

On March 27, U of T PDAC, TGDG and SEG student members were given an in-depth tour of the SNOLAB in Sudbury. SNOLAB is located 2 km underground in the Vale Creighton Mine. It is a world-renowned science laboratory that specializes in dark matter and neutrino research. As geology students, even the opportunity to go underground and walk 1.5 km through the 'drift' to get the SNOLAB was exciting. Our tour guides for the day, Samantha and Taylor, did an excellent job of explaining to us and showing us the interesting and groundbreaking experiments currently underway. Of particular interest to the group were the PICASSO, HALO and DEAP-3600 experiments. The PICASSO experiment searches for dark matter, HALO searches for supernovae, and DEAP-3600 is a new dark matter detector. It is slated to be fully functional in October 2014. We were very lucky to have been able to see the set-up of the detector, as it will be closed off from view for approximately five years following its activation. Additionally, as Vale decides to expand its production to deeper levels, it will not be possible for groups to tour the lab much longer.

Our day began with an early 5:00am wake-up, as we had to be at the mine for a 6:30 am briefing session. Upon arrival Samantha greeted us and explained the general itinerary for the day. We then headed to the mine gear room to put on coveralls, boots, hard hats, belts and safety glasses in preparation for the walk through the drift. Our lunches had to be double bagged as instruments in the SNOLAB are extremely sensitive to contamination from mine dust and dirt (which contains 1 ppm radioactive uranium and thorium). In fact, only 1 gram of dust is permissible in any of the detectors. Some of the equipment cannot even be touched, as the potassium from your fingerprint can render the entire experiment useless. Around 8:00 am we headed to the cage - the mine elevator that would take us down 6800 ft. The trip lasted about 3 minutes and included a lot of gum chewing to help with the pressure change. At the base we headed through the drift towards the SNOLAB with only our headlamps to guide us. Then came the strict decontamination procedures: we had to thoroughly clean our boots with water, enter a hallway, remove our hat, glasses and belt, continue down the hall and remove our boots. Then we each had to shower, wash our hair; and change in to a TYVEK suit.

At this point the tour of the lab officially began. Samantha explained to us the relevance of neutrinos, dark matter and the types of experiments currently underway in the SNOLAB. We divided in to two groups and were taken around the lab where we looked at a number of detectors and equipment- including PICASSO, HALO and the DEAP-3600 detector. The DEAP-3600 detector is housed in such a giant room that is it hard to believe you are 2km underground. DEAP-3600 will be searching for the interaction of dark matter particles on liquid argon, and has been designed to be more than 100 times more sensitive than any other dark matter searches currently underway. The PICASSO experiment uses a fluorine loaded active liquid and looks for the mini-explosion that occurs when dark matter interacts with fluorine atoms in the liquid. HALO uses a lead based neutrino detector to track supernovas. The tour was very impressive, and gave us a new found respect for the type of work being conducted by Canadian and international scientists in the fields of physics and astrophysics.

We would like to thank the TGDG, PDAC, SEG, Department of Earth Sciences at UofT, and all of the individual donors for their contributions and making this trip possible. It was an exceptional trip for all of us - we all tremendously enjoyed the opportunity to tour the lab. It is experiences like this that have important and meaningful impacts on our education and professional careers.

1) Looking at the PICASSO equipment 2) Neutrino! 3) Adam and SNOLAB employee (below)

