Atomic Energy of Canada unearths nuclear-waste glass blocks

Two old pieces of glass, pitted and discoloured, that were buried in the ground at Atomic Energy of Canada's Chalk River Nuclear Laboratories for about 20 years, were recently unearthed and are causing much interest.

There are two distinct glass-block experimental areas at CRNL; the first lot of 25 blocks was laid down in August 1958, the second in May 1960. The objective of the Chemical Engineering Branch which carried out the experiment then is fresh and relevant today: to find "a safe and permanent method" of disposing of "the highly radioactive wastes that would arise from a nuclear power program".

Several countries were interested in the use of glass for waste disposal at the time; only Canada, it seems, had the foresight to test the actual performance of blocks incorporating radioactive substances. Consequently, CRNL's retrieval and Whiteshell Nuclear Research Establishment's examination of the blocks have drawn interest from many countries.

The first set of blocks was buried in 1959 at depths from 2.7 to 3.4 metres (nine to 11 feet) below the surface in a regular pattern spaced at 0.3-metre intervals, deliberately placed so that they were in the path of the groundwater.

The trouble was that the glass was too good – no traces of radioactivity that could definitely be attributed to leaching from the blocks could be found downstream from the burial site.

In a second test at another burial site in 1960 the concentration of fission products in the glass was increased by about a factor of three. A glass with a much higher leaching rate than the glass in the first batch was used deliberately, so the escape rate of fission products was expected to be higher.

Fishing expedition

The retrieval operation itself was something of a fishing expedition. The fishing was carried out "blind", using a remote-control three-fingered grapple working through a bottom loading retrieval flask seated on a concrete shielding pad and down a casing which had been excavated over the block. The retrieval flask was built and tested at CRNL. Both the grapple and the flask are reusable.

A wide-ranging series of tests on the first block has been carried out at WNRE.

Electron microscopy determined the composition of the weathered and internal surfaces and made depth profiles; X-ray diffraction was used to detect if there were crystal line phases in surface and bulk; the bulk chemical composition was analyzed to determine major glass elements and waste elements; the block was subjected to thermal analysis to determine radiation-induced stored energy, and leach tests are under way to determine the rate of release of radionuclides under standard leaching conditions.

To date, interest in the glass blocks retrieved from CRNL soil has been expressed by the United States, France and Germany.

(Article from CRNL Chalk Talk, *Vol. 1, No. 1.)*

Priceless records burned at maritime oceanography institute

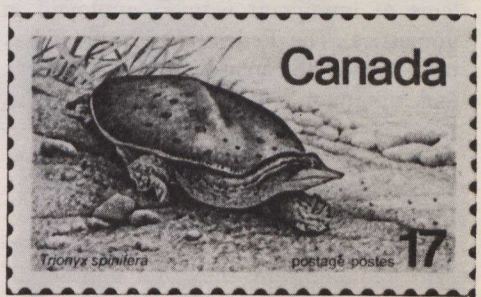
Property damage has been estimated at $150,000 in a recent fire at the Bedford Institute of Oceanography in Dartmouth, Nova Scotia, but a spokesman said the loss in records and research information was incalculable. The fire swept through a complex of 26 trailers at the institute site, severely damaging 14 of them. The units provided laboratory and office space near the main institute building.

Two complete research units specializing in marine ecology and fisheries management were destroyed.

The facilities hit hardest by the fire were the major ones on the East Coast involved in providing scientific data in such areas as toxicity of chemicals in the marine environment, pollution and fisheries management.

Three special stamps this month

Two more stamps in the endangered wildlife series, issued on April 10, depict the bowhead whale of the eastern and western Arctic Oceans and the eastern spiny softshell turtle of the lake districts of south central Ontario by Canadian artists Robert Bateman and Gary Low. The 17-cent turtle stamp is for first class domestic mail and mail to the United States; the whale stamp, worth 35 cents, is for first class letters going overseas.



Kluane National Park stamp

Another issue available this month – on April 27 – illustrates the wild terrain of Kluane National Park in the Yukon. The $2-definitive is a copy of a painting, *Across the Tundra,* by Alan C. Collier.

Rock and ice dominate Kluane National Park. Moist air from the Pacific maintains the ice field, which originated during the last ice age and which has created several huge glaciers. These flow down nearby valleys, sometimes covering as much as seven miles in four months.

So forbidding is the landscape, that Mount Logan, the tallest in Canada, remained undiscovered until 1890.

At lower altitudes, plant and animal life thrive. Endangered species, such as the golden eagle, the bald eagle and the peregrine falcon, inhabit the area. There are substantial populations of Dall sheep and grizzly bear. Most notable of the local fish is the kokanee, a dwarfed, landlocked variety of the sockeye salmon. The advance of a glacier cut off the creature's access to the sea.