casserole

a supplement section of the gateway

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Casserole this week takes two looks into our campus, one in the cardiovascular surgery unit at the University Hospital and the other in the nuclear research centre of the physics department.

Our thanks to the personnel at the hospital for their kind co-operation in aiding us with our feature story.

On page three we look at student salaries in Newfoundland. This is something many people would like to see, but as the story shows, money isn't everything.

Council on the hot seat is analysed on page three. This could become a very important item on our campus, but it does have its limitations.

On page six we preview the Jubilaires' production for VGW this year. The show is entitled "Finian's Rainbow".

Research

Nuclear physics centre scene of constant study

By GLENN CHERITON

Have you ever wondered what is in the building just to the west of the physics-computing sciences building?

Inside this brick and concrete structure is some of the most sophisticated and complex physics equipment on campus. This building houses the nuclear research facilities of the U of A's department of physics.

The main feature of the nuclear research centre is the 5.5 million volt Van de Graff generator and particle accelerator. The building is constructed around the accelerator and the rest of the equipment in the building is used to operate the accelerator, control it, and analyze the reams of data coming out of the machine.

The tall 110-foot high tower houses the generator which charges the particle 'gun' assembly in the tower to several million volts. The charge is produced by a moving, rubberized canvas belt in much the same way as a charge is built up petting a cat.

ACCELERATED DOWN

The high positive charge produced accelerates particles down through an evacuated stainless-steel tube. The particles are nuclei of atoms of certain gases such as hydrogen and helium which have been stripped of their electrons by a high frequency current.

In operation, the particle 'gun' is encased in a tank pressurized with a mixture of nitrogen and carbon dioxide. When the device is being levelled, the entire 17-ton 'gun' assembly may be moved with an ordinary wrench because it rests on three one-inch steel balls.

Below the tower is the magnet room. Here an analyzer magnet bends the particles' path by 90°, at the same time removing unwanted particles. In the same room, the beam is focused and sent through a switching magnet which deflects the beam on to any of seven tubes. In the adjoining room experiments are performed using the particle beam.

Although the seven channels are not all in use, there are several experiments set up on different channels. Only one experiment may use the particle beam at a time.

Physicists are not limited to a continuous beam. The particles may be pulsed by sweeping the beam in an ellipse over a hole where the beam originates back in the tower. Not satisfied with this pulse, which lasts for about ten millionths of a second, the physicists compress it to a pulse duration of one millionth of a second. This is accomplished by giving a resonant frequency pulse to the particle pulse, making the pulse travel obliquely. When the beam is bent through 90°, the trailing particles catch up with the lead particles.

ELABORATE PRECAUTIONS

Elaborate safety precautions have been taken to prevent accidents in the research centre. Chief technical officer Jock Elliot says they have not had an accident in the building yet. Massive shielding protects the personnel and prevents escape of dangerous radiation. The walls of the Van de Graff tower are solid concrete, three feet thick.

One of the most dangerous spots in the building is the experiment room. No one is allowed in there while an experiment is in progress. The three entrances are guarded by a variety of devices. One door can only be opened from the inside; another has a gate, which, when opened, sets off a horn which would raise the dead. The last entrance goes past the console where the experiment is controlled.

Other safety features include flashing red lights, a horn connected to a 'panic button' in the control room, and a speaker used, according to Mr. Elliot, to tell an offender "to get his lead ass out of there."

AWFUL STUPID

Asked if it was possible for the radiation to kill a person in the target area, he said, "'It would have to be a massive dose and an awful stupid person."

Radiation levels in all rooms are monitored from the central control room. The entire experiment is handled from the main consol. A computer is connected to the controls of the accelerator to make split-second (reaction time one ten-thousandth of a second) adjustments in the apparatus. The computer also does preliminary analysis of the data while the experiment is running. The final computations are done by the computing science facilities in the physics building.

Most of the impressive equipment is in the control room. One of the newer pieces of equipment is a graphical display device (a television tube) connected to the computer showing the results of the experiment. The graphs may be expanded, rotated or a section selected for study.

AN ACCESSORY

One of the accessories of the TV tube is a light gun which asks the computer for information about a point on the screen at which it is aimed and fired. I asked Dr. W. J. McDonald how it worked.

He explained that the light from a point traced on the screen is fed back into the computer through a flexible cable connecting the light gun and the computer. (No, light does not travel in straight lines.) Since the computer graphs each point separately and intermittently over a 1/30 of a second interval, all it needs to do is produce the information on the point it is graphing at the moment it is told to by receiving its own light pulse.

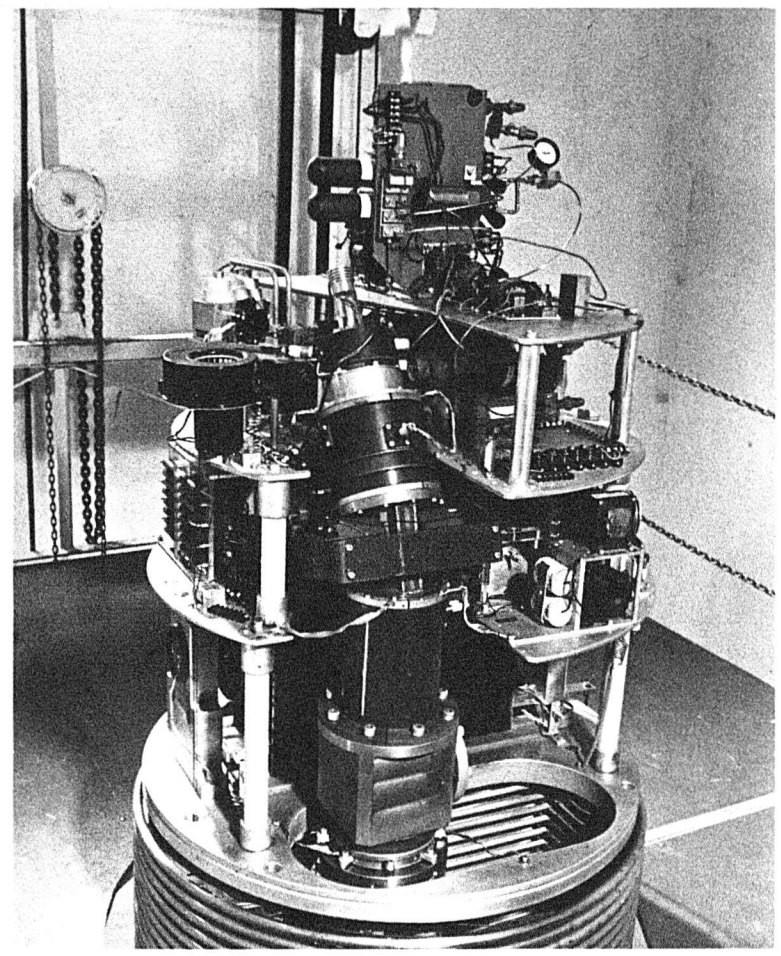
In the field of nuclear physics the centre is known for something other than TV tubes—neutron time of flight and energy measurements. Dr. Neilson, director of the centre, said this research was "the feature (of the centre) not duplicated anywhere else in the world."

NEUTRONS TIMED

The neutrons are timed over a six meter distance. Typical times are about 300 billionths of a second, or a velocity of 7% of the speed of light.

Constructed in 1964, the nuclear research centre has grown in stages to its present size. Now, there are six full-time professors, six technicians, five post-doctorate fellows and fifteen graduate students working in the building.

"Most of the centre's budget of $200,000-$300,000 comes from federal sources," said Dr. Neilson. There are no plans for expansion on this campus but he reported plans for a 500 million electron volt proton cyclotron to be built in Vancouver. This will be far more powerful than the accelerator at the U of A.



THE VAN DE GRAFF 'GUN'
. . . that 'fires' the particles down the tube

THE TARGET AND THE CONTROL—The particles fired by the gun end up at ground level (pictured above) in the target area. Experiments are performed on the beam of particles, with most of the action taking place in the control room (at right). The centre is known for its neutron time of flight and energy measurements, a feature not duplicated anywhere else in the world. All photos are courtesy the U of A Photographic Service.