

UofT researcher receives top MIT honour - leads research in "buckyballs" for fibre optic materials



A University of Toronto electrical and computer engineering professor, currently leading cutting edge research in the use of "buckyballs" in new materials for fibre optic communications, has been named one of the world's top young innovators by MIT's Technology Review.

Prof. Edward (Ted) H. Sargent, Nortel Networks - Canada Research Chair in Emerging Technologies and professor at U of T's Edward S. Rogers Sr. Department of Electrical and Computer Engineering was named "one of the world's top young innovators" in the TR100, a group of 100 creative individuals under age 35, drawn from a broad spectrum of fields, whose research will shape how we live and work in the future.

Also sharing the honour is Alex Vasilescu, a PhD candidate in the U of T's Department of Computer Science, selected for her innovative research

on anti-terrorism technologies, including face recognition and human motion analysis.

Her research in face recognition resulted in TensorFaces, a unified mathematical framework for face recognition that could have an immediate impact on the security and biometrics industries.

Molecules resemble 60-sided soccer balls

They are profiled in the October 2003 issue of Technology Review magazine.

Using molecules resembling 60-sided soccer balls, Prof. Sargent and Carleton University chemistry professor Wayne Wang led a team of researchers that succeeded in creating a new material for processing information using light.

The material combines microscopic spherical particles - known as "buckyballs" - with polyurethane, the polymer used as a coating on cars and furniture. The buckyballs, given the chemical notation C60, are clusters of 60 carbon atoms resembling soccer balls that are only a few nanometres in diameter. (A nanometre equals a billionth of a metre.) When the mixture of polyurethane and buckyballs is used as a thin film on a flat surface, light particles travelling through the material pick up each others' patterns. These materials have the capacity to make the delivery and processing of information in fibre-optic communications more efficient.

"In our high-optical-quality films, light interacts 10-to-100 times more strongly with itself, for all wavelengths used in optical fibre communications, than in previously reported C60-based materials," said

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Northern Medical School looks to ORION to make partnership work



By their very nature, the Northern Ontario Medical School (NOMS) and ORION were made for each other.

NOMS - a partnership between Laurentian University in Sudbury and Lakehead University in Thunder Bay - will serve an area the size of France. While the main campuses will be in Thunder Bay and Sudbury, NOMS will have multiple teaching and research sites in both large and small communities across Northern Ontario, making connectivity over the ORION network a critical element in the project's success.

NOMS will rely on some of the most advanced communications technologies to bridge the distances and maximize the sharing of research and education resources.

"The Northern Ontario Medical School will train and help retain doctors in the North, ensuring that the long-term health care needs of residents are met.

Using the latest in e-learning technology through the Ontario Research and Innovation Optical Network, NOMS will also open the door to new opportunities in medical research, development and education," said Greater Sudbury Mayor Jim Gordon. "This exciting initiative will have a positive and powerful impact on the economic health of Northern Ontario," he said.

ORION's ability to effortlessly transmit multiple streams of massive amounts of data between NOMS partners is key to overcoming the great distances separating them.

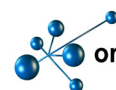
For example, ORION will make it possible for simultaneous, real-time, two-way video communication between students and classrooms in Sudbury, Thunder Bay and other communities.

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The ORION Research and Discovery News is a monthly electronic publication providing news and information of interest to users of the Ontario Research and Innovation Optical Network and to the worldwide research and education community.



DNA research requires high transmission and storage capacity



Biomedical research is one of the leading edge areas of research and advanced education that increasingly requires the ability to send, receive and share massive amounts of data at very high speeds.

For example, Genome research involves the creation of large amounts of data, so much data, in fact, that much of it is discarded rather than stored because researchers don't have adequate storage or transmission capacity.

ORION's recent partnership with the SHARCNET project has the added advantage of not only moving more data faster it will also increase computational speed and storage capacity of SHARCNET.

"ORION gives SHARCNET the underlying communication capability to create large shared storage across its member institutions" explains Chair of the Department of Computer Science Mike Bauer, at the University of Western Ontario. "Once in place, it will provide users much greater flexibility in how data is stored and shared."

Researchers will be able to choose to work with gigabytes of information from a remote location, or choose to move that information to a more convenient location if it better suits the type of research they're doing.

"Without the communication infrastructure that ORION provides this type of storage development would not be possible," adds Bauer.

The genome structure of all life is such an incredibly gargantuan task ...

ORION will also greatly enhance SHARCNET's already superior computational speed. For example, comparing genome information, such as nucleotide sequences, involves very complex computational analysis and comparison of vast amounts of data. Understanding how genes work or how they interact at almost an atomic level is the kind of research that leads to pharmaceutical discoveries or medical breakthroughs. "Before ORION, the process could take days," says Bauer. "With ORION's speed, the same computations will now take mere hours."

DNA research inherently requires massive amounts of data to be created, transferred and accessed beyond the confines of SHARCNET.

"ORION's high-bandwidth networking will provide the fast, efficient access to and transfer of the information needed for the collaborative nature of this research I do," says Brian Golding, Professor of Biology at McMaster University.

Sharing of microarray data is one example of research that is undertaken at McMaster that requires high bandwidth to perform at peak efficiency. Microarray research involves using tiny pins to spot a bit of DNA on to a slide. RNA with a fluorescent marker is then hybridized to the DNA on the slide. RNA can be added from healthy tissue with one fluorescent marker and RNA from cancerous tissue can be added with a different fluorescent marker. Differences in the intensities of the two markers show what genes are expressed more in one tissue source than in the other.

"Thousands of these spots are made on just one slide and over half-a-million data points can be accumulated in a single afternoon," explains, Golding. "The immediate result of this research is a massive amount of data on gene expression that describes a snapshot of the activity inside the cells.

Because the task of identifying and mapping the genome structure of all life is such an incredibly gargantuan task, a high level of cooperation is required among life scientists.

This includes a necessity that research data be made available to researchers and students from around the world. An example of this is the National Centre for Biotechnology Information at Bethesda Maryland which hosts a database of all DNA sequences that are currently known. It stores and provides everyone with access to over 30 billion nucleotides. The data can be searched and/or downloaded at anytime by anyone.

Obviously, some DNA research has a very high privacy factor. "ORION provides a secure method of transferring hundreds of gigabytes of very sensitive data and applications very quickly between collaborating researchers," says University of Guelph's Prof. Deb Stacey, Department of Computing and Information Science. "Previous methods of transferring data, including the use of couriers to take CDs from one institution to another, was risky."

Digitized medical and biological data other than DNA research also involves terabytes of information each terabyte being equivalent to twenty thousand four-drawer filing cabinets of information.

"Some institutions have excellent libraries of information but the only way researchers from other institutions are able to use the information is to physically go to the host institution" observes Stacey.

"For example, a research project in mammography images especially one that studies the time-based images or images taken over a period of time may require one to two terabytes of data," explains Stacey. "The images have to be of a high enough resolution to be useful and to retain confidence. "With ORION, data has become dramatically more accessible."

UofT researcher receives ...

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Sargent. "We've also shown for the first time that we can meet commercial engineering requirements: the films perform well at 1550 nanometres, the wavelength used to communicate information over long distances."

" This work proves that 'designer molecules' synthesized using nanotechnology can have powerful implications for future generations of computing and communications networks."

The research was supported by the Ontario Research and Development Challenge Fund, Nortel Networks, the Natural Sciences and Engineering Research Council of Canada, Canada Research Chairs Program, the Canada Foundation for Innovation and the Ontario Innovation Trust.

Prof. Sargent, who says he is looking forward to taking advantage of the collaborative networking capabilities of the ORION network, is the author of over one hundred papers in refereed journals and presented at international conferences. He has delivered invited addresses at leading technical conferences in the U.S., Japan, and Europe in the areas of microwave photonics, communications, and nanotechnology. More information can be obtained at the Sargent Group web site. Alex Vasilescu's work is profiled on her research page.

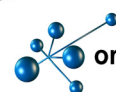
The team 's research parallels other research at the university into a new class of microscopic crystal structures, which is bringing high bandwidth optical microchips one step closer to efficient, large-scale fabrication.

The structures, known as photonic band gap (PBG) materials, could usher in an era of speedy computer and telecommunications networks that use light instead of electrons.

"This will be a tremendous breakthrough," said Sajeev John, a professor in U of T's Department of Physics and co-investigator of the study published in the June 7-13 issue of Physical Review Letters. "It's basically a whole new set of architectures for manufacturing nearly perfect photonic band gap materials and will provide an enormous increase in the available bandwidth for the optical microchip."

Prof. John and his team devised a photonic band gap blueprint that can be made with nanometre-scale precision by bombarding it with x-rays. The x-rays pass through a gold "mask" with an array of holes, removing portions of a polymer template below. Glass is deposited to fill in the holes and the remaining polymer burned away with heat. Silicon is then deposited throughout the void regions of the glass template and the glass finally removed with chemicals, leaving behind a pure silicon photonic band gap material.

The study was co-written with physics graduate student Ovidiu Toader and Mona Berciu, a physics professor at the University of British Columbia, and funded by the Natural Sciences and Engineering Research Council of Canada.



Setting for Hugo-winning novel, Sudbury Neutrino Observatory connects to ORION



While this year's Hugo Award winning novel – Hominids – is clearly a work of science fiction, there is no fiction involved at the Sudbury Neutrino Observatory (SNO), where the best-selling novel by Canadian writer Robert J. Sawyer is set.

Hominids, about a portal between Earth and another world, tells the story of an alternate Earth where a Neanderthal quantum physicist is accidentally transferred to our universe, arriving at the real-life Sudbury Neutrino Observatory in Northern Ontario.

SNO may well be at the centre of attention in the world of science fiction, but the project is firmly grounded in reality, and just connecting to ORION, to facilitate collaborative research and data transmission with colleagues around the world.

While we've all heard about protons, which help to form atoms which in turn help to create everything we see, touch, smell, hear and taste in our day-to-day lives, we know very little about neutrinos, estimated to be 30 million times as abundant as protons.

Located in a unique but remote site near Sudbury, SNO collects crucial data for the international community of scientists who study neutrinos.

Operating 24 hours a day, seven days a week, SNO compiles almost a terabyte of raw data every year. Simulations to calibrate and create

the optimum performance of the observatory, as well as analysis of data increases the amount of stored data by a factor of three. In all, SNO is the central repository of almost nine terabytes of data, the equivalent of approximately 180,000 four-drawer filing cabinets of information.

"Without ORION, the prestige of this project would have been diminished."

"We're very fortunate to have this ideal location in an old Inco nickel mine to set up this observatory," said Clarence Virtue, a professor of physics at Sudbury's Laurentian University. "Scientists have always gone wherever they have to go to collect the observations they need to do their work, no matter how remote the location; for the study of neutrinos, Sudbury is that location.

"But until ORION came along there were unavoidable obstacles to accessing and sharing the information involved in studying neutrinos," added Virtue. "It has been a nightmare without good bandwidth to communicate with other research institutions

throughout Ontario, the United States and around the world."

Data collected on site or sent to the site is currently copied on tapes and sent through the mail. Virtue recalls that, in order to receive half-a-terabyte of data recently, four hard drives had to be purchased for the purposes of copying the data that was then transported by mail.

With ORION, scientists will be able to access and manipulate the data they need independent of where in Ontario or around the world their base of operations is located.

Last year, the Canadian Foundation for Innovation announced funding for a major expansion of the facilities at SNO to enable at least three other experiments, in addition to the neutrino observatory, geared toward better understanding the composition of our universe.

"Without ORION, the prestige of this project would have been diminished," says Virtue. "Instead, this will look very good for all of Northern Ontario to not only have a world class facility but to be plugged in to the rest of the world via ORION."

Among the other Ontario institutions currently participating in the project are Laurentian University in Sudbury, Queen's University in Kingston, Carleton University in Ottawa and the University of Guelph.

Find out more about the project at the SNO home page at Queen's University.



ORION - CA*net 4 Days - Ontario researchers gather to learn about advanced networking



Researchers and educators from throughout Ontario will gather at a series of workshops over the next several months to learn more about ORION, its advanced networking capabilities and how it can be used to facilitate collaboration and innovation in their work.

The ORION - CA*net 4 Advanced Networking Days, to be presented throughout Ontario, will feature presentations from researchers who are already making extensive use of advanced networking, as well as presenters from ORION

and CANARIE and other experts.

Participants will be invited from the various regional institutions that are now connected to the network, and from those that anticipate being connected in the near future.

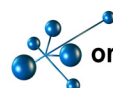
"This is a great opportunity to demonstrate the benefits of being part of the ORION network, and to start raising awareness within institutions and the broader research community," says ORION's Senior Manager of Strategic Partnerships, Randy Neals.

ORION expects to schedule the workshops in

Sudbury, Toronto, Kingston, Hamilton and London in November and December. More sessions are planned for Thunder Bay and Ottawa in January and February 2004. Other locations will also be scheduled.

ORION – CA*net 4 Days have already been held in Windsor and Ottawa.

The workshop schedule, including dates, locations and program will be finalized and announced in October. For more information, contact event organizers at info@orano.on.ca.





ORION News Briefs

ORION traffic growing - exceeds other RANs

With only just over 20 institutions connected to ORION, production R&E traffic between ORION and CA*net 4 has already exceeded the traffic of most other regional advanced networks in Canada. ORION traffic peaked at 170 Mbps this week (Sept. 23, 2003) As more eligible Ontario institutions connect, ORION is expected to represent over 30 per cent of the traffic on CA*net 4, as early March 2004. More institutions are scheduled for connection over the next several weeks. Five Northwest Ontario school boards will also be joining ORION near the end of September. The PoPs at Timmins, North Bay and Sault Ste. Marie should be operational by November, says ORION Project Director Sam Mokbel. View real-time statistics on the ORION CA*net 4 Traffic Map.

Partnership wins Showcase Award

ORION and the Ontario Ministry of Enterprise, Opportunity and Innovation recently shared a coveted Showcase Ontario Award of Excellence, in recognition of the partnership's success leading to the building and deployment of ORION, one of the world's largest and most advanced optical research networks. The Merit Award, bestowed at the Showcase Ontario award ceremony Sept. 9, was in the Public-Private Sector Partnership category. "We're very proud of this award and we're

thrilled to share this recognition with our partners at the Ministry," said ORANO President and CEO, Phil Baker. The annual awards showcase excellence and innovation in information and information technology projects that enhance the quality of Ontario public service.

RISQ and CANARIE co-host 2003 Advanced Networks Workshop

"Networks for People - Accessibility, Performance and Results" is the theme of CANARIE's Advanced Networks Workshop, October 21 to 24, in Montreal. The conference is co-hosted in collaboration with the Réseau d'informations scientifiques du Québec (RISQ). The annual ANW is the most significant Canadian event in the field of broadband and its applications and brings speakers and presentations from throughout the world. More information, including the conference program, can be obtained at the conference web site.

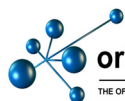
2003 CANARIE IWAY Award Winners celebrated

Over people from throughout Canada's advanced networking community was on hand on Monday, Sept 22, as CANARIE presented the annual IWAY Awards to seven groups and individuals, at Toronto's Arcadian Court. Also marking CANARIE's 10th anniversary, the awards recognized innovators and leaders who have made outstanding contributions to the advanced of Canada's information society. Toronto-based Canadian Hearing Society received the Adaptive Technology Award. Dr. Edward Brown, Executive Director of North

Network - Toronto, and Robert Gamble, President of Service New Brunswick - Fredericton, shared the Application of Technology Award. Carleton University's Prof. Wade Hong and Corrie Kost, of TRIUMF in Vancouver, both received the New Technology Development Award. The Public Leadership Award went to Dr. Michael Geist, Professor at the University of Ottawa. The Director of Technology for TakingITGlobal, of Toronto, was honoured with the IWAY Community Service Award. The event also featured E-Canada, a live national demonstration of the power of advanced networks. School children from across the country sang the national anthem from seven locations, including Vancouver, Edmonton, Iqaluit, Buckingham, Ottawa, St. John's and Toronto. The demonstration was a recreation of an event on July 1, 1927 when the original CN radio network broadcast the music of orchestras from multiple locations across Canada.

Jack Gorrie

The University of Toronto mourns the recent passing of Jack Gorrie, the university Provost's Adviser on Information Technology, and more recently, a member of ORANO's Board of Directors. Gorrie, 55, passed away on Aug. 30 after a short battle with pancreatic cancer. "This is a major loss to ORANO and our university community," said ORANO Board Chair, Dr. Ross Paul, President of the University of Windsor. "His years of experience brought an important perspective to our work at ORANO. He will be missed," he said. An obituary notice was published in the Globe and Mail.



orion research and discovery news

THE OFFICIAL NEWSLETTER OF THE ONTARIO RESEARCH AND INNOVATION OPTICAL NETWORK

About ORION

ORION is an advanced high-speed fibre optic network that connects research and education institutions to each other and to colleagues around the world. Spanning 3,700-kilometre to 21 cities throughout the Province of Ontario, ORION was created to bring leading-edge network capability to Ontario's publicly funded R&E community and to become a catalyst for creative and innovative next generation Internet applications.

For more information

ORION is owned and operated by the Optical Regional Advanced Network of Ontario (ORANO). For more information, visit our web site at <http://www.orion.on.ca>. Communicate directly with the Editor of the ORION Newsletter at info@orano.on.ca.

To subscribe to the electronic version of this newsletter, visit this web site. <http://www.orano.on.ca/newsletter/subscribe.html>

Northern Medical School looks to ORION ...

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Collaborative research in biomedical, clinical, public health, population health, epidemiological, psychological and social sciences, health services, and educational research will also be possible, including remote access to Magnetic Resonance Imaging (MRI) facilities and exploring virtual reality environments using CAVE (Cave Automatic Virtual Environment) - a highly useful tool for visualization and was specifically developed to encourage more of the scientific community to use virtual reality in learning and research applications. Virtual reality is the wide-field presentation of computer generated multi-sensory information, which tracks a user in real time.

"The sky's the limit," says NOMS spokesperson Mick Lowe. "ORION will give us more than the ability to make this pioneer institutional partnership work - it will help NOMS to flourish."

With ORION's high speed data pipeline, faculty will have the ability to conduct research between the Laurentian and Lakehead sites using Laurentian's CAVE to access Giant, Lakehead's SGI Origin 2000 supercomputer, explore biomedical models and run simulations. Considerations are also being given to a project where ORION will enable Giant to tie into the Sudbury hospital's MRI facilities for research purposes.

