

# Work begins on world's deepest underground lab

June 22 2009, By DIRK LAMMERS , Associated Press Writer

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Dignitaries and board members applaud South Dakota Gov. Mike Rounds, at the podium, during dedication ceremonies Monday, June 22, 2009, at the future site of the Sanford Underground Science and Engineering Laboratory. The event occurred at the 4,850 foot level of the former Homestake gold mine at Lead, S.D. In the near future, scientific experiments dealing with dark matter and numerous other ideas will be set up in the mine shafts nearly a mile underground, shielded from cosmic rays. (AP Photo/Steve McEnroe)

(AP) -- Far below the Black Hills of South Dakota, crews are building the world's deepest underground science lab at a depth equivalent to more than six Empire State buildings - a place uniquely suited to scientists' quest for mysterious particles known as dark matter.

Scientists, politicians and other officials gathered Monday for a groundbreaking of sorts at a lab 4,850 foot below the surface of an old gold mine that was once the site of Nobel Prize-winning physics research.

The site is ideal for experiments because its location is largely shielded from [cosmic rays](#) that could interfere with efforts to prove the existence of dark matter, which is thought to make up nearly a quarter of the mass of the universe.

The deepest reaches of the mine plunge to 8,000 feet below the surface. Some early geology and hydrology experiments are already under way at 4,850 feet. Researchers also hope to build two deeper labs that are still awaiting funding from Congress.

"The fact that we're going to be in the Davis Cavern just tickles us pink," said Tom Shutt of Case Western Reserve University in Cleveland, referring to a portion of the mine named after scientist Ray Davis Jr., who used it in the 1960s to demonstrate the existence of particles called solar neutrinos.

Davis and a colleague named John Bahcall won a share of the 2002 Nobel Prize for physics for their work.

The old Homestake Gold Mine in a community called Lead (pronounced LEED) was shut down in 2001 after 125 years. Pumps that kept the mine dry were turned off years ago, so workers have been drying it out to prepare for the new research.

Before the labs are built, crews must also stabilize the tunnels and install new infrastructure. The lab at 4,850 feet is not much to look at yet. A rusty orange film covers the walls, floors, ceilings and debris left behind by miners.

The first dark matter experiment will be the Large Underground Xenon detector experiment - or LUX - a project to detect weakly interacting particles that could give scientists greater insight into the Big Bang explosion believed to have formed the universe.

Shutt, along with Brown University's Rick Gaitskell and nearly a dozen collaborators will work at the site to search for dark matter, which does not emit detectable light or radiation. But scientists say its presence can be inferred from gravitational effects on visible matter.

Scientists believe most of the dark matter in the universe contains no atoms and does not interact with ordinary matter through electromagnetic forces. They are trying to discover exactly what it is, how much exists and what effect it may have on the future of the universe.

Physicists have said that without dark matter, galaxies might never have formed. By learning more about dark matter, they hope to understand better whether the universe is expanding or contracting.

The research team will try to catch the ghostly particles in a 300-kilogram tank of liquid xenon, a cold substance that is three times heavier than water. If they tried to detect [dark matter](#) above ground, the highly sensitive detector would be bombarded by cosmic radiation.

Scientists hope to start construction on the two deepest labs by 2012 and open them by 2016. The projects are expected to cost \$550 million.

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On the Net:

Sanford Underground Lab <http://sanfordlaboratoryathomestake.org/>

Homestake DUSEL: <http://www.lbl.gov/nsd/homestake/>

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Citation: Work begins on world's deepest underground lab (2009, June 22) retrieved 20 March 2024 from <https://phys.org/news/2009-06-world-deepest-underground-lab.html>

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