LANL's Manvendra Dubey with team.

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DOE Pulse

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DOE completes 1 million miles of hybrid electric vehicle testing

If the purchase of a new hybrid electric vehicle is in your future, you may be interested in the results of recent testing by DOE. The Advanced Vehicle Testing Activity, managed by DOE's Idaho National Engineering and Environmental Laboratory, recently completed 1 million miles of hybrid electric vehicle fleet testing. The testing includes the miles-per-gallon fuel use, vehicle maintenance and repair data for 18 vehicles, including Honda Civics and Insights, and the Toyota Prius. The cars' fuel efficiencies range from 38 to 46 miles per gallon. Each hybrid vehicle is also dynamometer and track tested. Details of the testing are available on the web at avt.inel.gov.

[Steve Zollinger, 208/526-9590; gaz@inel.gov]

Fermilab's SELEX experiment gets long look at surprising new particle

Scientists of the SELEX fixed-target experiment at DOE's Fermilab have observed an unexpected new member of a family of subatomic particles called "heavy-light" mesons. This new meson, a combination of a strange quark and a charm antiquark, is the heaviest ever observed in this family. As a rule, the more massive the meson, the shorter its lifetime before decaying into other particles. But this comparatively heavy meson lives three times longer than its lighter relatives. SELEX also saw the new meson decay about six times more often than expected into an eta particle (a rarer but well-studied member of the meson family), rather than into the expected particle, called a K meson.

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First Light for SNIFS

The moniker may be inelegant, but the concept is cutting-edge: SNIFS, the Supernova Integral Field Spectrograph built by the international Nearby Supernova Factory (SNfactory), uses lenslets to produce 200 spectra within a six-by-six arc-second region surrounding target supernovae, including their home galaxies and surrounding sky. After months of alignment, calibration (and bad weather) atop Mauna Kea, where SNIFS is mounted on the University of Hawaii's 2.2-meter telescope, the Snfactory, led by DOE's Lawrence Berkeley National Laboratory, declared "first light" late in June. SNIFS will add to the supernova database and improve measurements crucial to choosing among the competing theoretical models of dark energy.

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PNNL teams on storage technology development for data-intensive computing

DOE's Pacific Northwest National Laboratory has formed a research alliance aimed at enabling a new generation of fast and efficient storage technology for data-intensive computing. Part of a long-term collaboration between PNNL and Silicon Graphics, the alliance includes options for more than 2.5 petabytes of storage over the next two years. PNNL will conduct research into "active storage," a groundbreaking effort to shift computation and transformation of data from client computers to storage devices. The effort holds the promise of dramatic productivity breakthroughs for a broad range of computing disciplines saddled by large data.

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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).

ORNL, university researchers determine just how 'old in the tooth'

Methods routinely used by health physicists at DOE's Oak Ridge National Laboratory to do radiation measurements and determine personnel exposures are helping University of Tennessee researchers determine the age of anthropological finds.

Jim Bogard and his team in the Dosimetry Applications Research Calibration Laboratory are using radiation testing equipment to date finds such as a bovid (horse or cow) tooth found near an ancient human tooth on the island of Java, Indonesia.

By testing the bovid tooth, researchers can determine the age of the rare human tooth while still preserving it. They conservatively estimate the tooth is half-a-million years old.

"We determine the age of the fossil by something called radiation damage dating," Bogard said. "The people from UT determine what is anthropologically significant and we do the physical measurements."

First, scientists determine the radiation dose of the sample by extracting electrons that have been promoted into "traps" in the tooth by natural radioactive materials in the surrounding soil.

Techniques such as thermoluninescence (TL) or Optically Stimulated Luminecese (OSL) are commonly used to empty the traps. TL uses heat energy to make the excited electrons fall back to the ground state, emitting measurable energy in the form of light. OSL extracts the information by applying a laser beam to heat a portion of the sample.

Electron Spin Resonance (ESR) is an alternate method to determine dose. ESR measures the spin of the promoted electron by placing it between two magnets half the size of a VW car and applying a superimposed oscillating field. Scientists use this technique to detect and count the trapped electrons.

The radiation sensitivity of the sample is also measured and is used with the TL, OSL or ESR results to calculate the radiation dose to the sample.

Life Sciences Division health physicist Michael Murray's job is to determine the dose rate of the sample's contextual material using a gamma spectrometer. The instrument looks at sharp peaks in an energy spectrum generated in the test to determine what radioactive elements are present and in what amount.

By dividing the dose by the dose rate, researchers can determine the relative age of the fossil.

By applying radiological testing techniques to the dating process, ORNL scientists hope to be able to solve some of anthropology's greatest mysteries.

"We want to find out 'where did we come from?' and 'what paths did we take to get here?'" Bogard said. "The whole deal with anthropology is to figure out the story of man." — *Written by Amy Merrick*

Submitted by DOE's Oak Ridge National Laboratory

Passion for Understanding the Atmosphere

Dubey standing in background) watches members of his team.

Manvendra Dubey has a passion for understanding the Earth's atmosphere that has taken him around the world. As the Geochemistry Team Leader in the Earth and Environmental Sciences Division at Los Alamos and the Climate Focus Leader for the Laboratory's Institute of Geophysics and Planetary Physics, Dubey works closely with Los Alamos staff members, postdocs, and students to understand processes and couplings across the air-plant-soil-water interface by integrating computer modeling with laboratory measurements and field observations.

Dubey began his chemistry studies at the Indian Institute of Technology in his native India. In 1994, Dubey received a Ph.D. in chemical physics from Harvard University where he assisted a group that established the causal link between the chlorofluorocarbons and the Antarctic ozone hole. In 1995, Department of Energy, NASA, and National Science Foundation selected him as an Emerging Senior Scientist in Atmospheric Science.

As an active member of American Geophysical Union, American Chemical Society and the American Association for the Advancement of Science, Dubey nurtures strong interdisciplinary science collaborations in earth system science and as a result has published extensively in a variety of scientific journals and public policy areas. The geochemistry team he leads at Los Alamos has research programs in such diverse earth science areas as water and air quality, carbon management, environmental remediation, containment of radioactive waste, nuclear repositories, global climate change, remote sensing and threat reduction.

At the heart of Dubey's current research is work aimed at resolving what Dubey calls "the aerosol-climate-water puzzle". That research connects the Laboratory's core capabilities in climate modeling and satellite remote sensing with state-of-the-art laboratory experiments.

Submitted by DOE's Los Alamos National Laboratory