The SLOWPOKE Reactor

Nuclear research pays off

photo Angela Wheelock

Above: Dennis Ng, Research Technician, prepares samples for analysis.

by Georgeann McInerney

The nuclear reactor in the Pharmacy Building at the U of A is one of only six SLOWPOKE reactors in Canada.

SLOWPOKE is an acronym derived from Safe Low Power Kritical Experiment given to a small research reactor design by Atomic Energy of Canada Ltd.

Unlike reactors such as CANDU, SLOWPOKE is not a power reactor, but rather a neutron source. Its power level is only 17KW, half of what is needed to furnace a moderate sized home. 400 MW of a reactor like CANDU can produce 400,000 KW of power and could furnace 40,000 homes.

SLOWPOKE is unique because theoretically it is next to impossible to design and construct a working reactor of its small size and simplicity with minimum damage to the reactor and danger to the environment.

Other reactors such as the CANDU reactor are huge and high powered. They must be electronically monitored with several backup systems.

If potentially dangerous situations arise, the reactor absorbs great quantities of neutrons instantaneously causing the reactor to automatically shut down.

As the result of clever design SLOWPOKE is much less complicated and is as safe or safer than commercial reactors. Nothing dangerous could happen even if the controls inherent in the system were removed completely. The scientific work being carried out would be spoiled, and a small additional amount of fuel would be consumed, but the reactor would not be damaged and no dangerous radiation field would be produced.

In addition, to guard against gamma rays, SLOWPOKE is immersed in 4.5 metres of recycled purified water 20 feet underground beneath a concrete lid that weighs 9 metric tons.

SLOWPOKE has two basic uses for different disciplines within and outside of the university.

The first is to provide a source of neutrons to convert normally non-radioactive elements of material, to radioactive versions of those same elements. The radiation given off by these "radioisotopes" can then be used to detect and measure the amount of the various elements present.

This technology is used in a process known as "Neutron Actuation Analysis". Pharmacy, for example, uses it to determine the effects of pharmaceuticals (drugs), by attaching a radioisotopic tracer to them. The drugs become radio-pharmaceuticals and their movement and action can be observed by monitoring the radiation given off.

Geologists use the process to determine how rocks have been created by quantitatively measuring trace elements in samples.

The other major use of the reactor is to produce radioisotopic tracers: an element of interest has a small quantity of a radioisotope of the same element added to it. The radiation from this is used as a very sensitive way to trace the movement of the element through the system under study.

Medicine applies this to determine how different elements cross the walls of blood cells.

An important asset of SLOWPOKE is its capacity to readily produce a number of short-lived radionuclides which is useful for two reasons. Firstly, short-lived radionuclides decay away rapidly and large quantities must be used to conduct an experiment of any duration. Producing them locally avoids expensive transportion cost. The nuclides must be shielded if they are flown in.

In addition when Neutron Actuation Analysis is carried out using short-lived radionuclides, the reactor makes it possible to make measurements more quickly.

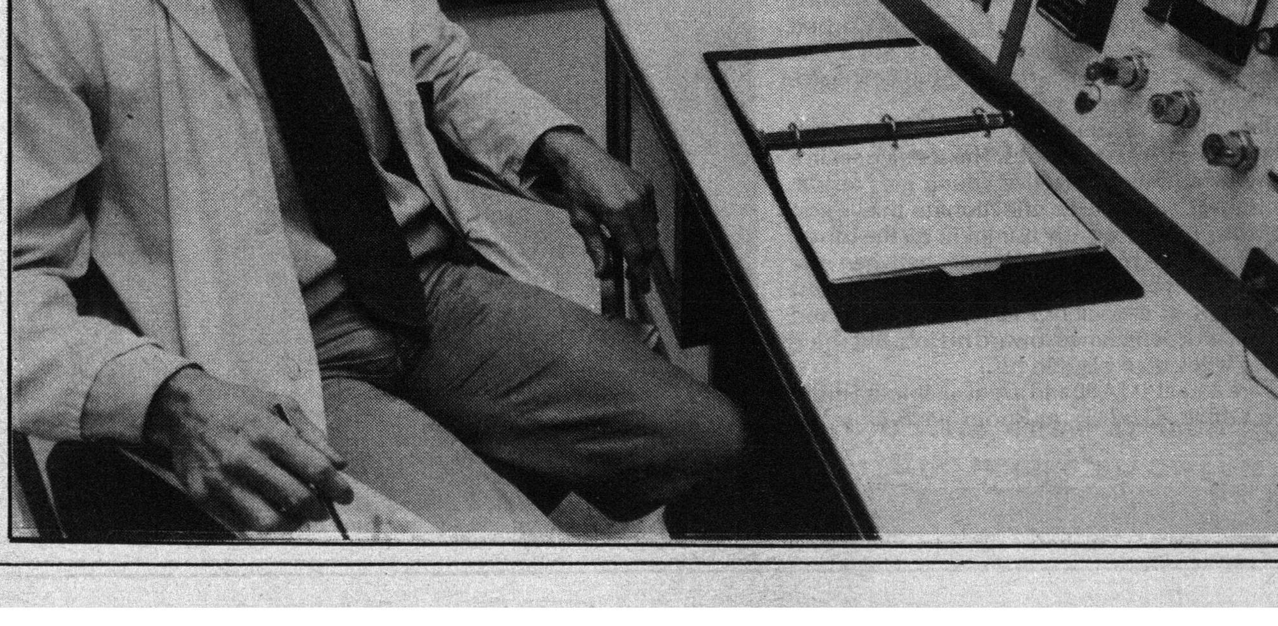
An example is the analysis of Selenium, which could be important to the study of cancer and some other diseases.

Some investigation of its possible protective role against cancer is being carried out. Cattle and calves which do not have sufficient dossages can die from white muscle disease, while, on the other hand, too much can send them "loco".

To conduct tests the Selenium must be irradiated. Irradiated Selenium nucleoids have a half-life of only 17 seconds. If the university did not have the reactor to irradiate nucleoids, these nuclear experiments could not be conducted.

The reactor was installed in 1976 at a cost of $205,000.

Below: Pete Ford at the reactor's controls.



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