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Cover: The heat for most Canadian homes now comes from energy sources which, once tapped, cannot be replenished. In the future, many homes will be heated by a renewable source — the Sun. This solar collector heats a home in Fredericton, New Brunswick, and is part of a practical test of solar heating technology being conducted by NRC across Canada. (See story, p. 4) Photograph by Bruce Kane, NRC.

TRIUMF: An update

Bruce Kane, NRC/CNRC

Looking down on the main floor of the TRIUMF facility.

Le niveau principal de TRIUMF vu du dessus.

In April 1976, the National Research Council accepted responsibility for the financial support of one of the world's most powerful and versatile cyclotrons. Located on the campus of the University of British Columbia, TRIUMF (Tri-University Meson Facility) was designed, constructed and is presently operated by the Universities of Alberta, Victoria, Simon Fraser and British Columbia. TRIUMF is a meson factory (meson particles are the "nuclear glue" that binds protons and neutrons together in the nucleus) and can accelerate hydrogen ions (H^-) to velocities that approach the speed of light. Two simultaneous beams of high energy protons are extracted from the accelerator, one for research on high energy protons and the other for production of an intense beam of mesons.

At a seminar recently held at NRC's Division of Physics, TRIUMF director Dr. J. T. Sample gave a progress report on the upgrading of the TRIUMF facility, as well as a description of the experimental program.

According to Sample, researchers have already used it to complete several investigations despite the fact that many of the experimental facilities are still not finished. Indeed, on July 29, 1977, TRIUMF attained its design maximum beam intensity of 100 microamperes at an energy of 500 MeV, a level that will be available regularly following the installation of proper shielding and remote handling equipment in mid-1978.

The easy variability of beam energy, intensity and polarization at TRIUMF has already produced a great improvement in our knowledge of nuclear structure and the properties of nucleons, the basic building blocks of the nucleus.

Although the raison d'être of TRIUMF is research in basic science, an active program is under way to explore possible applications of the various beams.

One of the biggest projects is an investigation of the potentially favorable properties of negative pions (pi mesons) for the treatment of cancer; unlike gamma rays produced by conventional cobalt-60 beam therapy units, pions can be made to cause their greatest damage at the tumor site rather than near the skin surface.

There are three possible applications of TRIUMF's proton beams: two of these — proton radiography and radioisotope production — are of medical interest, while the third concerns the breeding of nuclear fuel.

The use of protons for radiography depends on their well-defined range in matter. A detector placed near the end of the range of a beam of protons will see large changes in intensity for only small changes in the thickness or density of the material traversed, a potentially useful property for the detection of small tumors in soft human tissue.

In the field of thyroid gland tumor detection, the TRIUMF proton beam has been used to produce the isotope iodine-123 in sufficient quantity to begin a clinical program to demonstrate its superiority over the presently-used isotope iodine-131 (I^{123} exposes patients to less radiation).

A third study is the electromagnetic breeding of nuclear fuel through the conversion of isotopes such as the non-fissile thorium-232 to fissile uranium-233. In the coming months, conversion rates and the eventual economics of the process will be evaluated. □

Michel Brochu