



*Bhiladvala holds an oxide-covered silicon wafer that is prepared for fabrication into sensor chips, which can be used to detect prostate cancer molecules.*



## Nanomedicine: Big ideas on a small scale

While you are going about your day, a few of the trillions of molecules running around inside you could be ducking into shady corners to plot the takeover of your body systems. A little molecular eavesdropping is forgivable to head off the plot before it gets out of hand. But how? That question hooked mechanical engineering professor Rustom Bhiladvala, who published an article about detecting a small number of prostate cancer biomarker molecules.

Integrating research from a number of disciplines, Bhiladvala's work in the UVic Nanoscale Transport, Mechanics and Materials Laboratory is done in collaboration with cancer pathologists, chemists and electrical engineers to create nanoscopic (the generation beyond microscopic) sensors.

"These sensors are like an arm," Bhiladvala says, holding his own arm out to illustrate a nanowire. "It's vibrating very fast and is made to respond only to the binding of a very specific disease target molecule." The molecule is named PCA3, and provides a more specific indication of prostate cancer than the commonly used Prostate Specific Antigen (PSA) test.

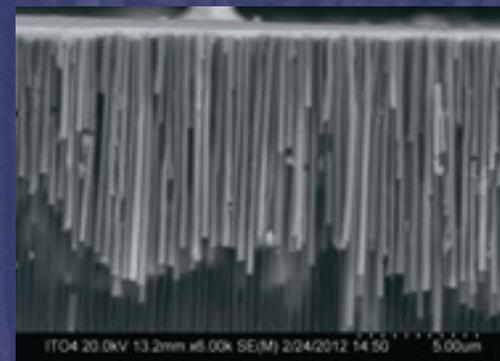
For the aggressive form of prostate cancer, early detection is crucial, but PSA tests also produce many false positives. One-in-seven Canadian men—a proportion expected to rise to one-in-four within a decade—will receive a warning diagnosis from a PSA test. Yet up to three-quarters of patients who get biopsies after a test end up not having cancer, US National Cancer Institute statistics show.

More accurate test results from a blood sample would provide a better screening procedure for early detection of the disease, and could also save money in health-care costs and recovery time from invasive procedures. The sensors Bhiladvala's team is working with might be the solution. They are extraordinarily sensitive, responding to very small concentrations of disease markers found in the early stage of cancer—making them highly effective screening tools.

"The nanosensors can detect small numbers of molecules, snagging only those molecules that are produced by cells with particular kinds of cancer." Bhiladvala explains that the sensitivity of the nanosensors is what makes them remarkable. "We detect specific marker molecules less than a millionth of the mass of a cell, and there are typically 60,000 of these per prostate cancer cell, so using these sensors, we can jump in and ring the alarm bell at an early stage of the disease."

Bhiladvala cautions that although the process is simple, there are numerous intricate details when working with nanotechnology, and they will have to be resolved before this new screening process can be put into practice. The technique is described in a recent paper by Bhiladvala and Penn State collaborators, published and marked as having potential clinical relevance in *Nanomedicine*.

"We have demonstrated sensitive detection with low false-positives for early detection of prostate cancer," says



*Small wonder: With the aid of a scanning electron microscope, individual nanowires are revealed on a cleaved section of growth template. With a diameter about 1/1000 of a human hair, these nanowires in vibration can sense the small mass of a few large molecules.*

Bhiladvala. "There is still work to be done before this test appears in the doctor's office, but the hope is for a more accurate test for prostate cancer that will get to the market within a decade." The team hopes to extend the application of the technology to multiple biomarkers for the same disease and to other types of cancer, neurodegenerative disorders and genetic diseases.

## MESSAGE FROM THE DEAN



During the 2012-2013 academic year, the Faculty of Engineering had the largest first year engineering class in its history, twice as large as five years ago. Powerful forces—the economic landscape, internationalization, globalization, aging demographics, rapidly evolving technologies,

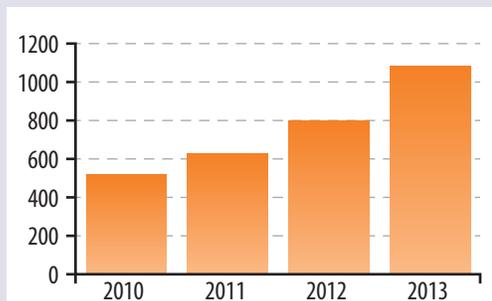
sustainable development and resource limitations—require significant changes in the role universities play in society. These forces present big challenges, as well as huge opportunities, for engineering and computer science to exhibit leadership in designing quality programs that will shape our future.

Since the establishment of the Faculty in 1983, students and faculty members have been instrumental in the growth of the technology sector on Vancouver Island. Technology is already Victoria's number one industry, estimated yearly at \$1.67 billion, surpassing Victoria's \$1.19 billion tourism industry. Our alumni are disproportionately represented among the technical staffs of the more than 900 technology companies in the region.

Mary Sanseverino, a faculty member in Computer Science who is well known among computer science alumni as an outstanding computer science instructor, won a Minerva Foundation award for women in technology. The Vancouver Sun quoted Mary as saying: "Everybody should know a little bit about how a computer works and how to mold something like an app to create something that does what you want it to do." Good advice!

Spring application data suggests that first year engineering and computer science classes next year will be even bigger. Part of the growth is associated with a growing interest nationwide in computer science and engineering careers, and part is due to the new Civil Engineering and Biomedical Engineering degree programs, that were introduced last year. This growth is an encouraging sign for both our campus and our region and we look forward to welcoming a new generation of innovators into our Faculty.

Tom Tiedje Ph.D., FRSC, P.Eng.



The number of applications for admissions to the undergraduate programs in engineering and computer science has doubled over the last four years. The numbers in the figure are applications received at the end of January for each year.

## A BLAST FROM THE PAST From humble beginnings



The Faculty of Engineering was founded as a response to a provincial labour shortage, but ended up as a defining feature of the university's acceleration into a globally recognized research institution. During the 1970s, more than half the engineers hired in BC came from outside the province. But starting in 1983, students were able to enroll in electrical engineering and computer engineering—and later, mechanical engineering—in Victoria. New instructors—including engineering luminaries such as Andreas Antoniou, Sadik Dost and David Scott—meant that the teaching and training of engineering grads happened side-by-side with a blossoming research culture of discovery and innovation.

"Starting the faculty was very exciting," recalls Antoniou. "We worked with a number of engineers in Victoria, and this program would never have started without their support. They helped change a lot of misconceptions about engineering. Soon people understood that engineering is an important part of environmental solutions, not about building more chimneys." The growth and diversification of engineering at UVic continues today, with Western Canada's first biomedical engineering degree program launched in 2012, and civil engineering slated to begin this fall.

In an example of university-industry partnership, a practice that still continues today, Dr. Ruediger Vahldieck, (right) worked with Mr. Ronald Daniels of Daniels Electronics Ltd. on the development of a high-performance receiver for remote locations in the late 1980s.



The 1977 Computing Centre with the IBM system 370, model 148.

## From floppy to flash

Although computer science courses had previously been offered through the Department of Mathematics since the university's inception in 1963, the Department of Computer Science was officially founded within the Faculty of Arts & Science in 1980. MSc degrees were first offered in 1971 and a BSc in Computer Science was offered in 1975. In 1988, the Department of Computer Science moved from Arts & Science to the new Faculty of Engineering, joining two computation-intensive departments to form an information technology-based faculty.

## Western Engineering Competition 2013

Your challenge is to build a wind-powered cart. You're handed a random assortment of paper plates, toothpicks and a glue gun for your team to beat the out competition... and the clock starts ticking. Welcome to the Western Engineering Competition (WEC) 2013, an annual competition for student engineers.

In January, teams competed in a variety of challenges against universities from across Western Canada to put their ingenuity, technical ability and leadership to the test. "The Junior Design challenge was to use a variety of things which were basically dollar store junk," says WEC 2013 Chair and UVic mechanical engineering student Nigel Syrotuck. "Teams had to build a working cart and received points for weight carried, distance traveled, design review and presentation."

This year the UVic teams had the hometown advantage with WEC 2013 taking place in downtown Victoria. The Senior Design team took home first place for the more complex challenge of building a robot capable of navigating an obstacle course to simulate the re-planting of a forest. Their top finish secured a spot to compete in the national challenge in Ottawa.



L-R: Sankalpa Bhattacharjee, Tyler Edey, Reo Baird and Solomon McMorran proudly display their first place trophy for Senior Design.

## Bridging the gap with a new civil engineering program

Beginning in September 2013, second-year engineering students will have the option of taking program-specific civil engineering classes. A civil engineering stream will be available to any student who completes the common first year in 2012. The program is distinct in its curriculum design. Students choosing to pursue the Civil and Environmental Engineering Program will gain a solid foundation in the design of structures design of structures—such as buildings, water systems and transportation systems—as and integrated discipline. This means ensuring students are taught to consider the principles of carbon-neutral design and relevant socio-economic issues from the outset.

“Our program will help BC to maintain its commitment to responsible infrastructure and sustainable resource development,” says Dr. Caterina Valeo, Civil Engineering Program Coordinator. “This program capitalizes on the growing need for graduates who can meet the challenges of climate-change adaptation and mitigation, water resource management and environmental stewardship that considers population growth and dwindling resources in the future.”

BC needs many new civil engineers per year to maintain the current number of civil engineers working in the province today. At present, foreign-trained civil engineers are meeting this labour market gap. The program will bring teaching, interdisciplinary research and industrial collaborations on advanced and cutting-edge technologies to UVic. The five-year degree includes four co-operative education work terms, giving students direct contact and experience with working civil engineers.



*Graduate student Kerri Robinson monitors the levels of single-celled organisms called periphyton to determine the impacts of treated wastewater effluent on a sensitive river ecosystem.*



*Coady, left, with high school student/lab volunteer Georgia Gibbs in UVic's Mystic Vale.*

Photo: Nik West

## ANY WAY YOU SLICE IT

### Pioneering the next step in the ever-evolving information age

According to computer scientist Yvonne Coady, we're on the threshold of a technological change that promises to be every bit as revolutionary as the World Wide Web. “The next step,” says Coady, “is to tap into the computing power of networked computers to create virtual supercomputers capable of analyzing massive amounts of data, such as climate models, satellite images and DNA sequences.”

Coady and her team of faculty and graduate student researchers are Canadian leaders in a global project called “Slice Around the World” which demonstrates the potential of this cutting-edge technology. Using “slices” from programmable research networks around the globe, they're linking up clusters of computers that communicate through networks thousands of times faster than the Internet.

The networks Coady and her team are developing will weed out unnecessary information and produce factual answers that take all available data into account. “This project shows that the infrastructure works,” says Coady, “and that UVic is among the frontrunners in its development. One day soon, we'll all be using networks like this.

“The uses for this kind of dynamic, programmable networking are almost limitless,” says Coady. “The exciting thing is that it will be revolutionary not just for scientists, many of whom already have access to this kind of network, but for everyone in the community. It will break down the ivory towers of research and put enormous computing power into the hands of ordinary people.”

— by Peigi McGillivray

To learn more about Yvonne Coady, visit <http://webhome.cs.uvic.ca/~ycoady/slice.html>

## Rowing across the Atlantic —with UVic's help

In late January, when four men began their journey to row across the Atlantic, they gave their bodies over to the elements of wind and waves and their daily schedules over to a scheduling app developed at UVic. The Ocean Adventure Rowing Northwest team, including Olympic gold medalist and UVic Vikes alumnus Adam Kreek, share a modified 29-foot rowboat from Dakar, Africa to Miami, Florida—a 6,700-kilometre trip across the Atlantic expected to take 60–100 days.

During their journey, the rowers must adapt to a challenging environment, all while becoming increasingly mentally and physically fatigued. In addition to simple daily tasks, they will need to make critical decisions involving meteorology, navigation, nutrition, oceanography, technology, shipboard and oceanic emergencies, expedition planning, interpersonal communication and leadership. Every aspect of the foursome's schedule—from taking scientific readings to sleeping to simply brushing teeth—is increasingly governed by an adaptive scheduling system developed as part of the Computer-Supported Cooperative Work (CSCW) course in the Department of Computer Science.

“They'll be rowing 12 hours a day and sleeping in shifts. They need a really structured schedule,” says Alessia Knauss, a PhD candidate leading the UVic aspect of the project, which also includes master's students Angela Rook and Jason Cumber. It began after Dr. Daniela Damian, who teaches the CSCW course, ran into Kreek in the airport and got chatting about the adventure and the participants' needs.

Designed as an Android app by Cumber, the program automatically makes tiny incremental adjustments to update daylight time according to the rowers' longitudinal positions. It then coordinates with a calendar app to keep the rowers on track as they cross different time zones. “They see it as a fifth person on the boat who is coordinating everything for them,” says Knauss.

To track the team's progress, visit <http://oarnorthwest.com>



Photo: Eric Knauss

*L-R: Knauss, Cumber and Rook developed a scheduling program to help a team of rowers cross the Atlantic Ocean*

## In memory of Trevor Williams, PhD



Trevor Williams was not a typical graduate student. An activist throughout his life, Williams made a principled decision to leave a successful 23-year career in the aerospace industry as a matter of conscience. In 2008, he continued his lifelong pursuit of knowledge by commencing his studies at UVic to work on renewable

energy projects. Nearing the end of his work as a PhD candidate, his regular life came to a sudden stop—he was diagnosed with cancer in November 2012.

By early January the time had come for others to take action on his behalf. To ensure that he would receive his degree, his graduate supervisor Dr. Curran Crawford defended Williams' thesis on his behalf and UVic accelerated its degree granting process. The result was a unique convocation ceremony in a jammed hospital foyer on January 10. The rushed granting schedule was the first of its kind for a Doctor of Philosophy (PhD) degree and it enabled Williams to don his gown and mortarboard at the age of 47.

At his convocation, Dr. Williams offered his advice for achievement saying, "Listen. I mean really listen to other people. Do you know what I mean when I say really listen? I think ninety per cent of everything I have ever learned, I learned from listening to other people." The next morning he passed away with his wife and family by his side.

Born in Wales, Williams was deeply committed to sustainability, preserving the environment and animal welfare. Williams' PhD dissertation research makes significant contributions to our understanding of the challenges and opportunities presented by the integration of plug-in electric vehicles and distributed energy resources into distribution networks.

The Faculty of Engineering has established the Dr. Trevor John Williams Memorial Fund to create a legacy to benefit future students. To contribute to a gift in his memory, please visit [extrweb.uvic.ca/donatenow](http://extrweb.uvic.ca/donatenow)

## Top co-op student soars on international placement

Like all UVic engineering students, Jason Deglint must complete a series of mandatory co-op terms to graduate. But Jason has gone above and beyond—literally—by getting hands-on with the next generation of aircraft with aerospace company NLR Amsterdam. The international work term, a placement he initiated, originated out of his desire to work in Europe as a first-generation Dutch-Canadian.

"Jason quickly adapted to The Netherlands, showed initiative in his work ethic and executed his project within the limited timeframe," says supervisor Gerald Poppinga. "His project resulted in many recommendations that will contribute to future work at NLR."

While he has also completed work terms with Research in Motion, Deglint credits living and working



in a different country as giving him tremendous opportunities for personal and professional growth. "The material that I was learning on my jobs did augment my academic studies quite well, but they also complemented it and gave me more professional skills." His hard work hasn't gone unnoticed; Deglint was named Co-op Student of the Year for Engineering, Computer Science and Math in November 2012.

To learn more about hiring a co-op student visit [www.uvic.ca/coopandcareer](http://www.uvic.ca/coopandcareer)

## Alumni Making a Difference

To commemorate the University of Victoria's 50th anniversary, the UVic Alumni Association selected 50 alumni as representatives of a diverse group that demonstrates leadership on behalf of the university through their volunteer efforts and engaged support. These outstanding individuals were recognized on February 7 at the Alumni Who Made a Difference celebration during Alumni Week.

Recipients from the Faculty of Engineering include Aimey Bazylak (MAsc '05, PhD '08 Mechanical Engineering); Jessica Bekker (BEng '09 Electrical); Rob Bennett (BSc '83 Computer Science); Doug Ransom (BEng '90 Electrical); and Catherine Roome (BEng '90 Electrical).

In the last 50 years, UVic has awarded over 106,000 degrees, diplomas or certificates. Incorporated in 1965, the UVic Alumni Association's mission is to lead the worldwide involvement of alumni in UVic life through a variety of programs, services, and events offered in partnership with the university. The complete list of the 50 recipients can be found at <http://alumni.uvic.ca/docs/AlumniWhoMadeADifference.pdf>



## Giving Back

Our alumni make a difference by volunteering at events, speaking to classes, hiring co-op students or supporting scholarships. To explore how you can help change the lives of our current students, contact Ms. Jody Kitts, Development Manager at 250-853-3245 or [kittsj@uvic.ca](mailto:kittsj@uvic.ca).

## Planning a reunion?

The UVic Alumni Association can help by promoting your event to classmates, arranging speakers or providing door prizes. Network and keep involved by exploring the list of groups and upcoming events to find something that's right for you. <http://alumni.uvic.ca/events/reunions.php>

## Faculty News

EngineeRing is published twice yearly by the Faculty of Engineering to communicate the faculty's goals, strategic direction and activities in order to connect alumni with each other and the university.



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