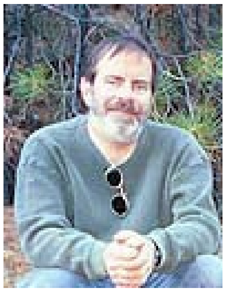


Clean room essential to Ossie Millican.

Page 2

DOE Pulse

Science and Technology Highlights from the DOE National Laboratories

Number 58 June 26, 2000

Research Highlights . . .

Berkeley Lab does its part for SNS:

A major milestone in the development of the Spallation Neutron Source —the accelerator-based facility at Oak Ridge that will provide the most intense pulsed-beams of neutrons ever available for scientific research—has been achieved at DOE's Lawrence Berkeley National Laboratory. A startup negative hydrogen ion source and low-energy beam transport (LEBT) system, the first two components of the SNS "front-end system," have been built and are now undergoing commissioning tests. Results so far could not have been better. In its maiden run, the ion source/LEBT successfully produced an intense beam of negative hydrogen ions (peak current of 46-milliamperes) at pulse lengths of 200 microseconds.

[Lynn Yarris, 510/486-5375, lcyarris@lbl.gov]

Pure titanium medical implant

Researchers at DOE's Los Alamos National Laboratory and Ufa State Aviation Technical University in Russia have developed a process for making strong, lightweight and corrosion-resistant medical implant material from pure titanium. The novel process nearly triples the strength of the titanium, and could have worldwide impact on the use of titanium medical implants in health care. The process creates medical implants that are strong enough to bear heavy loads without failure. The implant material is corrosion resistant and chemically compatible with body organs and fluids so it can remain in the body for years.

[Kay L. Roybal, 505/665-0582, k_roybal@lanl.gov]

Radioisotopes unravel groundwater mysteries

Researchers mapped the movement of naturally-occurring radioactive elements within Idaho's Snake River Plain aquifer and documented distinct transport paths—some areas essentially trap elements for decades while other areas are speedy corridors where water quickly passes through. This research challenges the traditionally held model that aquifers are uniform in flow and depth. Now scientists can make more accurate predictions about how and where contaminants move through the aquifer—a critical component of addressing the Department of Energy's environmental cleanup mission. The collaboration includes researchers from the Idaho National Engineering and Environmental Laboratory, Los Alamos National Laboratory and the University of Southern California.

[Deborah Hill, 208/526-4723, dahill@inel.gov]

Russian tech helps research to immobilize plutonium

Researchers at DOE's Lawrence Livermore National Laboratory are using Russian technology in developing methods to make the spread of nuclear weapons less likely. A "plutonium-oxide saltwasher" acquired by Livermore from the Russian Scientific Research Institute of Atomic Reactors will help remove unwanted chemicals from excess plutonium that authorities don't want falling into the wrong hands. Once treated, the plutonium can be immobilized in a ceramic matrix roughly the size and shape of a hockey puck, then further isolated for storage. The automated washer technology offers improvements in speed, efficiency and cost over existing methods, said Livermore researcher Mark Bronson.

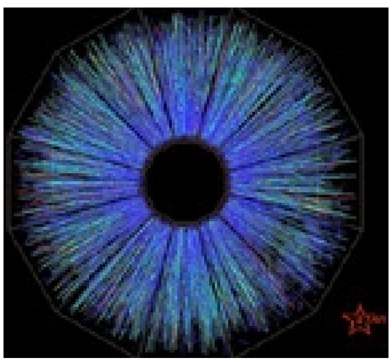
[Jeff Garberson, 925-423-3125, jbg@llnl.gov]

DOE Pulse highlights work being done at the Department of Energy's national laboratories. DOE's laboratories house world-class facilities where more than 30,000 scientists and engineers perform cutting-edge research spanning DOE's science, energy, national security and environmental quality missions. *DOE Pulse* (www.ornl.gov/news/pulse/) is distributed every two weeks. For more information, please contact Jeff Sherwood (jeff.sherwood@hq.doe.gov, 202-586-5806).

First Collisions at RHIC

Physicists working on the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory were exhilarated the week of June 12 as the new machine's first collisions were recorded by one detector, then another and another.

The 2.4-mile-circumference, dual-ring collider has four detectors—BRAHMS, PHENIX, PHOBOS, and STAR—each built by an international team of researchers to witness and study collisions between gold nuclei traveling close to the speed of light. In addition to Brookhaven scientists, who work on all four detectors, collaborators from Los Alamos, Lawrence Livermore and Oak Ridge National Laboratories contribute to PHENIX. The PHOBOS team includes researchers from Argonne National Laboratory. And scientists from Argonne and Lawrence Berkeley National Laboratory collaborate on STAR. By June 16, all four detectors were recording data from collisions.



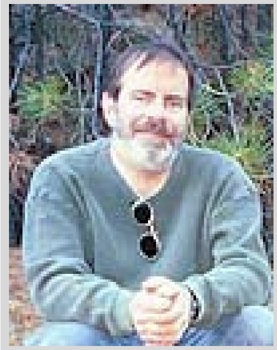
End view of particle tracks streaming from a heavy-ion collision, as recorded by the STAR detector at RHIC.

The goal of the collisions is to produce enough heat in a space about the size of an atomic nucleus to allow the quarks and gluons that make up nuclear matter to exist freely-as scientists think they did just after the birth of the universe. By studying this hot soup, called quark-gluon plasma, scientists will gain insights into the nature of matter and how the universe evolved. RHIC's first collisions, with beam energies of about 30 billion electron volts (GeV) per nucleon, are the highest-energy heavy-ion collisions ever achieved at a particle accelerator. And there are plans for RHIC to go even higher-to 66 GeV per nucleon, the goal energy for this summer's research run. Eventually, RHIC's beams will reach their maximum energy of 100 GeV per nucleon. These high-energy collisions will allow detailed studies of the quark-gluon plasma.

"We are crossing into a new frontier of scientific inquiry," said Energy Secretary Bill Richardson. "Scientists from around the world will use this facility to answer some of the most basic questions about the properties of matter and the evolution of our universe."

Submitted by DOE's Brookhaven National Laboratory

A CLEAN ROOM INDEED



Ossie Millican

"We've had clean rooms here at SLAC before, but this clean room has a few interesting features which make it different," said Ossie Millican, a 15-year veteran at DOE's Stanford Linear Accelerator Center. He's referring to a clean room being built for SLAC's venture into space-based experiments, the GLAST project.

The acronym stands for Gamma-ray Large Area Space Telescope, and it's a partnership among DOE, NASA, and collaborators in France, Germany, Italy, Japan, and Sweden. Scientists expect GLAST to make cutting edge discoveries in particle astrophysics after its launch in late 2005.

Millican's work at SLAC over the years includes a lot of tinkering, which is what he likes to do, but he agrees that this is a somewhat larger scale with more complexity. A clean room is a controlled environment in which loose particles are kept out by using air pressure to pump in filtered air.

Workers in clean rooms generally wear outfits affectionately called "bunny suits," which prevent particles from clothing and shoes from entering the system. "Think of your typical office building," says Millican. "That type of building would have maybe two to three changes of air per hour. This clean room will have 60–65 changes per hour."

"The GLAST telescope needs a clean room because of the wire bonding of the silicon wafers that are used in the space telescope and to prevent stray particles from being released in weightless conditions," says Millican. There are over 4.5 million of those wires, which means a very clean room indeed.

"Working on a clean room for GLAST that will be used for future space based experiments is a tremendous challenge. SLAC is a great place for always providing opportunities to build things, and this clean room is no exception."

Submitted by DOE's Stanford Linear Accelerator Center