



INSIDE:

- RADIATION TREATMENT SAVES OVER HALF A MILLION LIVES EVERY YEAR
- SASKATCHEWAN IS THE LARGEST URANIUM PRODUCER IN THE WORLD
- SASKATCHEWAN PEOPLE MAKING A DIFFERENCE
- NEW RESEARCH TOOL FOR SASKATCHEWAN

The NUCLEAR *Advantage*

SASKATCHEWAN EDITION



Serving in so many ways...

How uranium and nuclear technology benefit mankind



AN MRI FOR REGINA

From the now routine X-ray to the latest Magnetic Resonance Imagery, (MRI), properties of the atom have been harnessed by medical science to diagnose diseases and identify injuries for nearly 100 years. Countless lives have been saved by early identification of problems, enabling doctors to prescribe treatment and surgeons to perform operations. In 1997 in Saskatchewan more than 200,000 radiology examinations (X-rays) were performed; 112,000 ultrasounds, 46,000 CT (cat) scans, and 5,000 MRIs were carried out. With the installation of new MRI equipment in Regina's General Hospital later this year, the figure may well double.

The MRI can produce an infinite number of images of the body, using a magnetic field and radio transmissions that can "read" the condition of the nuclei of the body's atoms.

WHAT IS NUCLEAR TECHNOLOGY?

We all know that "technology" means the application of technical knowledge to processes that sustain our everyday way of life – but "nuclear" – where does that come in? It all goes back to the atom – we're all made up of atoms, as is every living and inanimate body in the earth. Atoms have nuclei that have many different properties, one of which is the natural phenomenon of radiation. Over the past 200 years scientists have learned much about the behaviour of atoms, and from this research has come the development of technologies. These technologies have harnessed the atom for a variety of uses. Some are familiar to us all – the generation of electrical energy, of course is preeminent; the medical uses have produced immeasurable benefits to mankind.

But there are many others; from the protection and preservation of food, to the testing of the strength of metals and machinery; to the removal of pollutants from the environment.

FACT:

Medical applications

– Over 40,000 medical procedures using radioactive isotopes are performed each day in North American hospitals and clinics to diagnose and treat various diseases. One Canadian company, MDS Nordion Inc., supplies most of the major diagnostic isotopes used in the world. These isotopes are produced at Canada's Chalk River Laboratories in Ontario.



NUCLEAR MEDICINE

In the last fifty years, nuclear medicine has evolved as a specialty, extending far beyond diagnosis to the treatment and cure of many diseases. Radioactivity is used first to diagnose and then treat the disease. A small dose of radiation is introduced into the patient's body where it can be directed to the specific part to be studied and then treated. Often this eliminates the need for invasive surgery. Since the thirties, Saskatchewan has been a pioneer in this field; first and continuing in the treatment of cancer, but now in many other areas from cardiology to psychiatry.



Revealing the past and the future with nuclear science



DATING THE DINOSAURS

Scotty, the Tyrannasaurus Rex, discovered a few years ago near Eastend, Saskatchewan, is now an internationally known personage. (Not to be confused with the rather fanciful, but popular, Mega-Munch who lives in the Royal Saskatchewan Museum and has been known to appear at the Regina airport.) Thanks to radioactive, or atomic technology, the layers of rock above Scotty's last resting place have been dated, telling us that the huge T-Rex is more than 65 million years old.

Without atomic technology, the rocks could never have told us this tale from the past.

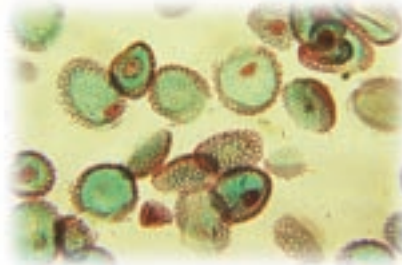
GREAT WOMEN IN SCIENCE

Madame Marie Curie discovered radioactivity in a natural mineral (pitchblende) in 1903. Sadly, this Polish born, French citizen died as a result of her constant unprotected exposure to the radioactive substances she was studying. But her adopted country France has not forgotten her contribution to science and humanity. Today, thanks to nuclear power which produces more than three quarters of the country's electricity, France is now the only industrialized country in the world to have almost eliminated emissions of carbon dioxide, sulphur dioxide and nitrous oxides from electricity generation despite increasing its electrical production by over 50% in the last decade and exporting large quantities of electricity to neighbouring countries.



FACT: Helping the environment

– Over the last 30 years, the 22 CANDU nuclear power reactors in Canada have helped to reduce the release of carbon dioxide into the environment by more than one billion tonnes.



CANADIAN LIGHT, EH?

If people doubt that entrepreneurial spirit is alive at our Saskatchewan universities, they need only spend a day with Dr. Dennis Skopik, the Director of the Saskatchewan Accelerator Laboratory

at the University of Saskatchewan. Over the past five years Dr. Skopik has quietly gone about gaining support for a new technology to be acquired at U of S. The machine is called a Synchrotron Light Source and it will allow scientists to see objects as minute as viruses. It will be the only one in Canada and it will be built on to the existing linear accelerator on the Saskatoon campus.

Synchrotron light is used in many scientific and research applications in fields such as biotechnology, biopharmaceuticals, medicine, mining, minerals, the environment, materials properties and manufacturing and telecommunications technology. Cameco's chair Bernard Michel heads up the group that helped put the package together with support from the Saskatchewan government and the business community. Once the project is built and becomes operational, corporations and scientists from around the world will be visiting Saskatoon to utilize the services of this unique research tool. Saskatchewan thanks you Dr. Skopik!

FACT:

Nuclear technology helps find land mines

– One approach to land mine detection involves the application of nuclear technologies. Both X-rays and gamma rays have been used successfully in detecting land mines that kill or injure an estimated 23,000 people annually.



Saskatchewan people making a difference

SASKATCHEWAN ENGINEER BUILDS NUCLEAR PROJECTS WORLDWIDE

René Godin grew up on a family farm in Domremy, Saskatchewan. René opted to seek adventure, challenge and independence and struck out for the University of Saskatchewan where he graduated in engineering in 1959. Godin left Saskatchewan and joined a large American based construction company and became in charge of constructing chemical plants, pulp and paper mills, heavy water plants. He then joined SNC-Lavalin Inc. and Canatom Inc. and became involved in nuclear power projects in Canada and overseas. "I became interested in the nuclear industry at just about the perfect time," he recalls. "In the late 1960s, everyone felt very optimistic about nuclear power and the industry was buoyant all over the world."

Today, Godin is viewed by many as Canada's "Mr. Nuclear Power", in many countries where Canada does nuclear business. He is President and CEO of Canatom NPM Inc., the largest private Canadian firm dealing exclusively in nuclear worldwide. The company undertakes design, construction, procurement, plant performance improvement and handles nuclear waste.

Canatom NPM is owned by AGRA Monenco, SNC-Lavalin and BFC Construction. Godin oversees the nuclear business in Asia, Europe, North and South America, and has been involved in all CANDU nuclear plants as well as many USA plants. He often deals with utility customers, their governments, regulators and, of course, Atomic Energy of Canada Limited. Like a true stubble-jumper, he maintains contact with his Saskatchewan farm roots.



HIGH ACHIEVER

For Sylvia Fedoruk, almost anything has been possible. She averaged two scholarships a year during the 1940s at the University of Saskatchewan.

In 1950, she was appointed assistant physicist to the Saskatchewan Cancer Commission. She helped Dr. Harold Johns develop the cobalt radiation therapy machine that has subsequently saved millions of lives throughout the world. She helped design and build one of Canada's first scintillation cameras, a device used to detect cancer cells. Today the scintillation camera is a mainstay of cancer diagnosis and other body functions, including cardiac activity.

In 1973 Sylvia Fedoruk became the first female member of the Atomic Energy Control Board, Canada's nuclear regulatory agency. In 1975 she became Director of Physics for the Saskatchewan Cancer Foundation and in 1986 she was elected Chancellor of the University of Saskatchewan. And yet another achievement to add to the list – she also served as Saskatchewan's first female Lieutenant-Governor. "I've never refused a challenge," she maintains.



FACT:

Saskatchewan film producer Kevin deWalt of Minds Eye Pictures in Regina won an award for his film *Electricity: Weighing the Options*.



NORTH BATTLEFORD PROSPECTOR GOES NORTH

He was fascinated by the northern lights as a boy and as soon as he was old enough he headed north to seek his fortune in then booming Uranium City. By the time the 1970s rolled around, North Battleford's Dale Hoffman was the fuel distributor at Uranium City. But then, however, the mining bug got to him, and with faith in the mineral potential of northern Saskatchewan, he went prospecting. His enthusiasm, common sense and strong business ethics helped finance countless gold, silver, uranium and most recently diamond exploration projects throughout northern Saskatchewan. That same quality of fair play and honest dealings have attracted well-qualified professionals to advise and work with him.

Although his business affairs are now based in Vancouver, callers to his Vancouver office are frequently advised that he's "out in the field." That field is usually northern Saskatchewan.



Uranium – the clean energy fuel



NUCLEAR POWER

Nuclear power is the most controversial of the world's primary energy sources. Seen by many as the only possible long-term source of energy for humanity, in others it evokes fear and occasionally a determination to protest against it. It is also an energy source about which there is a great deal of ignorance. Nuclear physics, what goes on inside a reactor, and the measurement of radiation and its hazards are far removed from most people's knowledge and experience. Many of these same people would be surprised to learn that nuclear power is now a proven, middle-aged technology that accounts for about 17% of world electricity production, about the same as hydro or water power.

FACT:



Nuclear clears the air

– The amount of carbon dioxide emissions avoided each year by one nuclear power plant is the same as the emissions from 2,500,000 automobiles



ating for billions of years and will continue for billions more. Although excessive exposure to the sun can cause cancers in humans, most people accept that the value of the sun far exceeds its dangers. Scientists haven't yet figured out how to use nuclear fusion to produce electricity here on earth, but they are working on such a process and some day will likely have developed a method to do so.

ONE OF THE GUYS

The Saskatchewan uranium industry has developed some of the most advanced and effective training programs in the world. Governments, aboriginal delegations and corporations all come to Saskatchewan to learn more about these programs. An example of its success is Cindy Caisse from Beauval, Saskatchewan. Caisse started at the Rabbit Lake uranium mine as a loader operator and since then she's been trained to operate most of the machines, including bulldozers. As the only female heavy equipment operator at the mine, Caisse often gets a lot of attention. "People will come by the pit just to see a woman operator and take my picture." At first she felt uncomfortable, but now she takes that attention in stride, calling it "a definite ego-booster."



FACT:

Douglas approved purchase of cobalt for cancer treatment

– Bypassing his cabinet and the Provincial Treasury, Premier Douglas in the spring of 1949 approved the purchase of radioactive cobalt 60 from the Chalk River Laboratories of Atomic Energy of Canada Limited.



FACT:

Saskatchewan's uranium contribution is world-class

– Exports of uranium from Saskatchewan fuel nuclear power systems around the world and reduce carbon dioxide, nitrous oxide and sulfur dioxide emissions. This reduces world carbon dioxide by an amount equal to Canada's entire annual emissions from all sources. Now that's definitely world-class!



Benefits today & tomorrow

THE BAYDA COMMISSION – AN IMPORTANT LEGACY

The Cluff Lake Board of Inquiry into uranium mining presented its final report twenty years ago, after more than a year of hearings. It was prepared under the direction of Justice E. Bayda, now Chief Justice of Saskatchewan, and it gave the green light for uranium development. The report has been recognized as a guidebook for development of the Saskatchewan uranium industry, and it has gained a worldwide reputation as one of the most thorough and comprehensive reviews, not only of uranium mining, but also of the ethical basis of the entire nuclear fuel cycle. Unlike so many commission reports, it has not been left to gather dust; many of its 54 recommendations to the Saskatchewan government have been implemented in areas of health and safety, worker education, environmental effects of radiation, employment and economic impacts.

A key recommendation which the Bayda Commission heard from northern people and gave its support to was that the uranium industry must benefit northern people if it proceeded. It is in this area of northern benefits that the model prescribed by the Bayda

Commission has met its greatest success. At the time of the report, very limited northern participation took place in uranium or indeed any other type of mining. Most miners at that time were recruited from southern Canada and even overseas. Today, thanks to the Bayda Commission and the wisdom of the uranium firms operating in northern Saskatchewan, almost 50% of all workers are recruited from the north and that number continues to grow. There are also many significant northern business enterprises that have developed over the years; some of them are mentioned in this pamphlet. Northern Saskatchewan can show many positive benefits from the recommendations of The Bayda Commission.



GLOBAL WARMING

Global warming is real, although debate continues as to whether it is caused by humans, or whether it represents natural climate change occurring over the centuries. Perhaps both factors contribute, and there is no doubt that the greenhouse gases from thermal power stations are big contributors. As much as people are concerned over present day levels of greenhouse gases, the real threat is perceived to be from the projected growth in these gases over the next fifty years.

Asia, with over 60% of the world's population, will be the biggest new contributor of greenhouse gases. Fortunately, there are alternatives and the nuclear power industry can play a huge part in reducing the growth of these gases. Furthermore, Asia seems to understand this solution and has an increasing number of nuclear power plants under construction. A 1,000 megawatt nuclear power plant produces only 23 tonnes of waste material each year compared to 1400 tonnes of ash and nearly 6 million tonnes of greenhouse gases from a comparable coal-fired plant.



FACT:

Saskatoon machine shop helps make medical history

– In 1952 John McKay of Acme Machine and Electric built the critical machinery to hold the radioactive cobalt 60 developed by Dr. Harold Johns for cancer treatment.



Saskatchewan – uranium leader



SASKATCHEWAN, URANIUM AND THE FRENCH CONNECTION

Back in the late 1960s when the Cluff Lake uranium mine was being developed, the visitor arriving at the sandy airstrip at the site was perhaps surprised to see the French tricolor and the Canadian maple leaf flying together over the

small log structure that formed the terminal building. Although one was not greeted by an honour guard of the French Foreign Legion in white uniforms, the connection between Saskatchewan, uranium and France has been a long and productive one, with Cogema Resources Inc. involved in four mines in Saskatchewan including the newly built McClean Lake mine.

In the 1960s French exploration teams believed that major mineralization in the Athabasca Basin of northern Saskatchewan was similar to deposits they were familiar with in Gabon, West Africa. In 1968 they discovered what was then the richest known uranium body in the world at Cluff Lake. The Cluff Lake mine was subsequently developed and started production in 1979.

Although surpassed in grade and tonnage by several subsequent discoveries at other northern Saskatchewan sites (several made by French geologists), the Cluff Lake mine continues production to this day although according to recent announcements, its days are now numbered.



FACT: Radiographic survey for tuberculosis

– In 1941 Saskatchewan instituted a province-wide campaign against tuberculosis. Technicians and nurses travelled by truck to Saskatchewan communities with this free service to identify and then treat this serious disease.

JOINT VENTURES OFFER ATTRACTIVE BENEFITS

One of the benefits of the economic activity created by the uranium mining industry in northern Saskatchewan is the proliferation of joint ventures between northerners and southerners. The Mudjatik Thyssen Mining joint venture is one such partnership. Thyssen is an international mining and construction firm and has been involved with COGEMA Resources Cluff Lake mine for many years.

In the Mudjatik joint ventures, Thyssen have joined forces with several northern based groups; Des Nehde Development Inc, Clearwater River Development Corp., Sakitawak Development Corp., Buffalo Narrows Development Corp., and Tron Power Inc., a company owned by the English River First Nation. By combining the technical know-how and expertise from Thyssen with the human resources expertise of Tron Power and the First Nations participants, the economic performance of all partners is expected to increase.

These partners are currently active on four mining projects in northern Saskatchewan. The short term goal is to staff all projects with 50% northern employees, a requirement of the uranium industry.

SASKATOON – A WORLD MINING CENTRE?

While wheat and agriculture are still important to Saskatoon's economy, mining has grown over the past 40 years to represent a very big

component of the economy. It begins with potash. When one comes in to land at Saskatoon's airport, four potash mine headframes can be seen to the east and west of the city. Saskatoon hosts the head office of the world's largest potash company, *Potash Corporation of Saskatchewan*. But that's not all – *Cameco*, the world's largest producer and *COGEMA Resources Inc.*, part of a larger corporation with the world's largest uranium reserves, both have head offices in Saskatoon.

Cameco was formed in 1988 by the merger of *Eldorado Nuclear*, a federal crown corporation and *Saskatchewan Mining Development Corporation*, a provincial crown corporation. In the ten years of its existence, *Cameco* has grown and prospered – doubling uranium production and sales, accumulating more than \$4 billion in revenue and earning three-quarters of a billion dollars of net profit for shareholders.



UNIQUE NORTHERN ACCOMPLISHMENT

When the Saskatchewan uranium mining industry began its new era of operations with the opening of the Rabbit Lake mine in 1975 and later the Cluff and Key Lake mines in the 1980s, there was concern that the track record of previous mine operators with respect to northern employment needed some serious fixing. Up to that point, northerners received few of the jobs at the mines and with no training or development programs, those lucky few who got jobs, often found themselves stuck at entry level positions. The Bayda Commission (see pg 6) pointed out that a new model was needed to truly involve northern people and create a modern northern based industrial labour force.

Fortunately the uranium industry and northern communities responded to the challenge and today the overall employment of northern people is close to 50% of the labour force. This far surpasses northern participation in government or most other private sector employment. An impressive accomplishment for a region that twenty-five years ago had few skilled people and no tradition of industrial employment. It has been accomplished by a combination of well-designed recruitment and training programs, tolerant and effective accommodations made by labor unions, clear and consistent signals from senior company managers and, equally important, the cooperation and participation of northerners, anxious to participate and compete for work and to capture benefits for themselves, their families and their communities.

Total employment in the Saskatchewan uranium industry, including contractors is 2,600. Of these, more than 2,050 work at the minesites.



URANIUM INDUSTRY DEVELOPS REMARKABLE PARTNERSHIPS

Northern knowledge of the land, southern technology for the future! Few stories are as nice to tell as the relationship between *Cameco Corporation*, *COGEMA Resources* and *Northern Resource Trucking (NRT)*. NRT was founded in 1986 to capture a trucking opportunity hauling fuel and other products for northern uranium mines. NRT is a limited partnership of Indian and Metis from communities throughout northern Saskatchewan, and Trimac Transportation, one of North America's largest commodity haulers.

Today NRT consists of a fleet of 60 power units with more than 50 owner/operators, servicing all the uranium and gold mines in northern Saskatchewan. Satellite technology ensures that each truck is always in touch with the dispatch office.

IN MEMORIAM

Harold Elford Johns died on August 23, 1998. For 11 years Johns worked jointly with the University of Saskatchewan and the Saskatchewan Cancer Commission. In the late 1940s he developed the cobalt therapy unit for cancer treatment, which led him to a new career in the pioneering field of medical biophysics. He published four editions of *The Physics of Radiology*, the premier textbook in its field. Johns' greatest public award was his appointment as an Officer of the Order of Canada in 1976. His final professional honour is his induction into the Canadian Medical Hall of Fame in October 1998 along with his supporter, former Saskatchewan Premier Tommy Douglas.

Nuclear reactor in Saskatchewan

– For the past 20 years the *Slowpoke* research reactor has operated without incident at the University of Saskatchewan.

This reactor has provided scientists, engineers and students with a powerful research device.



FOR MORE INFORMATION ON NUCLEAR ISSUES CONTACT

Cameco Corporation.....<http://www.cameco.com>
 Canadian Nuclear Assoc.<http://www.cna.ca>
 Canadian Nuclear Society.....<http://www.cns-snc.ca/>
 CANDU Nuclear Reactors.....<http://www.aecl.ca>
 Cogema Resources Inc.....Toll free in Sask 1-888-9COGEMA
 Greenpeace<http://www.greenpeace.org/index.shtml>
 IAEA – United Nations Agency<http://www.iaea.or.at>
 Isotopes – MDS Nordion.....<http://www.mds.nordion.com/home.html>
 Uranium Information Centre<http://www.uic.com.au>
 Uranium Institute.....<http://www.vilondon.org/index.htm>