

# Ideas on the Edge

## The Light Fantastic

TO SEE AT THE ATOMIC LEVEL, ONTARIO SCIENTISTS USE LIGHT  
A MILLION TIMES BRIGHTER THAN THE SUN.



Every child knows it: when we want to see something more clearly, we need to shine a powerful light on it. But at the atomic level, familiar rules start to break down. To see details on this scale, no ordinary light will do. Conventional illumination, even from the strongest of bulbs, is much too dim, its mix of wavelengths too chaotic.

What's needed is an immensely powerful, full-spectrum source of light, along with the means to precisely control and separate that light into the many wave-lengths it comprises. In short, what's needed is a synchrotron—a tool so useful and so versatile that it's been called the "Swiss army knife of modern science." And now, Canada has one of its own—the Canadian Light Source, located in Saskatoon, Saskatchewan.

Housed in a football-field sized building, the synchrotron consists of an electron source that generates a high-energy beam of light and feeds it into a circular ring where it gains even more energy. Branching off the ring are beam lines into which the beam can be diverted,

filtered to include only a narrow frequency of light, and then focused on a target. The resulting beam—with the brightness of a million suns—can reveal details and structures otherwise inaccessible to scientists.

The Canadian Light Source is Canada's first and only synchrotron, the product of many years of lobbying and planning by scientists nation-wide. And because the facility will be heavily used

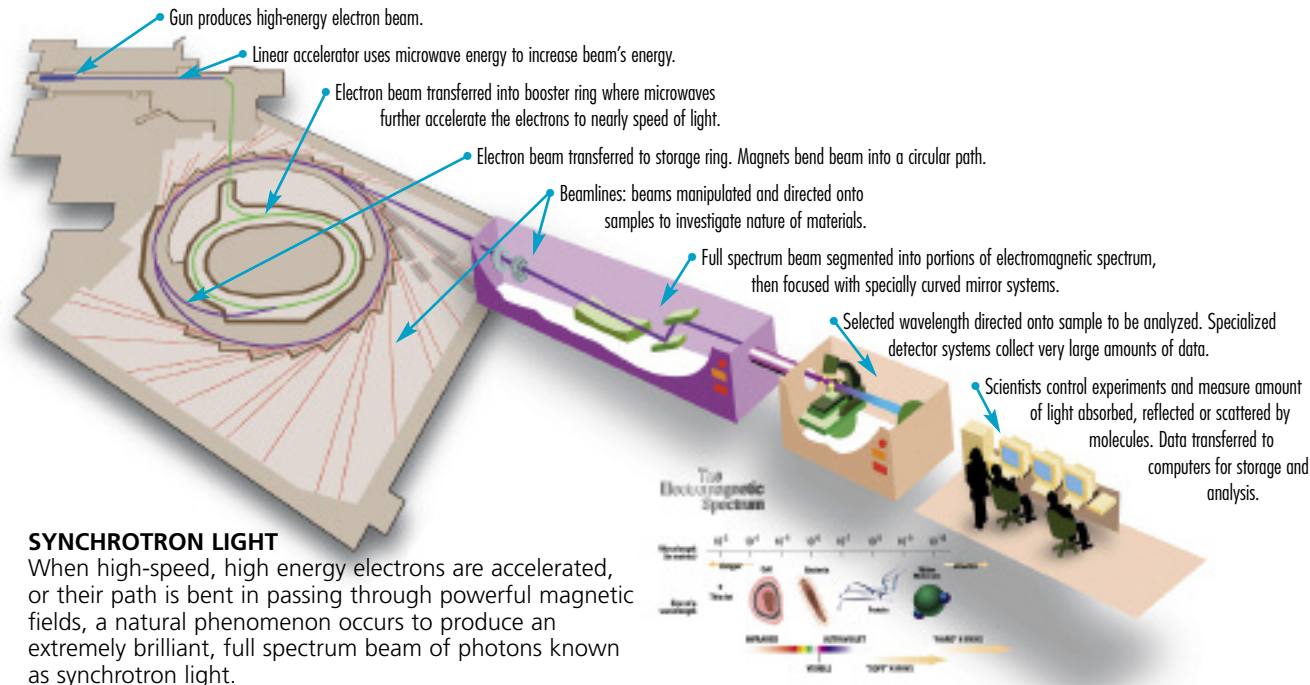
by Ontario researchers, the Ontario Innovation Trust is helping to finance two of the synchrotron's beam lines and associated equipment.

The newly-completed beam lines will be used for an astonishing variety of research. A few examples:

- study of the atomic structure of proteins, leading to the development of new and better drug treatments
- analysis of chemicals in mine tailings, leading to better environmental controls and more effective rehabilitation of mine sites
- imaging of the human body in unprecedented detail,

### RESEARCH THAT MATTERS REAL-WORLD BENEFITS FOR ONTARIANS:

- leadership in fundamental research, stronger educational institutions
- applications in a variety of areas, including medicine, the environment and manufacturing



### SYNCHROTRON LIGHT

When high-speed, high energy electrons are accelerated, or their path is bent in passing through powerful magnetic fields, a natural phenomenon occurs to produce an extremely brilliant, full spectrum beam of photons known as synchrotron light.

### Spinning off more than light

Light isn't the only thing that spins off from the Canadian Light Source. Ontario companies were involved in building some of the sophisticated equipment involved in the synchrotron—and the result has been credibility on a global scale. "The CLS contracts," says Johnson Ultravac president, Hans de Jong, "have enabled us to become a major international player in construction of synchrotron beam line equipment worldwide." Following on the heels of the Saskatchewan project, Johnson Ultravac signed a contract to provide the Indian Space Program with high-tech vacuum equipment.

leading to new approaches to treatment in a wide range of ailments including cancer, arthritis and reproductive dysfunction

- study of surface materials, leading to the development of new engine anti-wear coatings for the oil and automotive industry

For decades, Canadian researchers have been forced to go to other countries to perform

essential synchrotron research. But now, with the opening of a world-class Canadian facility, they can compete in the global arena. And from medicine to mines to car motors, the Canadian Light Source will allow them to throw new light on a host of issues that affect the quality of life for Canadians.



**Project:** Canadian Light Source  
**Institution:** The University of Western Ontario  
**Research Discipline:** Health Sciences/Imaging Technology  
**Principal Investigator:** Michael Bancroft  
**Trust Investment:** \$9,400,000  
**CFI Investment:** \$9,400,000  
**Total research investment from all sources:** \$39,105,900



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### Infrastructure for Innovation About the Ontario Innovation Trust

The Ontario Innovation Trust was created in 1999 by the Government of Ontario to invest in research equipment and facilities at Ontario's universities, colleges, hospitals and other non-profit research institutions. The Trust is governed by a volunteer Board of Directors, according to the terms of a Trust agreement established by the Ontario government. A small permanent staff looks after day-to-day operations.

Since its inception, the Trust has committed almost \$843 million to strengthen Ontario's position in the global marketplace of ideas. This represents more than a third of the \$2.44 billion in total funding that has been invested in Trust-supported projects.