

Opening New Fields for Canadian Science

The CNF will contain a source of cold neutrons. This first Canadian cold neutron laboratory will open up new fields of science that have not been possible with the thermal neutron beams from NRU. The cold source will produce the intense beams of low-energy neutrons that are required for advanced materials and industrial applications. Warm neutrons from the reactor moderator are cooled by entering a container of cold liquid hydrogen. The cold neutron "brightness" from the CNF will be ten times greater than that available from NRU. This will enable Canada to compete with European research centres where cold neutrons have long been exploited.

Cold neutron science opens new fields of study such as polymer and colloid chemistry; membranes and other biological structures; materials science and engineering; interfaces in nanostructural science; assay of trace impurities and contaminants, and high-contrast radiography.

Creating a National User-Facility

One hundred Canadian and international scientists and engineers currently conduct their research at the Chalk River neutron facilities each year and, at any given time, twenty graduate students are using the facilities for their thesis research. The total number is expected to more than triple with the advent of the CNF.

The Canadian Institute for Neutron Scattering (CINS) plays a valuable role in providing a network that links researchers from coast to coast.

Strengthening Global Research Connections

The steady-state CNF will be complementary to facilities in foreign countries where most new capacity has been in pulsed neutron sources based on accelerators, rather than reactors. An example is the large US\$1.3 billion Spallation Neutron Source announced in 1998. For atomic and magnetic research, steady-state sources are well-suited for selecting a particular regime of energy and momentum, while pulsed spallation sources are effective for large-scale mapping of energy and momentum space.

Investment in a new reactor in Canada will give Canadians reciprocal access to a much wider and costlier range of specialized facilities in other countries, and will promote international collaboration.

With its cold source and advanced instrumentation, the Canadian Neutron Facility will rank with the best steady-state neutron laboratories in North America, constituting a strong hub for materials research and development.



Testing rail steel for industry: Corporations come to Chalk River from Canada, Europe, the U.S.A. and Japan to solve their industrial problems.

Canadian Applied Neutron Research Highlights

- Leads the world in neutron stress scanning at depth in actual industrial components
- Pioneered the use of neutrons to directly study hydride formation, a critical failure process in nuclear and energy industry components
- Confirmed fitness-for-service of space shuttle booster rocket casing after Challenger disaster
- Linked key stress patterns to rail steel failures to improve the Canadian rail product
- Played a key role in validating new fuel channel specifications in support of international CANDU sales
- Developed technology to see sub-microscopic corrosion process at work in practical liquid chemical environment