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- **67** Researchers in Nanotechnology
- **19** Research Chairholders
- **9** Research Awards
- **5** International Workshops
- **26** Collaborative International Research Projects
- **5** International Collaborative Agreements
- **7** Distinguished Lectures
- **11** WIN Seminars
- **4** PhD Erasmus Mundus Scholarships
- **30** WIN Nanofellowships Awarded
# Waterloo Institute for Nanotechnology

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At the turn of the millennium, nanotechnology was emerging as an enabler of scientific and technological innovation. That’s when the University of Waterloo recognized the opportunity to lead Canada in education and research in this field.

Chairs of the Board of Directors

Nanotechnology will be the next industrial revolution. At WIN, we’re driving that revolution forward.

– Dr. Terry McMahon, WIN Board of Directors
In 2005, the faculties of engineering and science jointly launched an undergraduate co-op program in nanotechnology engineering that has proved to be a roaring success. A graduate program followed, providing the underpinning for a world-class research presence.

In 2008, WIN was founded as a research institute mandated to achieve global recognition, recruit and retain outstanding talent, attract promising students, build international partnerships and provide facilities for cutting-edge nanotechnology.

Today WIN has exceeded even the most ambitious expectations. It has a large number of young and dynamic researchers – the stars of the future – and a core of respected scholars, a fantastic new facility, partnerships with top universities and companies, and the admiration of all who visit.

The Board of Directors has been impressed with the rapid progress of WIN and applauds its many successes. It is a well-managed and fiscally responsible institute that has generated significant resources to drive collaboration and adds great value to the research of its members. Congratulations to WIN on another great year!

Dr. Terry McMahon  
Dean of Science  
University of Waterloo

Dr. Adel Sedra  
Dean of Engineering  
University of Waterloo
messages from the...

We believe that discovery and innovation happens at the interfaces of traditional disciplines.

– Arthur J. Carty, WIN Executive Director

Executive Director

When the Waterloo Institute for Nanotechnology was created in 2008, it had a bold vision: to be a global centre of excellence in nanotechnology and its applications.
Four years on, WIN has already achieved many of its founding goals. We have built a critical mass of researchers – 67 principal investigators, plus 250 graduate students and post-doctoral fellows – and equipped them with an arsenal of tools to fabricate and manipulate matter at the nanoscale.

Now, WIN can look forward to an explosion of outputs and impacts: papers, patents, innovative partnerships and spin-offs.

Complementing our research activities, Waterloo’s nanotechnology engineering undergraduate program is the largest of its kind in North America, with almost 500 co-op students enrolled. Meanwhile, a program of $10,000 Nanofellowships, generously supported by an anonymous donor, helps attract top graduate students into nanotechnology.

With this foundation in place, I firmly believe the decade ahead will see WIN acclaimed for excellence in research and innovation – a Canadian and global leader in a field that is touching every segment of our industry and society.

Dr. Arthur J. Carty
Executive Director

Chair of the International Scientific Advisory Board

WIN's International Scientific Advisory Board (ISAB) is composed of prominent nanotechnology players from around the world. Our role is to provide high-level advice on WIN’s research programs, scientific direction, strategic positioning and new areas of opportunity. The ISAB also helps bring credibility and stature to WIN within the global community.

From the beginning, the ISAB recognized that one of WIN's major challenges was developing research focus and cohesion in an institute comprising many individual talents drawn from nine different departments. Another challenge was to build faculty loyalty and commitment to WIN's vision. Over the past two years, the institute has made major strides towards these goals. WIN has the support of the Faculties of Engineering, Science and Mathematics. Dr. Arthur Carty has done an excellent job to draw expertise from these faculties, get these scientists and engineers to work together, build the required research laboratories and grow a research organization which is now among the top in the world.

The ISAB identified several areas of strength at WIN, including nanomaterials for energy harvesting, storage and conversion. WIN has built on this by organizing successful international workshops and pursuing the concept of an Energy Materials Centre – among many examples of WIN’s efforts to “add value” for its members through industry and academic partnerships.

Now, WIN is developing a strategic plan to guide its second 5-years. Our Board endorses the excellent progress made to date and encourages the university to invest additional resources in the Institute to continue its drive for international excellence.

Dr. Savvas Chamberlain, PhD, MSc, DEng, FRSC, FIEEE, FCAE, FEIC, C.M.
EXEL Research Inc., CEO and Chairman
At WIN I get to work with great minds down the hall and around the world.

- Bo Cui, WIN member and leader of the Waterloo Nanofabrication Group

The advent of nanotechnology has been called the next industrial revolution. At WIN, researchers are assembling tiny nanoelectronic components molecule by molecule and growing nanowires with diameters the width of an atom. Through our focus on nanomaterials, nanoelectronics, nanobiosystems and nano-instrumentation, we’re facilitating advances that promise to transform medicine, electronics and energy.
Treating tuberculosis is cheap. Diagnosing it, however, requires big bucks. But if WIN’s Karim S. Karim is successful, he could slash the cost of X-ray machines by a factor of 100. The electrical and computer engineering researcher recently won a $100,000 grant from Grand Challenges Canada to develop a low-cost digital machine that could put the diagnostic technology within reach of developing countries.
Energy storage has captivated me for 20 years and it still does.

– Linda Nazar, WIN member and Canada Research Chair

A Battery of Honours for Canada Research Chair

This past September, WIN electrochemist Linda Nazar was among 78 scholars elected to the Royal Society of Canada, the highest honour an academic can achieve in arts, humanities and science in this country.
But the Tier 1 Research Chair in Solid State Materials is no stranger to accolades. Her groundbreaking work has also earned her the 2011 Rio Tinto Alcan award for distinguished contribution to the field of inorganic electrochemistry. In fact, over the course of her career, Nazar has racked up numerous honours, including the 2011 IUPAC Distinguished Women in Chemistry/Chemical Engineering award and the 2009 Electrochemical Society International Battery Division Award, and she was a 2010 Moore Distinguished Scholar at the California Institute of Technology.

In 2009, Nazar and her research team made a major advancement in the field of battery research. In a paper published in *Nature Materials*, Nazar showed that intimately mixing insulating sulphur and conductive carbon on the nanoscale could significantly improve the energy potential and capacity of lithium-sulphur batteries. The result? A cheaper, more powerful rechargeable battery that could pave the way towards wide-scale adoption of renewable energy and electric vehicles.

The breakthrough injected new life into lithium-sulphur research. “Literally hundreds have jumped into the field since we published our first paper on this,” says Nazar.

After all the awards, patents, publications and hundreds of citations, the solid state materials chemist still arrives at the lab excited by all the discoveries that lie ahead. “Energy storage has captivated me for 20 years, and it still does,” says Nazar. “We still haven’t got to the point where we can establish really low-cost, efficient grid storage. That would completely change the way we conserve, store and use energy. It’s an enormous challenge that we would like to be a part of.”

**Palm-Sized Lab Promises to Save Lives**

Drinkable? Or deadly? For much of the developing world, hundreds of kilometres away from the nearest water-testing lab, it takes weeks to get the answer. As a result, millions of people die each year from consuming contaminated water.

Now, thanks to a hefty $1.3-million grant from Grand Challenges Canada and the Bill and Melinda Gates Foundation, systems design engineer John Yeow is developing a solution. Together with Bangalore-based Bigtec Labs and the Indian Institute of Science (IISc), he is creating a low-cost, portable device for on-the-spot water testing.

Yeow’s role is to develop technology for preparing the sample: separating the different types of cells, breaking them apart to release their DNA, and then amplifying the DNA so that it can be detected by standard sensors.

The challenge lies in that second step. Breaking the cells membranes requires a high-intensity electrical field – not so easy to achieve with a hand-held device powered by batteries. That’s where nanotechnology comes in. Using carbon nanotubes, he’s able to create a lightning-rod effect, strengthening the electric field at the tip of the nanotubes enough to zap open cells.

Although there are still challenges to be overcome, Yeow foresees having a working prototype within the next three years. If he and his partners are successful, finding out whether a water supply is safe could become a matter of minutes.
A Chemical Engineer Sets His Sights on Better Vision

As you get older, it’s natural to start squinting to read your latest BlackBerry® message. However, some age-related conditions are more serious.
Untreated, macular degeneration and diabetes retinopathy can lead to blindness. And while an injection directly into the eye can keep these diseases in check, it has to be repeated every three months because the eye clears away the pharmaceuticals so efficiently.

Canada Research Chair Frank Gu and his colleagues in the NSERC 20/20 Ophthalmic Materials Network hope to dramatically reduce the frequency of these injections by packaging the drugs in nanoparticles designed to target the affected cells. Once there, the particles slowly release their payload, increasing the effectiveness of each treatment.

But how do you keep the nanoparticles in place long enough to do their job? The solution is brilliant – literally.

After the injection, shining a light of a particular wavelength into the patient’s eye will prompt the nanoparticles to clump around the diseased cells, forming a mass too big to pass through the sieve of the eye’s capillaries. Later, once the nanoparticles have dispensed their drugs, shining light of a different wavelength will break up the clumps, leaving particles small enough to exit the eye. With lab bench trials successfully completed, Gu is now ready to test the process in vivo.

So how did a chemical engineer wind up working on the human eye? “I’m always fascinated with biomedical technologies,” says Gu. As a post-doc with MIT biomaterials pioneer Robert Langer, he used similar technology to target cancer cells.

When he came to Waterloo – “the MIT of Canada,” according to Gu – he brought his mentor’s multidisciplinary approach with him. While many scientists focus on either materials or biology, Gu believes in bridging the gap. “When you gather a group of professors from different departments together,” he says, “sometimes magical things do happen.”
By understanding what goes wrong, we may be able to come up with solutions.

- Hany Aziz, NSERC-Dalsa Industrial Research Chair

The Future Is Flexible

Not too many years from now, Hany Aziz predicts, you’ll roll down your big-screen TV before settling in for an episode of Big Bang Theory. And your cell phone? Just roll it up and stash it in your pocket or purse.
That’s the future promised by flexible organic light emitting devices (OLEDs): LED devices built on carbon-based semiconductors rather than silicon. Add in their minimal weight and the fact they won’t break if you drop them and you’ll understand why Aziz is bullish about this emerging technology.

The benefits don’t end there. Because flexible OLEDs can be created using inexpensive, roll-to-roll manufacturing, they cost less and embody less energy than their silicon counterparts.

So why can’t you grab a flexible screen at your local Best Buy today? “There are certain limitations with these materials,” explains the electrical and computer engineering professor. OLEDs experience electrical aging, making them unstable, while flexible varieties are less durable than silicon – problems he and his graduate students are currently tackling, thanks to an Ontario Research Fund grant co-written with WIN’s support and administration.

“By understanding what goes wrong, we may be able to come up with solutions,” he says.

He’s well positioned to do it. Aziz is a pioneering contributor to the field of organic electronics. With eighteen years of experience, including an eight-year stint at Xerox, the NSERC/DALSA Industrial Research Chair has dozens of patents and several seminal publications to his name.

If Aziz and his team are successful, their work could revolutionize electronic displays in everything from TVs to MP3 players to computer screens, a market worth billions of dollars a year.

Already, rigid OLEDs are starting to show up on store shelves. That’s just the beginning, according to Aziz. “The next wave is going to be flexible displays.”
A hexagonal honeycomb steel lattice provides support, as well as symbolizes the structure of graphene, a fundamental and Nobel-prize-winning building block of nanotechnology.

This remarkable new building, unique in the world, will add tremendous new capacity to the University of Waterloo’s global impact in research and discovery as a state-of-the-art research facility where scientists from many disciplines will work together towards the next big breakthroughs in science and technology.

– Feridun Hamdullahpur, University of Waterloo President
Imagine a space where leading nanotechnology and quantum researchers are equipped with the facilities they need to make game-changing discoveries. That’s the University of Waterloo’s new Mike & Ophelia Lazaridis Quantum Nano Centre. The 284,000-square-foot space is shared with the Institute for Quantum Computing, creating tremendous synergy. In effect, nano will provide a bridge to the quantum world. The Centre will also provide a home for Canada’s largest nanotechnology engineering undergraduate program and the Collaborative Nanotechnology Graduate Program. Designed with interdisciplinary collaboration in mind, this $160-million showpiece at the heart of campus is scheduled to open in 2012.

**Features**

- $50 million of state-of-the-art instrumentation for deposition, lithography, etching, metrology and quantum characterization
- 10,000 square feet of clean rooms and cutting-edge metrology areas
- 50 individual labs
- Floating, one-metre-thick, carbon-fibre rebar-reinforced concrete waffle slab in the metrology areas to prevent vibration and RF radiation interference
- Customizable spaces that encourage the cross-pollination of ideas
- Labs buried below grade to minimize interference from EMI and vibration
- Green roofs

The centre will help bring the best minds to study small things and produce big results.

— Dalton McGuinty, Ontario Premier
There is more and more potential to make discoveries and develop new technologies if your work is international and interdisciplinary.
– Arthur J. Carty, WIN Executive Director

For an institute with a focus on the very small, we believe in thinking big. So big, in fact, that making a national impact is not enough. By focusing on global challenges in energy, environment, health and electronics, we aim to make discoveries and engineer solutions that will change the way the world works. The way energy is created and stored. The way new therapeutics are targeted. And how electronics and devices are integrated into society. Improving the quality of life for all.
We do this by connecting the brightest minds from around the world, fostering international partnerships with top institutes. Through focussed workshops, industry visits, visiting lecturers, student exchanges and joint research projects, we’re forging unprecedented access to the best the field has to offer.

**China**

An agreement with Soochow University Nanotechnology (SUN) is the latest example of WIN partnering with emerging centres of excellence in nanotech. It follows a highly productive workshop with Soochow researchers in Waterloo in July 2011 and a 16-member delegation to Soochow in February 2012.

The 2012 agreement establishes a Joint Research Institute for Nanotechnology; a 2+2 arrangement where top doctoral students can earn PhD degrees awarded by both institutions; and a 3+1+1 program where undergraduates complete their Chinese Bachelor’s degree and earn a uWaterloo Master’s degree.

To date, twelve joint research projects have received almost $1 million of funding from Suzhou Industrial Park and Soochow University under the auspices of the Joint SUN-WIN Institute.

**France**

Our 2010 memorandum of understanding with Université Bordeaux 1 gives us access to a network of 800 researchers and students from 22 research labs in France’s Aquitaine region. In addition, WIN is a founding member of the Erasmus Mundus International Doctoral School in Functional Materials, a European Union initiative that encourages international connections by offering scholarships for binational PhD projects.

In May 2011, the WIN-France Workshop and Business Roundtable brought together 12 participants from Bordeaux and 40 from Waterloo. As a result, nine joint research projects have been approved, including a collaboration between leading French chemical company Rhodia and WIN member Hany Aziz, who jointly share a doctoral student with Bordeaux.

**India**

With five joint research projects currently underway at three top institutions (IIT-Bombay, IISc-Bangalore and JNCASR), India is our longest-standing strategic partner. Through numerous delegations, workshops and invited speakers over the past four years, we’ve built a network of collaboration with educational institutes and industry in Mumbai and Bangalore that is yielding big results, such as the $1.3 million Grand Challenges grant profiled on page 9.

**Japan**

As one of the world’s leading investors in research and development, Japan is an obvious choice for international collaboration. Building on a memorandum of understanding signed in 2010, we have established research collaborations and exchanges with Japan’s National Institute for Materials Science in the area of energy and electronic materials.

In November, a successful Canada/Japan nanotechnology conference hosted by WIN brought together 65 stakeholders to build on Canada’s Science and Technology Agreement with Japan and define research and funding priorities between the two countries. WIN also headed to Tokyo in February for the fourth year in a row to advance research projects, visit industry collaborators and participate in NanoJapan 2012.

**Taiwan**

In the technological hotbed of Taiwan, we have signed research exchange and collaboration agreements with five top institutions: the Academia Sinica, National Taiwan University, National Cheng Kung University, National Chiao Tung University and National Tsing Hua University. After several WIN visits to Taiwan, a 12-person Taiwanese delegation visited Waterloo for a May 2011 workshop, leading to seven funded research projects.
We’re very excited by who we’ve met at WIN and the kinds of things that we think are possible.

– John van Leeuwen, co-founder of Ecosyntheticx

You don’t change the world until you’re making a commercial impact. That’s why the focus of WIN extends far beyond the academic. By building relationships with industry, providing direct support for proposals and encouraging faculty to found spin-off companies, we’re driving transformation from today’s lab bench to tomorrow’s marketplace.
Corporate: Tech Leader Focuses on the Fundamentals

“It’s a real catch-22,” says John van Leeuwen, co-founder of Ecosynthetix. For a small company, investing in fundamental research keeps you on the cutting edge. On the other hand, few enterprises have the equipment, dollars or manpower required. For Ecosynthetix, partnering with WIN was the natural solution.

Since 2001 the company has been producing nano-based biolatex polymers from crops like potatoes and grains. Ten years and several patents later, van Leeuwen and his co-founder, Steven Bloembergen, have their sights set on making Ecosynthetix one of the world’s leading players in biomaterials. Having recently taken the company public with a $100-million IPO, they hope to develop further applications for their nanotechnology platform.

And there’s the catch. “There’s only so much you can do yourself,” explains van Leeuwen. Internal research at Ecosynthetix is geared to a specific product or customer. For more fundamental research, the pair turned to WIN. What they found was an institution that puts a priority on collaborating with industry.

After funding an initial $25,000 kick-start grant for one researcher last year, Ecosynthetix followed up with a multi-year, multi-researcher grant that has been matched by NSERC. Together, this means almost $1.7 million for WIN’s nanotechnology research team.

As for Ecosynthetix, in addition to gaining access to valuable knowledge and resources, they’re also attracting future talent to their company. With one co-op student returning for a second stint and another slated to start, they’re already seeing the benefits.

Commercialization: Fabricating the Tools of Tomorrow

Fabricating structures atom by atom may sound like science fiction, but electrical engineer Rafaat Mansour’s spin-off company – Integrated Circuit Scanning Probe Instruments (ICSPI) – is creating the tools to make it happen.

Mansour’s venture revolves around integrating a micro-electro-mechanical system (MEMS) directly into a complementary metal-oxide semiconductor (CMOS). “Effectively you have a mechanical system and an electrical system on a single chip,” Mansour explains.

The chip, in turn, can be used to produce a whole new class of fabrication, characterization and nano-manipulation tools. Picture, for example, highly sensitive scanning probe microscopes much smaller, and cheaper, than today’s state-of-the-art devices.

ICSPI has attracted DARPA seed funding and a WIN-supported $1.6 million grant from the Ontario Research Fund. “Hopefully one day ICSPI will reach a scale like COM DEV,” says Mansour, who worked at the aerospace giant before being lured to academia.

Partnership: Particles with the Potential to Transform an Industry

You’ve got a hot product but need help identifying its potential. Leonardo Simon is your man. The chemical engineering researcher is working with CelluForce, Bio Vision Technology, and the AboraNano Business-Led Centre of Excellence to find applications for nanocrystalline cellulose (NCC).

The tiny NCC fibres, derived from forestry and agriculture waste, can be combined with different plastics to improve a material’s existing properties or add entirely new ones, such as strength and scratch-resistance. “We’re working with industry to understand what the science is and where we can take it,” Simon says, who is adding NCC to bio-based polyethylenes and polyamides.

Potentially, the answer could range from consumer packaging to high-performance helicopter windows. That’s great news for Canada’s forestry industry – a major source of NCC – and for Simon’s corporate partners. It’s also great news for the planet. “Instead of getting plastics from petroleum and nanoparticles from mining or petroleum, you’re getting everything from plants,” says Simon. “We’re using nanotechnology to develop a sustainable future.”
If you want to raise the technological bar, you have to attract the best and brightest. Each year, WIN offers dozens of $10,000 Nanofellowships to graduate students across nine departments. Meanwhile, our Distinguished Lecture Series and our monthly Seminars bring scholars from around the globe to expand our knowledge base and stimulate new ways of thinking. All of this is made possible by generous endowments and donations from our supporters. The result? Academic achievement that is reflected in a steady stream of international visitors, honours and awards.
Jack of Many Trades, Master’s at WIN

On one day, master’s candidate Leanne Murphy might be surrounded by reagents, developing low-band-gap polymers in Yuning Li’s laboratory. The next day, you’ll find her clad in hairnet and booties, converting those polymers into photovoltaic devices in the Giga-to-Nanoelectronics Lab.

Bridging the divide between electrical and chemical engineering has meant mastering two skill sets and absorbing two bodies of knowledge, but Murphy says the results are worth it.

“I think if I’d just been working in the materials development, I would probably overlook a lot of the things that people have to struggle with when they are doing device fabrication,” explains the $10,000 WIN Nanofellowship winner. “There’s so many variables that will affect the way materials behave with each other.”

Crossing disciplines comes naturally for Murphy, who has undergraduate degrees in both zoology and chemical engineering, as well as several years of experience in industry. That made WIN the perfect fit, thanks to its emphasis on interdisciplinary integration.

The best part of her research? “It’s the idea of all the things you can do with organic photovoltaics,” says Murphy, describing how the cheap, flexible devices could one day be incorporated into paints, roofing and even clothing that charges up while you lounge in the sun. “It’s really cool to be in this field,” she says.

2011 Nanofellowship Winners

2011 Distinguished Lecture Series
» Self-assembled Nanodevices from Smart Block Copolymers for Gene and Drug Delivery
  Prof. Kazunori Kataoka, University of Tokyo, Japan
» Flat-Panel Electronic Displays – a Triumph of Physics, Chemistry, and Engineering
  Prof. Cyril Hilsum, University College London, UK
» Molecular Nanotechnology and Molecular Computing
  Dr. Ralph Merkle, Singularity University, USA (presented jointly with IQC)
» Nanotechnology at Japan’s National Institute for Materials Science (NIMS)
  Dr. Sukekatsu Ushioda, National Institute for Materials Science, Japan
» Scientific and Engineering Challenges and Opportunities in Printable and Flexible Organic Electronics
  Prof. Georges Hadzioannou, Université Bordeaux 1, Institut Universitaire de France, France
» Design and Applications of Single-Site Heterogeneous Catalysts
  Sir John Meurig Thomas, University of Cambridge, UK
» Arthur J. Carty Lecture: Do Governments Need Science Advisors?
  Sir David King, Smith School, Oxford University, UK

IDS-FunMat Program
WIN is a founding member of the International Doctoral School in Functional Materials (IDS-FunMat) in which students receive full funding by the ERASMUS MUNDUS program of the European Union. The school offers scholarships for PhD students studying Functional Materials Science, carried out in co-supervision between two universities and an industry partner. 13 cotutelle student scholarships have been awarded to WIN members, four in 2011. Dr. Hany Aziz is spending the month of June (2012) in Bordeaux supervising his student and collaborating with his industry partner in France.
disciplines

- Applied mathematics
- Biology
- Chemical engineering
- Chemistry
- Electrical and computer engineering
- Mechanical and mechatronics engineering
- Physics and astronomy
- School of pharmacy
- Systems design engineering

our people

Hany Aziz
NSERC-DALSA Industrial Research Chair in Organic Electronics

Jean Duhamel
Canada Research Chair in Characterization of Synthetic and Biological Macromolecules by Fluorescence

James Forrest
University Research Chair

Flora Ng
University Research Chair

Pu Chen
Canada Research Chair in Nanobiomaterials

Norman Zhou
Canada Research Chair in Microjoining

Dongqing Li
Canada Research Chair in Microfluidics and Nanofluidics

David Cory
Canada Excellence Research Chair in Quantum Information

Raafat Mansour
Canada Research Chair in Micro and Nano Integrated FR Systems

Marianna Foldvari
Canada Research Chair in Bio-nanotechnology and Nanomedicine

Michael Tam
University Research Chair

Hany Aziz
NSERC-DALSA Industrial Research Chair in Organic Electronics

Jean Duhamel
Canada Research Chair in Characterization of Synthetic and Biological Macromolecules by Fluorescence

James Forrest
University Research Chair

Flora Ng
University Research Chair

Pu Chen
Canada Research Chair in Nanobiomaterials

Norman Zhou
Canada Research Chair in Microjoining

Dongqing Li
Canada Research Chair in Microfluidics and Nanofluidics

David Cory
Canada Excellence Research Chair in Quantum Information

Raafat Mansour
Canada Research Chair in Micro and Nano Integrated FR Systems

Marianna Foldvari
Canada Research Chair in Bio-nanotechnology and Nanomedicine

Michael Tam
University Research Chair
It’s the interactions that make this place so special.

– Andrei Sazonov, Electrical and Computer Engineering
**by the numbers**

**WATERLOO INSTITUTE FOR NANOTECHNOLOGY**

**Ecosynthetix CRD Grant**
$1.7M

**Grand Challenges Award**
$1.3M

**International Workshop Grants**
$103K

**Summary of Expenses**

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**Our People**

Management and Administration
- **Dr. Arthur Carty**, Executive Director
- **Mr. Alain Francq**, Managing Director
- **Dr. Ariel Chan** (‘11)/ **Dr. Lisa Pokrajac** (‘12)
  Assistant Director(s), Research Programs
- **Ms. Caroline Brookes**, Administrative Assistant

**Co-op Students**

3
Board of Directors

**Chairs**

- Dr. Terry McMahon, Dean of Science, University of Waterloo
- Dr. Adel Sedra, Dean of Engineering, University of Waterloo

**Members**

- Mr. Atul Asthana, Vice-President Global Standards, Research in Motion Limited
- Dr. Rina Carlini, Principal Scientist and Nanotechnology Chair, Xerox Research Centre of Canada
- Dr. Arthur Carty, Waterloo Institute for Nanotechnology
- Dr. Marie D'iorio, Director General, NRC Institute for Microstructural Sciences, National Research Council of Canada
- Dr. Dongqing Li, Professor, Mechanical and Mechatronics Engineering, University of Waterloo
- Dr. Richard Florizone, Vice-President Finance and Resources, University of Saskatchewan
- Dr. James Forrest, Professor of Physics, University of Waterloo
- Dr. Raafat Mansour, Professor, Electrical and Computer Engineering, University of Waterloo
- Dr. Linda Nazar, Professor of Chemistry, University of Waterloo
- Dr. John Preston, Director, Brockhouse Institute for Materials Research, McMaster University
- Dr. Martin Sumner-Smith, Vice-President, OpenText Corporation

International Scientific Advisory Board

**Chair**

- Dr. Savvas Chamberlain

**Members**

- Dr. Gerbrand Ceder, Massachusetts Institute of Technology, R.P.
- Simmons Professor of Materials Science and Engineering, United States
- Dr. Mauro Ferrari, Professor and Director, Division of Nanomedicine, University of Texas Health Centre at Houston, United States
- Dr. Teruo Kishi, President, National Institute for Materials Science, Japan
- Dr. Eugenia Kumacheva, Department of Chemistry, University of Toronto, Canada
- Dr. Richard Martel, Canada Research Chair, Université de Montréal, Department du Chimie, Canada
- Dr. Thomas Picraux, Chief Scientist, Centre for Integrated Nanotechnologies, Los Alamos National Laboratory
- Dr. David Reinhoudt, Chairman of the Board of NanoNed, University of Twente, Netherlands

**Top 10 WIN Journals**

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**Top 10 Journals 2007-2012**

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**Selection of Papers from 2011**

- Neeshma Dave and Juwen Liu, “Protection and Promotion of UV Radiation-Induced Liposome Leakage via DNA-Directed Assembly with Gold Nanoparticles”, *Advanced Materials*, 23, 3182–3186, 2011
- Wong, William S.; Raychaudhuri, Souroh; Lujan, Rene; Sambandan, Sanjiv; Street, Robert A., “Hybrid Si Nanowire/Amorphous Silicon FETs for Large-Area Image Sensor Arrays”, *Nano Letters*, Vol11(6), 2011
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