A gold mine, 70,000 gallons of water — and the hunt for WIMPS

Yale UniversityYale University

The experiment is sunk — just as planned.

Scientists involved in the Large Underground Xenon experiment (LUX) have submerged an ultrasensitive particle detector in more than 70,000 gallons of water nearly a mile beneath the Black Hills of South Dakota — a major step in their attempt to directly observe dark matter, one of nature's most elusive subatomic particles.

"If nature is kind, then we could be the first to detect dark matter particles," said Yale physicist Dan McKinsey [1], a key player in the project. "We've been working hard to build LUX, and we're on the verge of turning it on in a low-background environment."

Most of the universe is believed to be composed of dark matter (as opposed to electrons, protons and neutrons); dark matter particles are called weakly interacting massive particles, or WIMPs.

But dark matter has never been directly detected. The LUX project, underway in a former gold mine, is racing to be the first to succeed in this quest. Other efforts are underway in Canada, Italy, and China.

In all, about a dozen Yale professors and students, including two undergraduates, are involved in the project, based in Lead, South Dakota. McKinsey, associate professor of physics at Yale, is currently LUX's co-spokesman. He previously served as its executive chair. Peter Parker [2], professor of physics and astrophysics, is also a member of the team.

The Yale team's specific responsibilities within LUX include purifying the xenon used to detect dark matter; preparing calibration systems for illuminating the detector with neutrons and gamma rays, which will allow scientists to quantify its performance; and applying the high voltage necessary to extract ionization signals from dark matter events.

To identify dark matter, the detecting device must be shielded from cosmic radiation, as well as natural radiation from rocks on earth. That's why scientists have placed it in a stainless steel tank filled with highly purified water at the bottom of a mineshaft.

Researchers will try to find signs that dark matter particles are colliding with atoms of xenon inside the LUX detector.

LUX will begin taking data in January 2013, when it is filled with ultra-pure liquid xenon, McKinsey said.

In all, LUX researchers represent 17 universities and national laboratories in the U.S. and Europe.

Read more [3].

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[1] http://physics.yale.edu/mckinsey
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