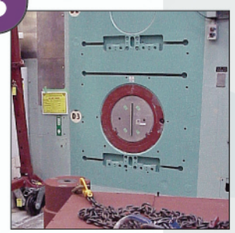
HOW A **NEUTRON BEAM** FACILITY WORKS

Overview of an experiment
Researchers come from all over Canada and the world to probe materials with neutron beams to find solutions to challenges in health, industry, and science. From the initial inquires into the feasibility of an experiment to the final interpretation of results, CNBC scientists and technical staff provide support to our users to ensure that this national resource is accessible to any user.

As neutrons pass through a material, the material changes the properties of the beam, such as the direction, energy, or magnetic polarization. By detecting these changes, researchers can deduce certain properties of the material such as atomic structure or stress.

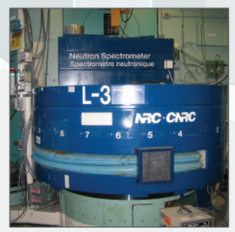
1 User Arrival
A researcher travels to the CNBC, typically after preparing a sample of a material for study. In some cases, samples may be prepared on site.

2 Neutron Production
Neutrons are tiny particles that reside in atoms. When uranium atoms are split in the reactor core, neutrons are released in every direction with a large spectrum of energies.

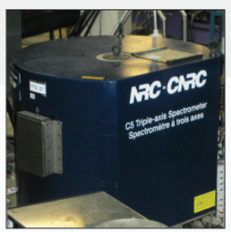


3 Beam Production
Several tubes through the reactor wall allow some neutrons to exit in the shape of a beam. Excess neutrons are absorbed by the reactor wall.

5 Sample Material
A sample material is placed in the emerging beam. As the neutrons pass through, the material changes the properties of the beam, such as the direction, energy, and magnetic polarization. Typically, the beam is scattered in many directions. A chamber around the material controls conditions such as temperature, pressure, or magnetic fields.

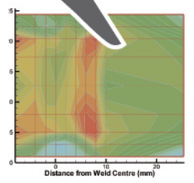


4 Beam Preparation
A crystalline material diffracts the beam, that is, it divides the beam according to the energies of the neutrons. A channel is positioned to allow only neutrons of a certain desired energy to proceed to the sample material. The remaining neutrons are absorbed in the wall of the large cylinder encasing the crystal.



6 Neutron Detection
A mobile detector system determines the intensity of the scattered beam in various directions.

7 User Interface and Electronics
A specialized electronic system controls each portion of the beam line and collects the experimental data. Work stations provide the user interface to control the experiment and perform preliminary data analysis.



8 Data Analysis
Data analysis typically continues after a user travels back to their home institution. CNBC scientists follow up with the users to assist with the analysis and interpretation of results.