*Powders spark Swank's interest*

*Page 2*

DOE Pulse

Science and Technology Highlights from the DOE National Laboratories

Number 65 October 2, 2000

# Research Highlights . . .

## "Cool" materials turn into hot research

Alloys that cool and heat dramatically in response to changes in magnetic fields—a property discovered at DOE's Ames Laboratory—could have applications that extend far beyond temperature regulation. The alloys, already under study for magnetic-refrigeration technology, may also be useful in sensors and energy-conversion devices. But first, scientists need to better understand why the gadolinium-silicon-germanium alloys respond so powerfully to changes in temperature and magnetic field. A four-year, DOE-funded project will enable Ames Lab to explore the properties of the alloys and several closely related materials. "These alloys could be among the most significant materials of the new millennium," says scientist Vitalij Pecharsky.

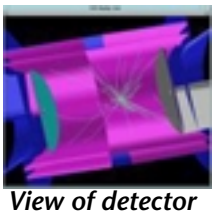
*[Susan Dieterle, 515/294-1405, dieterle@ameslab.gov]*

## Tin compound relieves bone cancer pain

About 75 to 80 percent of patients with prostate, breast, and lung cancer find that their cancers spread to bone, causing severe pain in the later stages of illness. Improving on their earlier invention, Brookhaven National Laboratory medical researchers Suresh Srivastava and George Meinken have refined the formulation as well as the method for making a tin compound that can be applied to pain management. The compound targets only the bone, sparing the marrow and soft tissue, but still delivers a highly localized dose of electrons to the tumors to ease pain without sedation.

*[Karen McNulty, 631/344-8350, kmcnulty@bnl.gov]*

## Collider Detector rolls in



*View of detector part and event*

In a major milestone for particle physics, the 5,000-ton Collider Detector at Fermilab collaboration has rolled into the Tevatron beamline for an "engineering run." The roll-in marks a new stage in preparations for Collider Run II at DOE's Fermi National Accelerator Laboratory. When Run II officially begins in March 2001, the 500-member CDF collaboration, along with an equal number of colleagues across the Tevatron at the DZero detector will take up the search for new physics at the energy frontier: the Higgs boson, supersymmetry, extra dimensions and other exotic phenomena.

*[Mike Perricone, 630-840-5678, mikep@fnal.gov]*

## 'You are there' in Argonne virtual research

To determine the microscopic culprit that has caused a costly work stoppage at a computer chip manufacturer, researchers from across the country gather at Argonne's the Materials Microcharacterization Collaboratory at DOE's Argonne National Laboratory to attack the problem. Although they work in different states, they haven't spent a dime on travel. In fact, they don't have to travel farther than their desktop computers. The Collaboratory uses an Argonne-developed technology to integrate expertise, data and state-of-the-art instruments from several sites over the Internet. The DOE 2000 project funded the Collaboratory to investigate research that transcends geographic, disciplinary and organizational boundaries and to bring scientists together to this virtual research laboratory.

*[Donna Jones Pelkie, 630/252-5501, djpelkie@anl.gov]*

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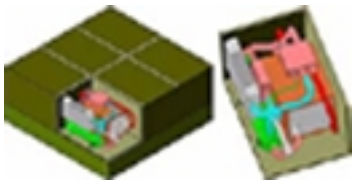
# Alliance catapults fuel cell development

DOE's National Energy Technology Laboratory and Pacific Northwest National Laboratory joined forces recently to launch a new fuel cell-focused program called the Solid State Energy Conversion Alliance.

Through SECA, program participants representing government agencies, commercial developers, national laboratories and universities will combine expertise and resources in support of a common goal—to bring a clean, affordable and highly efficient solid oxide fuel cell to market within 10 years.



*Fuel Cell*

"We envision a fuel cell system that not only meets the diverse power needs of many different markets, but one that runs on abundant fossil fuels, such as natural gas, gasoline and military fuels," said Subhash Singhal, Battelle fellow and director, fuels cells at PNNL.

Sponsors of SECA believe they can drive down the cost of fuel cells through the mass production of a versatile three-to-ten kilowatt-size fuel cell module. "Making fuel cells cost effective is critical to their widespread use within industry," said Mark Williams, NETL fuel cells product manager. "Through SECA, our goal is a solid-state fuel cell system that costs less than $400/kilowatt (kW) for stationary applications and even less for transportation applications."

Developers also are striving for a high fuel-to-energy conversion efficiency, which will result in significantly reduced carbon dioxide emissions and negligible emissions of other pollutants.

The module is being designed to meet energy needs in a range of markets, including residential, military and transportation. Nearer-term applications include auxiliary power to operate heaters, air conditioners and other accessories in autos and semi trucks and complex electronics on military equipment.

The mass-produced core modules will be combined like batteries for applications with larger power needs, thus eliminating the need for a custom-designed fuel cell stack to meet a specific power rating. SECA technology ultimately will lead to megawatt-size configurations for commercial/light industrial packages and Vision 21 central power stations applications.

Department of Energy funding for SECA is projected to be approximately $350 million over the next 10 years.

***Submitted by DOE's Pacific Northwest National Laboratory***

# Blazing powders spark Swank's interest

Sitting behind protective glass, mechanical engineer David Swank intently watches a glowing gas stream. He pushes a remote control, injecting tiny particles of metal into the stream. The particles hurtle toward their target, where they impact and form a thin metal coating.

***Glowing gas stream***

The thermal spray coating research performed by Swank and the physics group at the DOE's Idaho National Engineering and Environmental Laboratory helps companies monitor and control the thermal spray process.

The torch is key in making thermally sprayed coatings. The torch emits plasma, a stream of charged, heated gas (such as argon). "The plasma stream is bright, like a welding arc. It looks a continuous fountain of Fourth of July sparklers," says Swank.

When he's not pummeling things with powder in the lab, Swank is with his family. "I try to balance family and work," he says. An astronomy buff, Swank constructed a five-inch refractor telescope—big enough to see planets and galaxies. A photograph of his son and daughter—with the Hale-Bopp comet ablaze in the background—adorns his cubicle.

At the INEEL, Swank turns from hunting stars to tracking powder particles in the plasma. "Our group's forte is really understanding the process," says Swank. "We try to understand the link between the variables of the torch and the final product," he says.

"We can determine the temperature, velocity and size of individual particles," he says, "and we can measure up to one thousand particles per second." This information helps improve thermal spray equipment and processes, revealing how different particle velocities and temperatures affect the coatings.

Swank says he enjoys developing and using these instruments. "I like that I work at the desk analyzing and reporting data, and in the lab running experiments," he says. "It's one of the reasons I'm here at the INEEL."

***Submitted by DOE's Idaho National Engineering and Environmental Laboratory***