

Searching for dark matter in Stawell

What is dark matter?

The nature of dark matter is one of the great mysteries of the universe. Scientists know that dark matter constitutes 84% of the matter of the universe and is a substance that holds galaxies together. However, it is very hard to detect as it does not absorb, reflect or emit light.

Around the world, scientists are working to understand this mysterious substance. Part of that search is happening in the regional Victorian town of Stawell.

The Stawell Underground Physics Laboratory (SUPL)

SUPL is a laboratory built 1km underground in the Stawell Gold Mine and is the only underground laboratory in the Southern Hemisphere. SUPL will house the first major dark matter experiment in Australia: the SABRE South experiment.

An underground site for the experiment was necessary because the search for dark matter requires the use of very sensitive equipment and as little interference as possible.

The layers of rock in the gold mine protect the experiment from any cosmic interference that occurs in the atmosphere. The laboratory will also be used for other research in the physics, geology and biology fields into the future, providing a long-term asset for Australia's scientists.

Why Stawell?

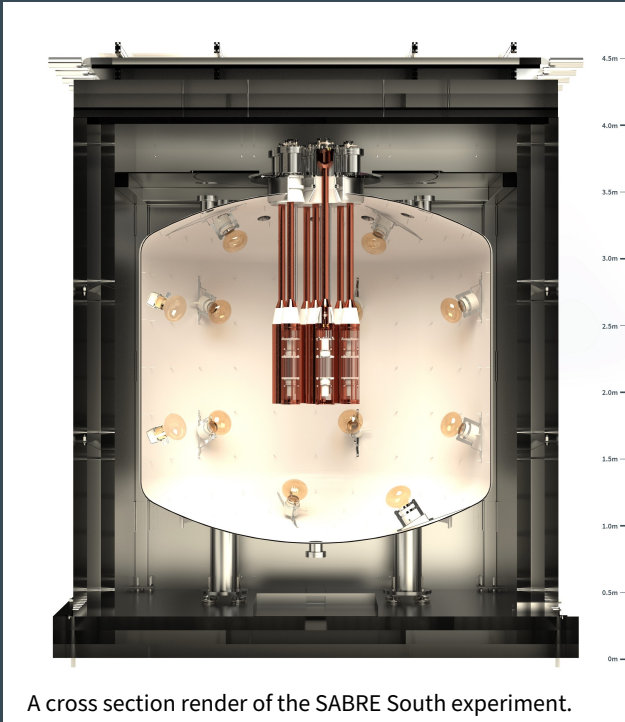
The dark matter experiment needs to be situated more than 800m underground, and Stawell Gold Mine is one of the deepest mines in Australia. SABRE South mirrors an experiment in the Northern Hemisphere at Italy's Laboratori Nazionali del Gran Sasso. A site in both hemispheres ensures that seasonal variation does not impact the results in any dark matter detection.

Who is involved?

Members of the ARC Centre of Excellence for Dark Matter Particle Physics (CDM) helped develop the underground laboratory.



CDM Director Elisabetta Barberio delivers a talk in Stawell.



A cross section render of the SABRE South experiment.

The SABRE South experiment

The flagship experiment of SUPL, SABRE South, aims to detect dark matter particles via their scattering off nuclei in an array of high radio-purity thallium-doped sodium iodide (NaI(Tl)) scintillating crystals deployed in a liquid scintillator veto system.

The full detector measures about 4m x 4m x 4m, including the scintillators and shielding.

The experiment has been designed to confirm or refute the strongest claim of evidence for dark matter direct detection by a similar experiment in the Northern hemisphere, DAMA/LIBRA.

The 'South' part of the experiment's title refers to the Southern Hemisphere; SABRE South has a twin experiment in the Northern Hemisphere in Italy.

International, national and local benefits

International

The discovery of dark matter would change the way we understand the universe.

This leap forward in human knowledge has the potential to expand our knowledge and lead to new discoveries that may have an untold impact on the way we live.

The CDM also brings together scientists from around the world, nurturing a culture of international collaboration.

National

The research carried out in SUPL will put Australia at the forefront of scientific exploration and nurture the scientific leaders of the future.

SUPL will be an important facility for future scientific research, including the work of the Australian Nuclear Science and Technology Organisation (ANSTO).

Through its outreach work, the CDM is visiting communities and schools across Australia to spread the message that science is for everyone.

Local

The CDM is working with school students in Stawell to provide front row access to the world-leading science happening in their backyard.

Through public events, the CDM is also engaging with the Stawell community to foster an interest in science and an understanding of the exciting potential of careers in physics.

Acknowledgements

The development of SUPL and SABRE South would not have been possible without the support of many individuals, businesses and organisations.

These include:

- The Australian Research Council (ARC)
- The Victorian Government (Regional Development Victoria)
- Stawell Gold Mines
- Northern Grampians Shire Council
- H. Troon
- Member and partner universities
- The Australian Government



Engaging with secondary school students


Find out more

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