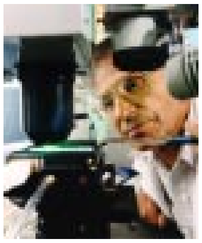

*Partners speed-read the genetic blueprint, page 2*

DOE Pulse

Science and Technology Highlights from the DOE National Laboratories

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# Research Highlights . . .

## Vital source for high-purity metals

When researchers need small amounts of high-purity metals or alloys to test their theories, they frequently turn to the Materials Preparation Center at Ames Laboratory. MPC can prepare, purify, fabricate and characterize more than half of the planet's naturally occurring metals. The staff has the expertise to develop custom materials in a variety of ways—as single crystals, powders, metal sheets, wires or ingots. Since its inception in 1981, MPC has aided thousands of scientists throughout the world who were unable to get small quantities of research-grade materials through commercial producers. "We're often a scientist's last hope," said MPC Director Larry Jones.

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

## Labs, university, chemical companies unite through Internet

Researchers at Northwestern University and two DOE laboratories—Pacific Northwest and Argonne—will partner with scientists and engineers at five chemical companies in an Internet-facilitated collaboration to study the chemical process by which pollutants can be neutralized at their source or in the environment. The Institute for Environmental Catalysis will be established with a five-year, $7.9 million grant from the National Science Foundation and the Department of Energy. Researchers at the three institutions will be linked electronically to industrial scientists at Allied Signal, Dow Chemical, Engelhard Corp., Union Carbide, and UOP Research Center.

***[Catherine Foster, 630/252-5580, cfoster@anl.gov]***

## Crystals arrive for SLAC's B Factory

DOE's Stanford Linear Accelerator achieved another milestone with the final delivery of crystals for the BaBar detector. BaBar has 6580 crystals in an array weighing over 23 tons. Grown from salt of the highest purity, the foot-long crystals were doped with thallium iodide, allowing the crystals to emit light when struck with subatomic particles from the storage rings of the B Factory. SLAC's need for crystals came close to the world's annual production. An aggressive procurement strategy was cost effective and time efficient to keep this international collaboration on schedule.

***[P.A. Moore, 650/926-2606, xanadu@slac.stanford.edu]***

## Strange quarks are also scarce

A recent experiment at the DOE's Jefferson Lab has announced results that could prove among the decade's most important in the field of nuclear physics: strange quarks are surprisingly scarce in ordinary nuclear matter. This finding, and expected follow-on results, should enlarge our understanding of proton structure, leading to a more complete understanding of the nuclear material that makes up most of the world around us. The research team partially credits the experiment's success to the quality of the beam from Jefferson Lab's accelerator, which has unprecedented resolution and extraordinary stability, eliminating effects that could destroy the interpretability of the experimental data.

***[Linda Ware, 757/269-7689, ware@jlab.org]***

***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).

# Labs combine efforts to develop new high-temperature material

Peek inside jet engines and you'll see cooling fans that keep the fuel from burning too hot. The reason? Steel and other superalloys used in the engine begin to melt as temperatures climb past 1000°C.

But if jet engines, car motors, turbines and furnaces could withstand temperatures of up to 1600°C, fuel could burn hotter. That would eliminate the need for fans and would allow the power sources to operate more efficiently. Scientists participating in the Design and Synthesis of Ultrahigh Temperature Intermetallics Project, a five-year, multi-laboratory effort funded by DOE, are working with a material that may solve the high-temperature problem. At the heart of the project is a molybdenum-silicon-boron alloy with promising properties that were discovered by Ames Laboratory senior ceramic engineer Mufit Akinc.

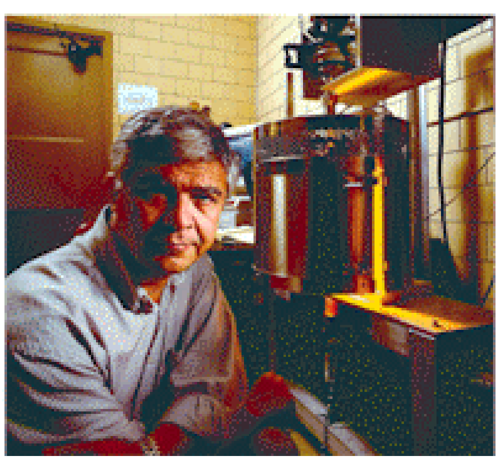
The molybdenum compound resists corrosion in the presence of air and holds its shape at temperatures of 1600°C. "It may sound simple, but it's so drastic," Akinc said. "You're getting into a temperature regime where the material becomes almost white-hot."

The project, which began in late 1996, divides $300,000 per year among the eight participating DOE national laboratories—Ames, Argonne, INEEL, Lawrence Berkeley, Lawrence Livermore, Los Alamos, Oak Ridge and Sandia—and the University of Illinois. The funding helps redirect research efforts toward Akinc's material and stimulates collaborative efforts among the 25 scientists involved in the project.

There are some kinks in the material that need to be worked out in order to make it a viable alternative to steel and superalloys. Each of the labs is tackling different parts of the problem and sharing the findings with the group. "We're making significant progress in a relatively short amount of time," said Oak Ridge's Roddie Judkins, one of the project's two coordinators.

"We've got a lot of good science in this investigation. That's one reason I think it will be successful."

***Submitted by DOE's Ames Laboratory***



***An alloy discovered by Ames Laboratory's Mufit Akinc could help solve the heat problem in jet engine design.***

## Reading DNA in "complete sentences"

A soft-spoken grandfather who rides a unicycle is probably not the first image that leaps to mind when thinking of scientists who are revolutionizing research.

But Andrei Mirzabekov, director of the Human Genome Project at the DOE's Argonne National Laboratory and director of the Engelhardt Institute of Molecular Biology in Russia, is not a typical scientist.

Splitting the year between the two research institutions, Mirzabekov is at the center of a joint project that will result in rapid advances in medicine, health care and agriculture, under a new partnership with Motorola Inc. and Packard Instrument Company.

The project, which aims at commercializing and marketing advanced biochips and related analytical technologies, is expected to make the process of decoding genes a thousand times faster than with current technologies.

"Instead of reading DNA one letter or word at a time, they read whole phrases and sentences at a time," Mirzabekov said. "It's like speed-reading the genetic code with one hundred percent comprehension. By combining biochips with robots and computers, we can find one genetic variation among three billion DNA bases in a matter of minutes. Conventional methods take days."

This biotechnology will have myriad applications in life science, including medical diagnostics, drug discovery, environmental restoration and agriculture. Medical diagnostics is where the greatest impact is expected. Widespread use of biochips will remove the guesswork from early treatment of many diseases and conditions.

By using less than a drop of test solution, doctors will be able to predict drug efficacy, to diagnose drug resistance to treatment for diseases, and to make on-the-spot identification of specific bacteria, viruses, and other micro-organisms. This makes Mirzabekov the grandfather very happy. "My grandson, by the time he is grown, will be able to carry with him his entire genetic code on a biochip," he predicts.

***Submitted by DOE's Argonne National Laboratory***