Canadian Light Source / Centre canadien de rayonnement synchrotron

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News from the Canadian Light Source Business Team

INNOVISION

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Ahead of the Curve

Ahead of the Curve, a business book written by Joseph H. Ellis on economic theory, is really a book focusing on how misleading and contradictory data often provides clues to the mysteries of the growth and decline of industries. As I read it, I could not help but relate it to science and the synchrotron.

"Ahead of the curve" is exactly where the Canadian Light Source (CLS) puts our industry partners. Whether you need environmental solutions for the mining or oil industries; answers to nanotechnology; information to improve the performance of materials and lubricants; a better understanding of protein structures to improve health; obtaining the make-up of a crop seed non-destructively; improved understanding and hence control of diseases such as cancer, Alzheimer's disease, malaria, diabetes, and others, a synchrotron touches us all with it's ability to deliver solutions to industry and, ultimately, consumers.

Recently, I toured the CEO of a major energy company through our facility. As we wrapped up, he summarized a synchrotron as follows: "I now know the solution - I need to talk to my people about what our problems are." He saw a way to get ahead of the curve from a business perspective by using the CLS as a solution provider.

I encourage you to read this first issue of InnoVision and see how it can help you stay ahead of the curve. The impact of the synchrotron on Canadian science and technology over the next 30 years will be tremendous. Our national research community will be greatly influenced in its ability to conduct state of the art science, to such a point that I expect we will see some Nobel Prizes come from their efforts.

The impact of the CLS on industry will be equally great, helping companies create solutions for regulatory needs, quality assurance and the development of new advanced products.

I trust that this first issue of InnoVision stimulates your entrepreneurial spirit and gets you thinking about the Canadian Light Source and being ahead of the curve.

Murray McLaughlin
CLS Director of
Business Development

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OUR MISSION | To attract and engage users by effectively communicating and delivering synchrotron solutions—thereby helping to maximize the utilization of the Canadian Light Source.

CLS Business Team
Our people make the difference.

Whether applying CLS beamlines to solve a particular problem for a client or inspiring the next generation of scientists through tours and classroom presentations, the CLS business team is committed to building clientele and attracting the best talent to the synchrotron.

"We are a solutions and service provider," explains Murray McLaughlin, Director of Business Development. "We work with business, government and academics to solve problems."

This kind of work requires a special kind of team: "We have a group of forward thinking people that contribute a unique combination of skills to the CLS. We provide the knowledge and the expertise that industry needs to solve their unique challenges."

As more beamlines come on-line, the business development team is staying abreast of industry developments where their services may be of use. One sector that is brimming with potential is the environment. Associate Director of Research for Industrial Science Jeff Cutler explains, "In responding to our natural resource-based economy, we will have an extensive role to play as we move towards sustainability in those sectors."

Scientific exploration and industrial liaising are only part of the daily activities of the business development team. Several team members are involved in communications, outreach and education. "We never know where our next client is going to come from," says Cutler, "We bring in community members, industry people, academics and students for tours, which sparks ideas in their own work. This often leads us to our next business opportunity."

CLS outreach and education staff gives classroom presentations and host summer camps for teachers and students. With luck, these students will eventually become the next generation of solution and service providers on the CLS Business Team.

CLS PARTNERSHIPS: | AREVA Resources Canada

Stabilizing mine tailings is good for business — *and the environment.*

"As the Vice President of Environment, Science and Technology," begins AREVA's John Rowson, "it's my job to ensure that operations are environmentally sustainable. That means the land has to be usable after it was mined in the same way that it was used beforehand."

Mining companies like AREVA mitigate short-term effects of mining throughout the extraction process. But they also need to mitigate long-term effects, such as preventing contaminants in the groundwater. Rowson continues, "We're talking about keeping materials stable for thousands, even tens of thousands of years."

Arsenic is a toxic by-product of most mining processes, and one that the industry has long been studying. In an effort to reduce long-term effects at the McLean Lake Operation, Rowson's team developed a process to engineer mine tailings in a way that contain arsenic as a stable mineral within the Tailing Management Facility (TMF). The mineral is relatively insoluble, allowing for the controlled release of arsenic in a manner that would not adversely affect nearby water sources.

Some scientific uncertainty remained in conclusions drawn from the initial laboratory studies and the regulatory agencies adopted a precautionary stance. "We couldn't point to any other mining operations in the world that were doing what we were proposing to do," says Rowson, "so we had to prove that it worked."

Evidence of mineralization wasn't visible when the sludge was viewed through conventional x-ray diffraction techniques, so Rowson and his team turned to the CLS for help. The research team used extended x-ray absorption fine structure spectroscopy (EXAFS) to identify the mineral.

"With the help of CLS, we were able to demonstrate that arsenic was stabilized in a poorly crystalline mineral. CLS helped us gain technical certainty in our quest for environmental sustainability. And that made regulatory agencies far more comfortable with licensing our operations."

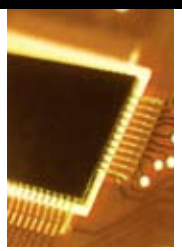
"It's hard to put a dollar value on that. We simply would not be able to mine ore bodies if we couldn't prove that we can control the long term effects of the mine tailings."

Jeff Cutler, Associate Director of Research for Industrial Science at the CLS adds, "Our work with AREVA was a true partnership. We work hard to provide solutions for our clients—in this case, AREVA needed proof that their methods were successful, and we were able to provide that."

John Rowson, Vice President of Environment, AREVA Resources Canada Inc. at McClean Lake (www.areva.ca)

JEFF CUTLER

"Whether you require initial training on how to most effectively use a beamline, or if you'd prefer to just hand over your question to us and have us solve it, we're able to provide every level of service".



The Industrial Services Team
In the business of providing solutions.

CLS' Industrial Services have developed broad expertise in the areas of earth and environmental science, materials and life sciences. From mining to aerospace to pharmaceuticals to bio-products, CLS professionals are lending their skills to industry partners.

"Industry has interesting problems," says Jeff Cutler. "You just rarely hear about them." At CLS, the Industrial Services team wants to hear about problems that occur in various industrial sectors—and they will be happy to solve them.

Scientists at the CLS have developed a high level of understanding of such principles as chemical bonding and structure, which helps them to gain insight into varied substances including soils, mine wastes, catalysts, ores and minerals, biological tissues, functional foods and nutritional supplements, forensic evidence and manufactured materials such as metals, ceramics and polymers.

These topics are of particular interest to scientists and engineers involved in environmental remediation, mineral processing, security and safeguards, and metals process technologies.

The CLS team takes pride in their ability to offer creative solutions to their clients. What makes this possible is the team itself—"We have a cohesive group of top-notch people who work very well together."

"Whether you require initial training on how to most effectively use a beamline, or if you'd prefer to just hand over your question to us and have us solve it," smiles Cutler, "we're able to provide every level of service." The team is also on hand to review options for each client's unique requirements, and recommend the best available technology solutions.

CLS scientists not only enjoy scientific exploration; they also enjoy the added challenges of catering to industry, such as tight timelines and addressing industry priorities. "Science has always been about the art of solving a problem," explains Cutler. "Here, we employ the art of solving the problem for industry."

Jeff Cutler, Associate Director of Research for Industrial Science

SGM / VLS-PGM

VLS-PGM and SGM both offer x-ray absorption spectroscopy, a technique that is often used in chemical analysis that is difficult to differentiate using other methods.

Beamline Profile: SGM / VLS-PGM

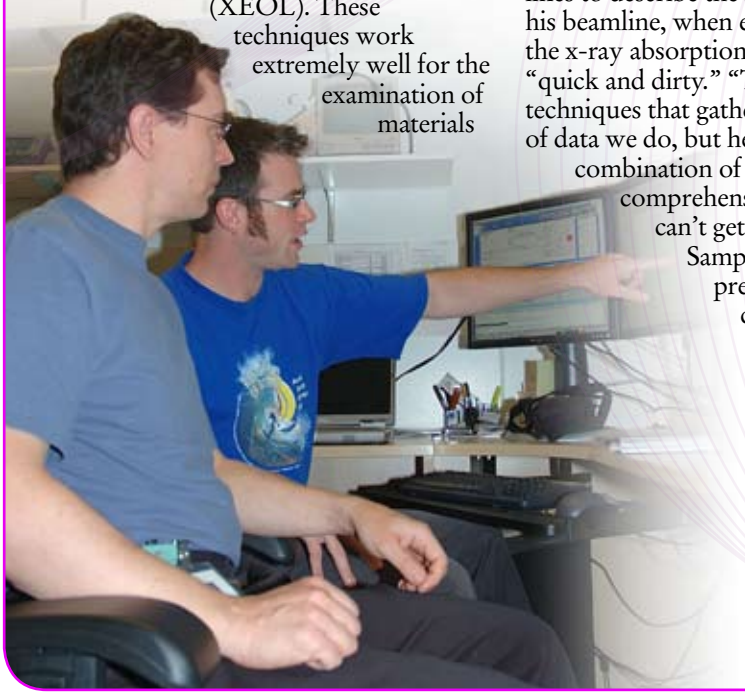
Complementary beamlines offer multiple opportunities for material close-ups.

The SGM (high-resolution spherical grating monochromator) and the VLS-PGM (variable line spacing plane grating monochromator) beamlines and their associated analysis tools share a straight section at the synchrotron. Whether researchers are looking for surface analysis of materials, or hoping to delve into the chemical make-up of the materials they're studying—or both—SGM and VLS-PGM can provide the information they need.

The beamlines' end stations offer differing techniques. SGM has a photo-emission spectrometer, which is best applied to analyzing solid surfaces. Its second end station involves x-ray absorption and excited optical luminescence (XEOL). These techniques work extremely well for the examination of materials that emit light, which are used in common products including light-emitting diodes (LEDs), computer monitors and traffic lights.

VLS-PGM and SGM both offer x-ray absorption spectroscopy, a technique that is often used in chemical analysis that is difficult to differentiate using other methods. Beamline Scientist Robert Blyth notes, "The method works particularly well for the speciation of spectroscopically quiet materials. For example, Aluminum hydroxide is known to be much more toxic than other types of Aluminum. This is relevant in cases where we're trying to test the safety of soil and water samples."

Beamline scientist Yongfeng Hu likes to describe the functions of his beamline, when equipped with the x-ray absorption end station, as "quick and dirty." "There are other techniques that gather the kinds of data we do, but here we enjoy a combination of ease, speed and comprehension that you can't get anywhere else. Samples take minimal preparation and can be examined in situ, which improves efficiency, something that matters in industrial research."

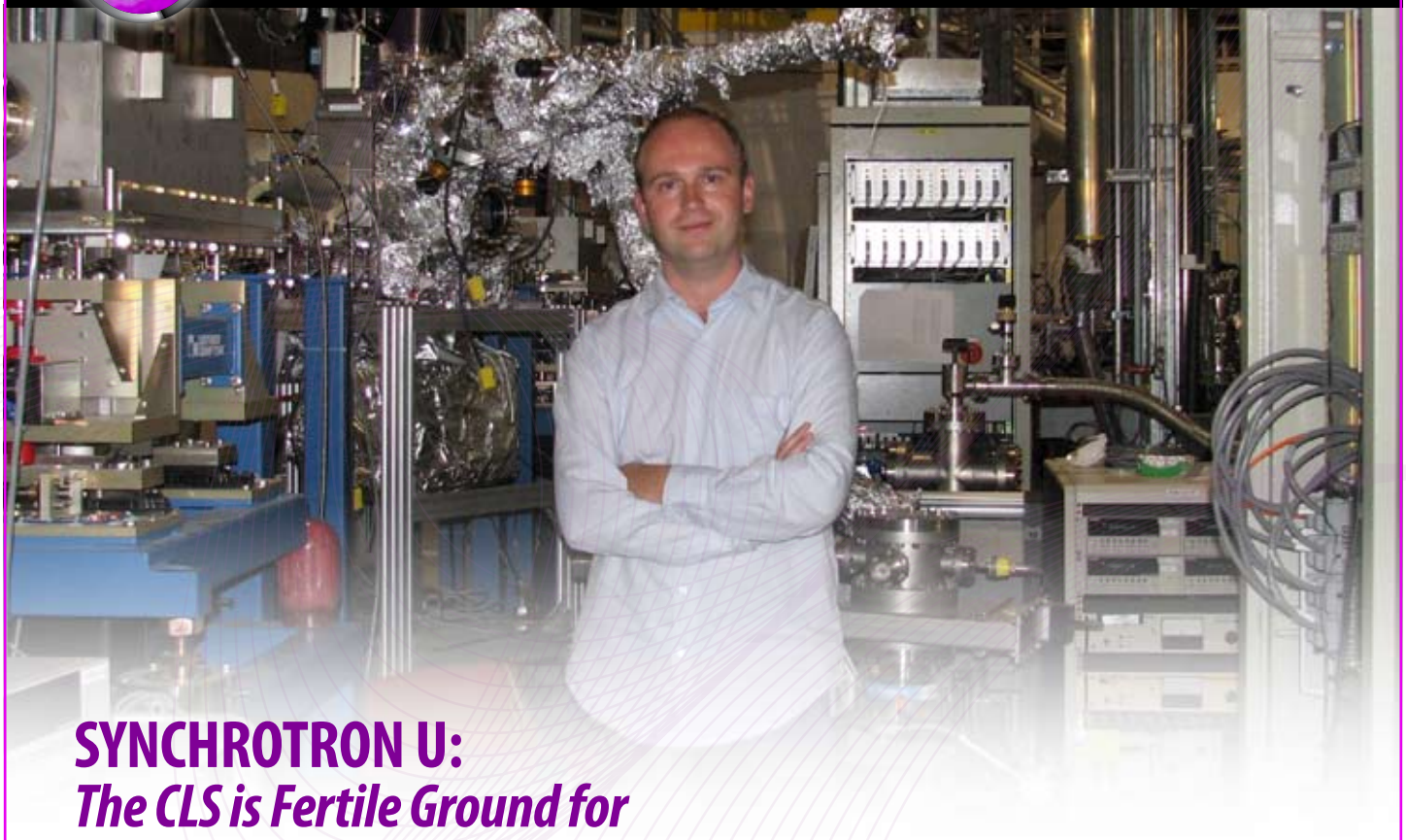


The equipment helps, too. As a 3rd generation synchrotron, more samples can be studied in the same amount of time as traditional analysis techniques. "We can do 20-30 samples per day, more than double the number at earlier generation synchrotrons."

VLS-PGM and SGM complement each other's applications. Often an aspect of a sample that can't be viewed by one of the beamlines can be seen using the other one. Blyth continues, "You can study the same element from various angles, whether you need to examine the surface, or inside the material."

VLS-PGM and SGM are currently at work in areas such as the mining and agriculture fields, aiding in examination of soil samples and fertilizer composition. They are also being used to study bio-lubricants. Blyth states proudly, "We're gaining an international reputation in soil science. We've worked with scientists from Germany, the United States, Australia, including some top soil scientists in the world."

REGAN WILKS | The University of Saskatchewan alumnus recently completed his master's thesis with Canada Research Chair Alex Moewes, tackling how metal-containing peptide molecules can conduct electricity.



SYNCHROTRON U:
The CLS is Fertile Ground for Tomorrow's Science Leaders

While industrial economies of the past depended on supplies of material resources like coal and iron, today's knowledge economy depends on people – specifically large numbers of researchers, engineers and technologists. In addition to being a cutting-edge research facility, the Canadian Light Source is helping to train the next generation of highly-qualified people in science and technology.

Following the Light

Regan Wilks is an example of the young scientists making the most of the CLS as an intellectual incubator. The University of Saskatchewan alumnus recently completed his master's thesis with Canada Research Chair Alex Moewes, tackling how metal-containing peptide molecules can conduct electricity. The groundbreaking work included calculating spectra for some of the largest molecules to date. Published in March 2006, the paper was one of the first publications to report data obtained at the CLS.

Now a doctoral student, Mr. Wilks is delving deeper into the behaviour of metal atoms surrounded by biomolecules. Particularly, he is trying to explain a curious phenomenon he observed while conducting his master's research at the CLS.

"When the molecules [we're studying] are irradiated with X-rays the valence band of the metal atom acquires an extra electron," explains Mr. Wilks. "I am currently designing experiments and performing calculations that will hopefully explain the mechanism behind this photochemical effect. Knowledge of the molecules' electronic states is essential for the rational design of molecular electronics."

In addition to discovering a new insight in chemistry, Mr. Wilks sees the CLS as contributing to his growth as a scientist, while being able to stay close to home.

"I see this as an opportunity to move from being a 'technique-oriented' to a 'question-oriented' researcher," he says. "The CLS kept me here and it has changed the environment [at the university], creating a materials science focus that's made me interested in working in that area."