMCI
- Increasing the percentage of subcontract and purchase order awards to small business and socioeconomic categories, led by Ronald Dolin of CAO-PMCI
- Reducing the percentage of invoices with insufficient funds on subcontracts and purchase orders, led by John Perreault of CAO-PMCI
- Reducing the number of prematurely disposed computer systems, led by Chris Binns of CAO-PMCI
- Increasing concrete placement rate, led by Stan Prueitt of CAO-PMCI
- Increasing commodity reuse rate, led by Michael Peters of CAO-PMCI.

The Green Belt process improvements are reducing cycle time to get small engineering subcontracts, led by Mike Strevell of Project Management Services (ADPMGT), and reducing erosion and transport of contaminants by storm water runoff into waters of the United States to comply with regulatory requirements under the federal Clean Water Act, led by Jackie Little of Ecology and Air Quality (ENV-EAQ).

These Black Belt candidates provide a progress report to their champions and stakeholder leaders.

For more information about Lean Six Sigma, write to *improve@lanl.gov* by e-mail.

Go to http://int.lanl.gov/news/links/ online.

Correction

Michael Caffrey's name was misspelled in the October 8 *Los Alamos NewsLetter*. Caffrey is a member of the Cibola Flight Experiment team, which won a Large Team Distinguished Performance Award.

Q: If fall is here, can winter be far behind? What tasks do you perform during the fall to help ensure your safety during winter, such as winterizing your motor vehicle, buying new tires, checking your furnace.

Chris Casillas of Departmental Computing 2 (CTN-2)

I shut down my air conditioner and make sure the furnace is ready to go. I also put away my garden hoses to make sure they don't freeze.

Paula Padilla of Business Services (ADBS)

[My family and I] just finished doing some of those things. In fact, we put new tires on all of our cars as well as getting them serviced. We also shut down our air conditioner and winterized it for the season, and we checked and serviced our furnace in anticipation of the colder weather. I also ordered some Yak Traks from the Worker Safety and Security Team (WSST) so I can be sure not to slip and fall this winter.

Jay Johnson of Project Management Services (ADPMGT)

This time of the year, I always check all of my cars to make sure I have my ice scrapers ready. I especially do this after the summer when my ice scrapers tend to get lost or misplaced. I always make sure to do this before we get hit by the first snow/freeze.

In Memoriam

Gustaf Norman Lindblom

Gustaf Norman Lindblom of Los Alamos died June 26. He was 91.

Lindblom began working at the Laboratory as a senior photographer in the former General Atomic (GA) Division. He retired in 1982 from the former Information Services (IS) Division.

He is survived by his wife Norine; sons David of New York and Todd of Albuquerque; and brother Charles of Santa Fe.

Winsell Ansell Biggers

Laboratory retiree Winsell Ansell Biggers died July 17. He was 87.

An Army Air Forces Captain from 1942 to 1946, Biggers joined the Laboratory in 1949 in the former NPD-36. In 1952, he joined the former Field Testing (J) Division. He retired from Los Alamos in 1976.

He is survived by his son, Wendell A. Biggers Jr.; wife, Rejance; son-in-law, Dick Wingfield and wife Elaine; stepdaughter Francine Berns-Hall; and many other relatives and friends.

PEOPLE

McBranch named deputy principal associate director for science, technology, and engineering

Duncan McBranch

Duncan McBranch is the Laboratory's new deputy principal associate director for science, technology, and engineering.

"Among the many qualified candidates who applied for the position, Duncan offered a range of skills and abilities that are most likely to help me chart the future path for science at the Laboratory," said Terry Wallace, principal associate director for science, technology, and engineering. "His experience in the world of business and input on how to make Los Alamos science more capability-based, productive, and inventive will be valuble."

During his tenure as Technology Transfer (TT) Division leader since 2005, McBranch led the Laboratory's efforts to commercialize new technologies and to partner with industry to strengthen Laboratory capabilities. By more effectively leveraging Laboratory intellectual assets, TT has grown the size and impact of the Laboratory's intellectual property portfolio. McBranch oversaw a strong growth in the funds-in for cooperative R&D agreements and non-federal work for others.

McBranch will be tasked with helping Wallace sustain scientific excellence, formulating and building PADSTE science strategy, science programs, and laboratory facilities, and helping guide the future development of the Laboratory's scientific work force.

McBranch considers his appointment a rare opportunity to help shape the Laboratory's future. "I think that today, more than any time in its history, the future of science at Los Alamos is being cast, said McBranch. "What we all do in the next few years will set the scientific course for the Laboratory for decades to come. It is particularly important as a capabilities-driven organization to grow a strong set of partnerships and programs that strengthen our national security missions."

McBranch came to the Laboratory in 1992 as a Director's Postdoctoral Fellow. He was a technical staff member and team leader through 1999, leading a research team investigating novel polymeric materials for nanotechnology with applications in optics and electronics.

McBranch has a broad technical background in materials chemistry, optics, and biotechnology. He received his doctoral degree in condensed matter physics from the University of California, Santa Barbara, and undergraduate degree in mathematics and physics from Whitman College in Walla Walla, Washington.

United Way Fall Fiesta

Music, food, and fun

There was a little bit of everything at the Lab's Fall Fiesta for United Way, including brief spits of snow. Despite the chilly weather, attendees were in good spirits, as they milled about to the music of Eddie Partridge of Accelerator Operations and Technology and the Nomads. The event also included a silent auction, games, and food, such as hamburgers that were flipped by Dan Gibson of KSL Services and Tom Cordova of Community Programs. Information from United Way funded agencies, such as Family Strengths Network, upper right, also was available at tables and booths during the event. Laboratory Director Michael Anastasio even got a new badge and became Marshal Anastasio at the Fall Fiesta. *Photos by Sandra Valdez, Records Management/Media Services and Operations*

A model of success

Summer of Applied Geophysical Experience program turns 25

by Caryn Johansen

"It's as heavy as a cement truck, but it works like a watch," said Lawrence "Larry" Braile, a professor from Purdue University. He was referring to the massive, roaring industry-grade piece of machinery called the Vibroseis truck shaking the ground on a mesa near Santo Domingo Pueblo roughly half way between Santa Fe and Albuquerque.

Braile, other instructors, and twenty-four students participated in the Laboratory sponsored Summer of Applied Geophysical Experience (SAGE), which turned 25 this summer.

The machine is what industry calls a truck-mounted vibrator. The Vibroseis truck, through a heavy pad on the ground, sends benign vibrational waves as deep as two to three kilometers into the ground that refract and reflect off layers of higher density, showing the students and the instructor where there is a change in the rock layers, for example.

For the past 25 years SAGE has attracted the best students from around the world interested in geophysics. The application process isn't difficult; however, students must meet certain academic standards, such as successfully completed courses in physics and math.

SAGE instructors are mostly looking for interest and motivation. A major in geophysics is not required.

Members of the SAGE faculty are among the best in the nation. Additionally, SAGE attracts some the best companies in geophysics, geology, and geological/mineral exploration. Students at SAGE familiarize themselves with state-of-the-art equipment and the latest software, much of it donated by companies.

Interest, motivation, and dedication drive SAGE. In the dry desert air with a storm looming to the west, a level of focus and eagerness to learn permeated through students and instructors alike.

SAGE is outstanding and long lasting because of its instructors, the core six who have been with SAGE most of the 25 years. The core faculty consists of

- Scott Baldridge of Geophysics (EES-11), co-director
- George Jiracek, co-director and professor of geology from San Diego State University
- Lawrence (Larry) Braile, professor and department head of earth and atmospheric sciences, Purdue University
- Shawn Biehler, professor of earth sciences at University of California, Riverside
- Bernard (Bernie) Gilpin, professor of physics and geology at Golden West College
- John Ferguson, associate professor and program head of the geosciences department at the University of Texas.

According to Baldridge, the faculty is "like a good baseball team. They work together well, and there is a high level of individual commitment."

Besides the core faculty, several newer staff members from Los Alamos, the U.S. Geological Survey, and Green Engineering consulting firm have joined the program to advance the students' experience.

In addition, geophysicists from several companies lead field experiments and assist with instructing students.

Since the beginning of the program, a huge focus has been on what could be improved for the next session. How could the students get a more satisfying experience from SAGE?

George Jiracek of San Diego State University and co-director of SAGE explains the principles of a geophysical method called "magnetotellurics" to SAGE students while they take a break during data collection.

Scott Urquhart, left, of Zonge Engineering and Research Organization Inc. explains to students in the Summer of Applied Geophysical Experience (SAGE) program how to perform transient electromagetics sounding to determine the depth to ground water. SAGE is an educational program designed to introduce students in geophysics and related fields to "hands on" geophysical exploration and research. *Photos by Caryn Johansen*

The faculty has made SAGE a flexible and adaptable program. SAGE, like any long-surviving program, has undergone changes that have been "more evolutionary than revolutionary," said Baldridge.

An example of such a change is the size and length of the program. The first SAGE program in 1983 had 42 students and lasted six weeks. In contrast, the 25 SAGE program had 24 students and lasted three weeks, allowing each student to have hands on experience and individual attention without completely exhausting the instructors.

The original SAGE was intended for students of participating faculty only. Now, student diversity is a main goal and is oft cited as one of the most valuable characteristics of the program. Though some of the foreign nationals in SAGE currently are studying in the United States, students from Mexico, Saudi Arabia, Lebanon, Germany, Sweden, and India have participated in SAGE.

The structure of SAGE also has undergone change to ensure each student gets the full experience. Instead of having one big group of students working sequentially from project to project, students are split up into teams and spread out around the area where SAGE is working at the time.

In addition to the major support of the Department of Energy and the National Science Foundation, a significant portion of SAGE is funded by industry involvement. Companies support SAGE with funding, personnel and the latest software and equipment. The Vibroesis truck was donated to SAGE by the executive vice president of Input/Output, a former SAGE student himself.

Companies are in turn invited to send representatives to SAGE to talk to, work with, and help teach students. Representatives promote job opportunities in the field and bring a sense of reality to the work.

"We're really interested in this experience," said Betsy Torrez, geoscience recruiting coordinator from ConocoPhillips. "We want to help out and enhance the program here, as well as offer career opportunities."

After 25 years, SAGE is running like clockwork. It's had its own "down years," said Baldridge, but it survived with support from the industries invested in SAGE. And like a fine wine, SAGE is only improving thanks to the faculty's dedication to providing the students' with a quality experience, and the general willingness to be flexible.