

Dark-matter labs become subterranean centres for science

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Deep beneath our feet, below mountains and mine shafts, a scientific transformation is taking place.

Laboratories that were custom built to search for particles such as neutrinos, and most recently mysterious dark matter, are now being exploited by researchers all over the world to explore science outside the realm of astroparticle physics.

Writing in May's edition of *Physics World*, Sean Paling, director and senior scientist at the Boulby Underground Laboratory in the UK, and Stephen Sadler, director at Durrigge UK Radon Instrumentation and honorary research fellow at the University of Sheffield, describe how these deep [underground](#) laboratories are branching out into a wide range of topics, from research into instruments for Mars rovers to muon tomography, radioactive dating and astrobiology.

The Boulby laboratory, like many other underground labs in the world, offers an environment almost entirely free from cosmic-ray-particle interference, which is a constant source of unwanted particle noise on the Earth's surface. Many groups beyond [particle physics](#) have realized that these environments would benefit their research too.

As a result, there has been an explosion in funding proposals followed by the diversification of these labs. Boulby now hosts a variety of projects including astrobiology and developing techniques to monitor buried carbon-dioxide gas in future carbon capture and storage schemes.

Boulby is not alone in this relatively new interest in diversification; at the Canfranc Underground Laboratory in Spain, scientists are exploring the link between seismic activity and river discharge and at Gran Sasso National Laboratory in Italy, physicists are using gamma-ray spectroscopy to date ice cores.

"Each deep-underground lab has a unique offering depending on its location and geology," Paling and Sadler explain.

Boulby is considered to be at the forefront of this diversification and hosts projects with extraterrestrial aims, testing a new generation of troglodytic Mars rovers as well as projects focused on monitoring [carbon capture](#), dating materials and measuring the radioactivity of materials.

"If we want to successfully explore Mars, we need to go to Mars-like places on Earth. The dark environment of Boulby Mine is the ideal place to understand underground life and test space technologies for the exploration of Mars," says Charles Cockell, director of the UK Centre for Astrobiology.

Boulby's future looks bright with a recent £1.8m grant from the UK's Science and Technology Facilities Council to build a brand new underground lab adjacent to the existing one. This new lab will not only be a multidisciplinary hub for science but will also host and support the UK's efforts in the world's next phase of dark-matter-search experiments.

Provided by Institute of Physics

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