Dobson's research leads to prehistoric theory

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Landmine detection made easy

Creating a technology that can quickly and easily detect landmines can be as daunting a challenge as removing the deadly weapons. But a promising detector being built at DOE's Pacific Northwest National Laboratory promises to do just that. PNNL has developed a prototype of an affordable, easy-to-use method to detect landmines. Called the Timed Neutron Detector, it offers benefits not available from many of today's existing detection technologies—low price, quick assessment, ease of use and, most importantly, the ability to detect mines containing little or no metal. The system can scan a 100-square-foot area at a walking pace. Also, the system is portable and lightweight, which makes it more appealing for scanning large areas.

[Staci Maloof, 509/372-6313, staci.Maloof@pnl.gov]

New transistor on the block

Nano-transistors being developed at DOE's Oak Ridge National Laboratory could change the complexion of the electronics industry. Transistors, which can be used as amplifiers, detectors or switches, are integral parts of computers, telephones and virtually all electronic components. Traditional transistors are based on single energy barriers that electrons either tunnel through or attain sufficient energies to overcome. ORNL's electron device—10 times smaller than conventional transistors—is based on multiple energy barriers, resulting in an effective energy barrier that can be either raised or lowered, thereby modulating electron flow. The device is also potentially much faster than a conventional transistor.

[Ron Walli, 865/576-0226, wallira@ornl.gov]

NREL releases building design tool for beta review

Researchers at DOE's National Renewable Energy Laboratory recently released a new version of the Energy-10 computer program for beta review. Energy-10 version 1.4 can now evaluate building-integrated and stand-off photovoltaic (PV) system performance. Energy-10 helps architects and building designers quickly identify the most energy-saving measures for small commercial and residential buildings. The PV system description accommodates up to four building-integrated (wall-, roof- and window-integrated) arrays and one stand-off array, all grid-tied and fed through a single inverter. Powerful output graphs allow the user to study the results at any level of detail.

[Sarah Holmes Barba, 303/275-3023, sarah_barba@nrel.gov]

Reservoir stimulation test a success

A better method of recovering natural gas from low-production wells was successfully tested at a 12,300-foot natural gas well in Carlsbad, New Mexico. Through a DOE co-funded project managed by DOE's National Energy Technology Laboratory, RealTimeZone, Inc. was able to mix two materials deep inside the well, instead of at the surface, to fracture the rocks and obtain more gas. A well scheduled for abandonment produced 300,000 cubic feet of natural gas per day. This method saved 50 percent over conventional stimulation costs in the same formation. Using this technology on just 20 percent of the stimulations performed could save the industry over $100 million per year.

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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).

NewNet stations bound for Bilbino

A network of United States–based environmental monitoring stations will eventually expand to include a Siberian nuclear plant, thanks to a multi-lab, multi-national effort.

NEWNET, the Neighborhood Environmental Watch Network based at DOE's Los Alamos National Laboratory, consists of stations that have sensors for monitoring wind speed and direction, ambient air temperature, barometric pressure, relative humidity and ionizing gamma radiation. The heart of the system, usually mounted on tall, slender metal stands with antenna built in, is the software and computers that transmit the data to a meteorological satellite and thus to the laboratories and to the public via the Internet.

The NEWNET staff at Los Alamos has partnered with the International Center for Environmental Safety, an organization with directors in Moscow and at DOE's Idaho National Environmental and Engineering Laboratory, to pursue the goal of establishing monitoring stations around the Bilibino community of northeastern Siberia. Key partners also include DOE's Pacific Northwest National Laboratory and Sandia National Laboratories, whose staff has been instrumental in coordinating the effort. "This isn't something that just happens, you have all these players to coordinate," said LANL researcher Larry Sanders. "None of us could have done this without the other." The project is funded by DOE's Office of Nonproliferation and National Security.

The plan, still in its early stages, is to find a way to install NEWNET stations in the vicinity of the Bilibino power plant, the first Russian nuclear power station built above the Arctic Circle. The town is in the central part of the Chukotka peninsula, closer to Nome, Alaska, than to Moscow, and the plant provides electricity for the regional mining industries. It has four small graphite-moderated reactors, used for electricity production and to heat water for the city's central heating installation. The power plant, producing 48 megawatts, is not far from the Bering Strait.

For the Bilibino project, the station locations will be selected on the basis of likely dispersion patterns and prevailing winds around the nuclear plant. Los Alamos researcher Cheryl Rofer notes that siting decisions will also take into account information relating to terrain, conversations with local residents, precipitation data and similar information. The equipment will be Russian wherever possible, both for ease of access and repair, and one challenge will be to make the US and Russian systems compatible.

NEWNET was started in 1993 with stations in Nevada, California, Utah, and New Mexico. It is based on concepts developed by DOE for the Community Monitoring Program at the Nevada Test Site Nuclear Testing Facility.

Current NEWNET units, placed across New Mexico and in several locations in Alaska, are solar powered but with some battery/electrical backup for dark winter days. For Bilibino, some may be close to the plant and have access to the AC power. Others may need other sources of energy such as wind, energizing storage batteries in anticipation of dark or cloudy days. If the Russian power station staff has developed ideas for improving cold weather performance challenges, existing stations in Alaska may benefit from the new information as well.

Submitted by DOE's Los Alamos National Laboratory

Dobson's research leads to prehistoric theory

Jerry Dobson

Jerry Dobson, a researcher at DOE's Oak Ridge National Laboratory, spends his research hours with his specialty, geographic information systems. He led the development of LandScan, a global population database that allows users to estimate populations at risk in the event of natural or man-made disasters. That work is part of the Department of Defense's Hazard Prediction and Assessment Capability.

His work with geographic information systems also led him to a controversial theory—that Neandertal, the mysterious prehistoric human being, may have differed from modern humans primarily by having a less efficient thyroid gland and an iodine-poor diet.

Dobson was working on a program to use satellites to measure ongoing changes in modern coasts when an idea came to him. Neandertals appeared to live in mountainous, glaciated areas that are deficient in iodine—a necessary nutrient readily found in coastal food sources.

A lack of iodine in the diet can cause a condition called, in its severest form, cretinism which is characterized by physical deformity and mental retardation.

"Distinctive Neandertal traits—overall body proportions, heavy brows and muscles, dental development and wear and propensities for degenerative joint diseases—are identical to those of modern humans suffering from cretinism," Dobson says.

Neandertals could have had a genetic inability to extract iodine, exacerbated by a lack of it in their diet. But iodine deficiency afflicts people in inland areas today—750 million people today suffer from goiter, which is caused by a lack of iodine in the diet.

Dobson's published theory was bound to spark debate, and it has. Many researchers agree that more research on iodine and Neandertal is in order. It's one of the most intriguing mysteries of the prehistoric world.

Dobson also serves on the council of the American Geographical Society.

Submitted by DOE's Oak Ridge National Laboratory