Neutron Beam Research

Improving Our Lives

Neutron beam research provides scientists and engineers with valuable information about materials that affect our daily lives. The results of neutron beam research include improvements in everyday products, such as jet aircraft, high-speed trains, pharmaceuticals and magnetic devices such as computer disks, pocket calculators and lightweight magnets in automobiles. As well, neutron research improves industrial products and materials, such as polymers, metals and ceramics, gas pipelines, rails, steel, welded structures, CANDU pressure tubes, high-temperature superconductors, biological materials, and synthetic nanostructures.

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Neutrons can precisely locate hydrogen atoms in the presence of heavy atoms. This is important in developing new therapeutic drugs whose structures must be known in order to control their function. Hydrogen and deuterium scatter neutrons very differently, a fact that allows scientists to zoom in on a chosen region within a molecule. This is of great importance, for example, in the study of biological materials and polymer research.

Neutrons are a uniquely valuable, deeply-penetrating, non-destructive materials probe. They have been used in a wide range of materials research, both in forward-looking university programs and in projects of direct value to industry. They provide fundamental information that cannot be obtained with any other probe.

The use of neutron beams for materials-related research has broadened extensively since the pioneering days. Today, new fields, such as soft matter, biology, chemistry and materials engineering, have emerged as rapidly-expanding frontiers. Both the 1996 European Science Foundation report on the scientific prospects of neutron scattering research and the 1998 OECD report on future sources of neutrons emphasize the growing importance of these emerging disciplines.

> "Given the outstanding tradition of neutron scattering in Canada and the limited life left to the existing facilities, we support the Bacon Committee's (NSERC's 1994 Materials Facilities Committee) recommendation for renewal of Canada's facilities for research using neutron beams. This is made more urgent by the currently uncertain future of neutron beam resources in the U.S. as compared to the situation in Europe and Japan."
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> *International Assessors' Report in the Review of Canadian Academic Physics, 1997*

In 1994, the Natural Sciences and Engineering Research Council (NSERC) commissioned a major review to identify which materials research facilities would be most valuable to Canada in the future. The NSERC Review concluded that:

Canada should make an immediate commitment to develop a fully-equipped, dedicated reactor-based national source for neutron beam research.

The CNF will accommodate both neutron beam research and CANDU power reactor development. It is a shared rather than a dedicated facility. This maximizes the return on investment to Canada.