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Canada's flagship research facility
Synchrotron officially opens Friday at U of S

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The StarPhoenix

Wednesday, October 20, 2004

When Bill Thomlinson visited Canada in 2000 to speak to a group about the medical use of synchrotron science, this country wasn't even on the radar screen for high-end research and technology.

CREDIT: Peter Wilson, The StarPhoenix

Canadian Light Source executive director Bill Thomlinson will host a gala party Friday to celebrate the opening of the synchrotron

Five years later, Thomlinson has moved to Saskatoon to become executive director of the Canadian Light Source (CLS), which Finance Minister Ralph Goodale refers to as Canada's flagship research facility.

Thomlinson will host a bevy of scientists from six synchrotron facilities from around the world in a gala event on Friday to celebrate the country's rush to the innovation agenda.

"Innovation agenda wasn't a term I had heard before I came to Canada," Thomlinson said Tuesday.

In the 1990s, in the midst of a period of retrenchment and government restructuring, then-finance minister Paul Martin announced Canada would embark on a prolonged period of reconstructing its research and development capacity.

Since then, Canada has shot up to fifth among Organization of Economic Development and Co-operation countries when it comes to investing in knowledge.

"We made quite a leap in that sector," Goodale said, noting the move upward corresponds to the government's commitment to the innovation strategy.

But this advancement has taken place on the public side, Goodale said in an interview.

"We are still back in the pack in terms of private investment."

It is for that reason the CLS is so important, he said.

The CLS represents an unusual opportunity for private industry to be able to use a public facility where it can invest in research and development in a wide array of areas, from biomedical to agricultural, engineering and basic material to the cutting-edge world of nano and information technology.

"This is the largest single investment undertaken in the innovation agenda and the largest investment by the Canada Foundation for Innovation," Goodale said. "For that reason, it is the flagship (of the agenda)."

According to an article in University Affairs -- a periodical put out by the organization representing Canada's universities and colleges -- the CLS is expected to help push the boundaries of knowledge in hundreds of areas.

"In the process it is bringing research expertise to Canada (and in some cases, back to Canada), creating exciting opportunities for young scientists here at home and is expected to bring solid economic benefits to the Saskatoon region," the article says.

This is critical for Canada's future, Goodale said. Growth in the country's GDP requires at least one of two fundamental ingredients, including having a larger workforce or improving productivity, the finance minister said.

Canada's workforce is aging at such an extent that by 2010 to 2012 its baby boomers will be retiring en masse. Without improvements in productivity, Canada's economy will have an increasingly difficult time maintaining a adequate standard of living and level of social programs.

It was for that reason the government pumped $13 billion into the innovation agenda -- to kick start the enhancement of productivity.

This investment was made in both bricks and mortar, such as the $173.5-million CLS, and in people, through initiatives such as the millennium scholarships and chairs programs.

"We will succeed in the future through the quality of our brains," Goodale said.

There is perhaps no tool on the planet better suited for that task than the CLS.

The CLS is a unique Canadian scientific facility because it will be utilized by, and critically important to, scientists from all provinces and in nearly all disciplines, from the basic sciences of chemistry, physics, geology and biochemistry to the applied sciences of genomics, global warming, engineering, radiology and medicine.

This tool creates light millions of times brighter than sunlight and is used to analyse the nature and structure of materials, Thomlinson said.

Synchrotron research is important for a diverse range of industries, including pharmaceuticals, biotechnology, environmental, mining, biomedical imaging, aerospace, advanced materials and micromachining. The CLS will be invaluable to Canadian companies, universities and government agencies who aspire to compete on an international basis.

A linear accelerator left from the decommissioned Saskatchewan Accelerator Laboratory has been converted to generate the power behind the 2.9 gig-electron volt (geV) synchrotron. The electrons it kicks out are sent down a stainless steel tube, where they are ushered along by a series of powerful magnets.

These magnets turn on and off in such a manner that they pull the electrons at an ever-increasing speed, turning off just as the bundle of electrons arrives, allowing another magnet farther down the pipe to take over the pull.

In this manner the electrons are grouped together into a beam about the size of a human hair and then pushed into a ring, where they are slammed by 10,000 jolts of microwave radiation to further speed them up. This propels them to just below the speed of light (186,000 miles per second), reaching the limit of speed that matter can travel.

From there the electrons are put into a second, larger holding ring (171.5 metres in circumference), where they are forced to bend by another set of very powerful magnets. The electron beam loses power, but that is captured by a beam of photons sent in a straight line off the magnet. Photons are the stuff of which light is made, as well as X-rays, ultraviolet lights and even the heat given off from an electric stove.

Those photon beams have an intensity millions of times brighter than the sun. Hence the facility's name.

There are about 17 third-generation synchrotrons in use, being built or planned in the world and the CLS -- which is one of these models -- is among the top couple in terms of versatility and power.

During the next few months the first of seven beamlines within the CLS will gradually come on stream. Beamlines of photons, which have an intensity millions of times brighter than the sun, are "captured, tuned, focused and used for an astonishing range of things, both for basic research and for a host of industrial applications," says the University Affairs article.

It is this wide range of potential uses that has academics, businesspeople and politicians dreaming of the next big find.

In the next couple of years the next family of five beamlines -- including a much-touted biomedical line that will put Canada ahead of the curve in terms of medical research capacity -- will be built and installed.

The CLS has already sent out requests for proposals for research projects on its first working beamlines and been greeted by an incredible response, Thomlinson said.

This is amazing because the first ones off the block will have to help work out the bugs, he said. The response is evidence of how eager the scientific community is to begin taking advantage of this instrument.

The U of S isn't the only university to benefit from the CLS.

Universities from one side of the country to the other have been attracting new faculty with the promise of the CLS, and the city of Calgary now includes mention of the facility on its letterhead.

Farideh Jalilehvand, a new assistant professor at the University of Calgary, came from Stanford University in California to have access to the CLS, he said in an interview.

And Dean Chapman, the head of the $17-million biomedical beamline project recently approved by the Canadian Foundation for Innovation for the CLS, and who left one of the most renowned synchrotron facilities in the world at Chicago, believes having a synchrotron on a campus with colleges of medicine, nursing, veterinary medicine, pharmacy and agriculture creates a unique opportunity.

"We could dominate the world on this," he said.

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