2021/08/12 **SNOLAB User Meeting** 

# **SNOLAB** Introduction

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**Jeter Hall Director of Research** 



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# 2021 User's Meeting

This workshop is the second SNOLAB User's Meeting, the other was in 2016

The workshop has a number of goals:

- Recognize and celebrate the student work at SNOLAB
- Allow some mixing, socialization, and insight between different user groups and the SNOLAB staff

We are happy to receive feedback on the format and topics (jeter.hall@snolab.ca)

Special thanks to all the speakers and the organizing committee (Blaire Flynn, Erica Brunelle,

Christina Kraus, Miriam Diamond, and Ken Clark). Also thank you to Laerie for all the work building the Gathertown!



## About me

- Westminster College of Salt Lake City (B.S.)
- University of Utah (M.S., Ph.D.)
  - Gamma-ray astronomy
- Postdoctoral studies at Fermilab (Illinois)
  - Underground dark matter experiments
- Scientist at Pacific Northwest National Lab (Washington)
  - Dark matter, nuclear treaty verification
- Special advisor in the Department of Defense (Virginia)
  - Nuclear threat detection
- Director of Research at SNOLAB (Ontario)
- Picked up a family (2 children) along the way. Spend time gardening, gaming with my boys





SNOLAB

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## **SNOLAB**

SNOLAB hosts rare event searches and measurements. It's located 2 km underground in the active Vale Creighton nickel mine near Sudbury, Ontario, Canada.

SNOLAB is operated jointly by University of Alberta, Carleton University, Laurentian University, University of Montreal, and Queen's University

SNOLAB operations are funded by the Province of Ontario, and the Canada Foundation for Innovation



## **SNOLAB Science**

The science at SNOLAB is currently focused on fundamental particle physics. Primarily looking at further investigating the nature of matter. Specifically:

- What is the nature of dark matter?
- What is the nature of the neutrinos?

SNOLAB is interested in collaborating on any scientific research that requires deep underground facilities. For example:

- Neutrino observatories (solar, supernovae, geo, reactor, etc.)
- Effects of radiation on biological systems
- Environmental monitoring (nuclear non-proliferation, aquifers, etc.)





### Supernovae cause dominant backgrounds to this science in surface labs



Crab Pulsar Plenon (Supernova

1054) Hubble and Chandra Space Telescopes, NASA



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## Muons are reduced by going deep underground

An international set of laboratories are exploiting the science enabled by reducing this muon background

Note SNOLAB has the lowest backgrounds due to its extreme depth and flat overburden



## **Strategic goals**



Enable and spearhead world-class underground science



Develop and maintain world-class facilities and infrastructure



Educate, inspire, and innovate



Develop delivery systems of internationally recognized standard

## **Core values**



#### Safety

This is the foundation upon which we realize our mission: We are committed, both individually and as a team, to protecting the health and safety of our staff, users, and visitors

#### Excellence

SNOLAB is committed to fostering a culture in which individuals make full use of their skills and knowledge, and provides opportunities to develop through continual improvement. Our focus is on delivering high-quality research, through driving, supporting, and enabling excellence in research and operations.



#### Teamwork

Our approach to teamwork is based on the belief that each member brings unique experience and important expertise to the workplace, allowing project challenges to be resolved and creating a work environment that supports cooperation and collaboration in all aspects of work.



#### Inspiration

We strive to educate and inspire as a core component of our commitment to our public sponsors. To showcase the enthusiasm of our staff and users, and the excitement of the research undertaken, SNOLAB will continue to engage fully in professional and public outreach.

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#### Accountability

SNOLAB is committed to upholding an environment of trust, responsibility, and accountability to our stakeholders. Accountability to internal governance structures, external research communities, funding agencies, and public sponsors is an ongoing goal. Strong governance and effective management will guide our organizational development.

# SNOLAB by the numbers

SNOLAB hosts a growing community of scientists, researchers, students, and collaborators from across Canada and around the world.

We see this continuing, but with growing pressure on the underground and surface campus.

### 137 employees





SNOLAB



## **Funding and People**



SNOLAB	layout
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Area	Dimensions	Area	Volume
SNO Cavern	24m (dia) x 30m(h)	250m <sup>2</sup>	9,400 m <sup>3</sup>
Ladder Labs	32m(l)x6m(w)x5.5m(h)	190m <sup>2</sup>	960 m <sup>3</sup>
	23m(l)x7.5m(w)x7.6m(h)	170m <sup>2</sup>	1,100 m <sup>3</sup>
Cube Hall	18.3m(l)x15m(w) x 19.7m(h)	280m <sup>2</sup>	5,600 m <sup>3</sup>
Cryopit	15m(dia) x 19.7m(h)	180m <sup>2</sup>	3,900 m <sup>3</sup>

5000  $m^2$  of class 2000 cleanroom underground. <2000 particles >0.5  $\mu m$  in diameter per  $ft^3$ 

# **Large Cavity Status**



# **Small Cavity Status**



## **Capability Development**

- **Cryogenics** are in many experiments. The lab plans to target this area for development of expertise.
- Radon is a fact of life underground, and a critical background concern for most current experiments. The lab plans to target this area for development of capability and expertise.
- The **project management** office is approaching full staffing, accelerating scientific excellence.

- Not complete list! SN
- Community levels of HPGe screening capacity appear sufficient for current and future use. No plans for development.
- The community has asked for an increased focus on lab environment monitoring, so we are developing capability in monitoring seismic activity, radon levels, dust levels, temperature, pressure, etc.
- Engineering support continues to develop expertise in requested disciplines including seismic modeling.



# **Expansion Concept**

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- Expansion study conceptual, phased design complete
- Estimated CAD \$200M, 5 years
- No current path for funding, and would require demand from the research community
- Expect space to be constrained over the 2023-2029 period, rotating experiments through existing floor space





## Partners







## Université **m** de Montréal



