

**University of Waterloo
BOARD OF GOVERNORS
Notice of Meeting**

Date: Tuesday, June 2, 2009

Time: 2:30 p.m.

Place: Research Advancement Centre, Room 2009, UW Research + Technology Park [directions / parking information enclosed]

	<u>OPEN SESSION</u>	Page	Action
2:30	1. Remarks from the Chair	Oral	Information
	<u>Consent Agenda</u>		
2:35	Motion: That items 2-4 [below] be approved and / or received for information by consent.		
	2. Approval of the April 7, 2009 Minutes [enclosed]		Decision
	3. Report of the President		
	a. Recognition and Commendation	A1-A2	Information
	b. Sabbatical Leaves / Leave Change and Administrative Appointments	A3-A6	Decision / Information
	4. Report of the Vice-President, Administration & Finance		
	a. Incidental / Tuition Fee Changes	A7-A9	Decision
	<u>Regular Agenda</u>		
2:40	5. Business Arising from the Minutes		
2:45	6. Report of the President		
	a. President's Specific Priorities 2009-10	A10-A11	Information
	b. Environmental Scan	A12	Information
3:05	7. Report of the Vice-President, Academic & Provost		
	a. 2009-10 Executive Council Priorities	Oral	Information
	b. 2009-10 Operating Budget Update	Oral	Information
3:25	8. Report of the Vice-President, External Relations	A13-A17	Information
3:35	9. Report of the Vice-President, University Research	A18	Information
3:45	Break		
	10. Reports from Committees		
4:00	a. Building & Properties	A19-A20	Decision
4:10	b. Finance & Investment	A21	Information
4:20	c. Pension & Benefits	A22-A25	Decision / Information
	11. Other Business		
4:30	a. University of Waterloo Report to the Minister of Industry [enclosed]		Decision

	<u>CONFIDENTIAL SESSION</u>	Page	Action
4:40	<p><u>Consent Agenda</u> Motion: That items 12 and 13 [below] be approved by consent.</p> <p>12. Approval of the April 7, 2009 Minutes [enclosed]</p> <p>13. Report of the President a. New Appointments with Tenure</p>		Decision
	<p><u>Regular Agenda</u></p> <p>14. Business Arising from the Minutes</p> <p>15. Reports from Committees a. Pension & Benefits [to be distributed]</p> <p>16. Other Business</p> <p>17. Next Meeting Tuesday, October 27, 2009, beginning with a briefing session at 1:30 on UW's registered pension plan / pension plan investments</p> <p>18. Adjournment Farewell dinner in honour of Amit & Meena Chakma, Chatterbox Farm, Heidelberg</p>	CS1-CS2	Decision
4:45			
4:50			Decision
5:00		CS3	Decision / Information

Action / Information Items Enclosed: Conflict of Interest Declaration; May *University Affairs*; UW Newswatch

Note: To allow the Board to complete a number of matters quickly and to devote more of its attention to major items of business, the agenda has been divided between items that are to be approved and / or received for information by consent and those that are to be presented individually for discussion and decision and / or information.

A consent agenda is not intended to prevent discussion of any matter by the Board, but items listed under the consent sections will not be discussed at the meeting unless a governor so requests. Governors are supplied with the appropriate documentation for each item and all items will be approved by means of one omnibus motion. The Board will then move immediately to consideration of the items on the regular agenda.

LC:tad
May 26, 2009

Lois Claxton
Secretary of the University

Please convey regrets to Tracy Dietrich at (519) 888-4567, x36125, or tdietric@uwaterloo.ca

University of Waterloo
BOARD OF GOVERNORS
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FOR INFORMATION

Recognition and Commendation

Miguel Anjos, professor of management sciences, has received a Humboldt Research Fellowship for Experienced Researchers to support his work in the “development of mathematical optimization models and algorithms for a class of problems in science and engineering known as the maximum-k-cut problems.” The fellowship allows foreign researchers to carry out long-term projects with German colleagues. Anjos’ project involves his Waterloo research group and two groups at the University of Cologne.

A book described as “a clarion call to all Canadians,” and written by four academics including two at Waterloo, is this year’s winner of the \$35,000 Donner Prize, an annual award for the best book on Canadian public policy. The book, *Arctic Front: Defending Canada in the Far North* by **Ken Coates** (dean of arts and professor of history), **Whitney Lackenbauer** (history professor at St. Jerome’s University), William Morrison (University of Northern British Columbia) and Greg Poelzer (University of Saskatchewan), was one of five 2008 books shortlisted for this year’s Donner. Coates was previously short-listed for the Donner Prize in 2000 for *The Marshall Decision and Native Rights*. The annual prize rewards “excellence and innovation in Canadian public policy writing; inspiring lively debate on public policy issues and rewarding provocative and excellent work that speaks to an informed readership and an open exchange of ideas and public debate.”

The 2009 CAP / DCMMP Brockhouse Medal was awarded to **Michel Gingras**, professor of physics & astronomy and Canada research chair in condensed matter physics and statistical mechanics, for his seminal contributions to the statistical mechanics description of random disordered systems and geometrically frustrated magnetic systems. Introduced in 1999, the medal is sponsored jointly by the Division of Condensed Matter and Materials Physics and the Canadian Association of Physicists. It is named in honour of Bertram Brockhouse, whose outstanding contributions to research in condensed matter physics in Canada were recognized by the 1994 Nobel Prize for Physics.

At a celebration at the MaRS Discovery District technology centre in Toronto, three UW faculty members were among the creators of “thirteen outstanding scientific achievements” that were recognized by the 2009 Ontario Premier’s Innovation Awards: **Scott Vanstone**, professor of combinatorics & optimization at UW and St. Jerome’s University and founder of Certicom Corp., a company that markets mathematical data security techniques, was given one of the province’s \$200,000 Catalyst Awards for “Lifetime Leadership in Innovation”; **Bin Ma**, professor of computer science, recognized as “Best Young Innovator” and also awarded \$200,000 in the Catalyst category, serves as chief technology officer of Bioinformatics Solutions Inc.; **Ming Li**, also professor of computer science and also of Bioinformatics Solutions, who received a \$250,000 Discovery Award to recognize “Innovation Leadership.”

Ken Stark, professor of kinesiology, has been awarded this year’s Young Scientist Award from the American Oil Chemists’ Society. It recognizes his research contributions to increase the intakes of omega-3 fatty acids among North Americans. Stark, a former AOCS-honoured student, received the award at the society’s annual meeting and exposition held in Orlando in May.

Biology PhD student **Adriano Senatore**, holder of the NSERC Alexander Graham Bell Canada Graduate

Scholarship, recently won the George Holeton Award at the Canadian Society of Zoologist's annual meeting at the University of Toronto for his poster (the most outstanding poster within the Comparative Physiology and Biochemistry section) "Identification and Characterization of an Invertebrate T-type Calcium Channel."

UW's student team placed tenth in this year's **ACM International Collegiate Programming Contest**. The final round of competition was held in Stockholm, with first place going to a team from Russia's powerhouse St. Petersburg State University of Information Technology, Mechanics and Optics; China's Tsinghua University came second. The Massachusetts Institute of Technology, top-ranking North American entry this year, was seventh among the 91 teams that reached the finals.

A UW student team placed 7th – out of 545 entries – in this year's **William Lowell Putnam Mathematical Competition**, which draws on teams from across the United States and Canada. The winner was Harvard University, followed by Princeton, MIT, Stanford, Caltech, Toronto and then UW.

UW congratulates four alumni named in the *Globe and Mail's* list of Top 40 Under 40 for this year: **Ryan Marshall** (bachelor of mathematics, computer science / software engineering, 1999), 32, vice-president of operating systems, Research In Motion Ltd.; **Marlo Reynolds** (bachelor of applied science, systems design engineering, 1996), 35, executive director, Pembina Institute; **Cameron Piron** (bachelor of applied science, systems design engineering, 1998), 34, president and co-founder, Sentinelle Medical Inc.; **Barbara Zvan** (master of mathematics, statistics, 1995), 38, senior vice-president, asset mix and risk, Ontario Teachers' Pension Fund. Winners of the award were chosen from more than 1,200 nominees by a 26-member independent advisory board. Candidates were selected on the following criteria: vision and leadership, innovation and achievement, impact, growth and development strategy, as well as community involvement and contribution.

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FOR APPROVAL

1. Sabbatical Leaves / Leave Change

UW Policy 3, Sabbatical and Other Leaves for Faculty Members [excerpts below, full text available at: <http://www.adm.uwaterloo.ca/infosec/Policies/policy3htm>], sets out the purpose of leaves for faculty members as well as the requirements / responsibilities of faculty who are granted such leave.

The granting of a leave . . . depends on the University's assessment of the value of such leave to the institution as well as to the individual, and on whether teaching and other responsibilities of the applicant can be adequately provided for in her / his absence. A faculty member who is granted a sabbatical or other leave is expected to return to duties in the University for at least one year and upon return will be expected to submit a brief report to the Department Chair regarding scholarly activities while on leave.

The purpose of a sabbatical leave is to contribute to professional development, enabling members to keep abreast of emerging developments in their particular fields and enhancing their effectiveness as teachers, researchers and scholars. Such leaves also help to prevent the development of closed or parochial environments by making it possible for faculty members to travel to differing locales where special research equipment may be available or specific discipline advances have been accomplished. Sabbaticals provide an opportunity for intellectual growth and enrichment as well as for scholarly renewal and reassessment.

. . . the granting of sabbatical leave is contingent upon the faculty member's department being able to make the necessary arrangements to accommodate such an absence, and also upon the financial resources of the University in any given year. Should problems arise in any of the above, it may be necessary to postpone individual requests until such time as all the conditions can be satisfied.

• **Sabbatical Leaves**

Monica Barra, Chemistry, January 1, 2010 to December 31, 2010, at 85% salary

During my sabbatical leave I plan to remain in Waterloo to focus on research and the writing of scientific articles. I will participate at a couple of international scientific meetings, and also plan to spend a portion of the leave revising and developing course notes and online material for various courses.

Jack Callaghan, Kinesiology, September 1, 2009 to February 28, 2010, at full salary

Pursuit of independent and collaborative research activities including short research trips to laboratories of collaborators in Canada, Australia and New Zealand for the purposes of acquisition of new skills, and collaborative research writing projects. Preparation of research grants for new initiatives in vibration research. Preparation of manuscripts and reports from ongoing research projects for publications.

Serge D'Alessio, Mathematics, July 1, 2009 to December 31, 2009, at full salary

My plan is to strengthen my research activity and also to initiate new research projects in the area of environmental and geophysical fluid dynamics. The leave will be spent primarily in Waterloo with short trips to visit collaborators. Lastly, I will use this leave to start preparing my next application for an NSERC Discovery Grant.

Riemer Faber, Classical Studies, September 1, 2009 to August 31, 2010, at full salary
Preparing for publication of the English edition of Erasmus' Annotations on the Epistles to Galatians and Ephesians for the Collected Works of Erasmus series; co-editing the proceedings on the conference, Belonging and Isolation in the Hellenistic World; preparing for publication of several articles on ancient Greek and Latin poetry.

Robert Gibson, Environment & Resource Studies, January 1, 2010 to June 30, 2010, at full salary
The sabbatical will be devoted to work on four projects: two with SSHRC funding that centre on application of sustainability and resilience concepts to initiatives in Biosphere Reserves and Model Forests; plus proposal to update my book on Sustainability Assessment; and the drafting of a new model federal statute combining strategic and project level environmental assessment.

John Holmes, Psychology, January 1, 2010 to June 30, 2010, at 85% salary
Book contract with Guilford Press for completion of 400-page book by July 2010 (The Architecture of the Interdependent Mind: Solving four Universal Problems in Relationships).

Mike Hudson, Physics & Astronomy, September 1, 2009 to August 31, 2010, at full salary
I will spend my sabbatical year at the Institut d'Astrophysique de Paris, a joint laboratory of the French CNRS and the Universite Pierre et Marie Curie, where I will work on two research projects. The first, in collaboration with Yannick Mellier and his group at the IAP, is the study of the gravitational lensing signal due to the dark matter haloes around galaxies. The second project, in collaboration with Roya Mohayaee and Stephane Colombi of the IAP, is the study of the large-scale cosmic flows in the nearby Universe.

Duane Kennedy, School of Accounting & Finance, September 1, 2009 to August 31, 2010, at full salary
My sabbatical will have two major directions: (i) regaining familiarity with research in my areas of interest after a heavy administrative and teaching load since my last sabbatical; and (ii) starting a number of new research projects in the area of initial public offerings, seasoned equity offerings and the resulting impact on the capital structure of companies.

Srinivasan Keshav, School of Computer Science, March 1, 2010 to August 31, 2010, at full salary
During sabbatical, I will complete a major revision of my graduate textbook on computer networking that is already under way. I also intend to explore the use of computer systems to monitor and more efficiently manage the use of energy. Finally, I plan to visit some research institutions in India with whom I have collaborated in the past.

James Martin, Physics & Astronomy, September 1, 2009 to February 28, 2010, at 85% salary
During the proposed sabbatical I plan to work in my laboratory on the precise measurement of electric fields near gold surfaces using laser cooled atoms held by micro-fabricated atom chips. Initial studies will focus on the spatial inhomogeneity of these fields due to the polycrystalline nature of thermally evaporated gold surfaces. There has been little done to quantify these.

Kshirasagar Naik, Electrical & Computer Engineering, September 1, 2009 to August 31, 2010, at 85% salary
I want to execute the following tasks during my leave: (i) complete the book tentatively titled "Software Evolution: Processes and Models" (with Dr. Piyu Tripathy at NEC Labs, USA); (ii) write a research proposal entitled "myNet: A Framework for Collaboration of Devices on and around an Individual User"; (iii) develop application-level broadcast and multicast protocols with the SIP protocol; and (iv) visit research institutions in India, Japan, and Taiwan.

Kumaraswamy Ponnambalam, Systems Design Engineering, September 1, 2009 to February 28, 2010, at 100% salary

I will be at the TUDelft, Netherlands, working to develop surrogate modelling methodologies for design optimization under uncertainty (DOUU). DOUU problems are where either (i) the design variables are random or (ii) decision variables are deterministic or (iii) a combination of these two; so far, the solution methods have been developed for these two problems independently. In addition, I hope to complete the interactive textbook on Water Management.

James Robinson, Environment & Resource Studies, July 1, 2009 to December 31, 2009, at full salary, and July 1, 2010 to December 31, 2010, at full salary

For many water utilities, including this Region, while water charges per litre are constant all year round, the principal determinant of infrastructure capital requirements is the height of peak (summer) demands. The leave will be used to research the effectiveness in use and general applicability of peak demand rate structures to defer major water infrastructure expenditures such as pipelines.

Ian Rowlands, Environment & Resource Studies, January 1, 2010 to December 31, 2010, at full salary

My research will focus upon two main areas: first, I will continue work on the policy and governance aspects of international climate change negotiations, following the outcomes of the December 2009 meeting in Copenhagen, Denmark; and second, I will continue work on the ways in which energy management strategies might facilitate the transition to a low carbon economy.

Alex Statiev, History, January 1, 2010 to June 30, 2010, at full salary

I plan to conduct research in Germany, Russia and Bulgaria for two projects: a major project on the Soviet NKVD divisions in World War II and an article on Bulgarian humanities scholars under the communist regime. I will also participate in the VIII World Congress of the International Council for Central and East European Studies in Stockholm.

Roger Suffling, School of Planning, July 1, 2009 to December 31, 2009, at 85% salary

I shall: 1) chair a symposium: Ecology on Edge and edit resulting proceedings, 2) complete a chapter for Ecology: A Canadian Perspective, 3) conduct research for a popular volume resulting from Ecology on Edge and 4) write up backlogged research papers before retirement.

Chaitanya Swamy, Combinatorics & Optimization, September 1, 2009 to February 28, 2010, at full salary

Sabbatical leave requested to pursue research in (1) Algorithmic Mechanism Design; (2) Approximation algorithms for stochastic optimization; (3) Algorithms for Data Mining from noisy samples.

Robert Varin, Mechanical & Mechatronics Engineering, November 1, 2009 to April 30, 2010, at full salary

I will spend the sabbatical leave at UW working in my laboratory on the development of novel nanostructured materials for solid state hydrogen storage. This research is supported by the NSERC Hydrogen Canada Strategic Research Network.

Olga Vechtomova, Management Sciences, November 1, 2009 to April 30, 2010, at 85% salary

I plan to spend my sabbatical leave at Microsoft Research Cambridge. My proposed research is aimed at developing techniques for complex question answering. My first objective is to identify features for predicting the type of semantic relation between concepts. The second objective is to develop a weighting scheme for text nuggets containing semantic relations expressed in the query.

Changbao Wu, Statistics & Actuarial Science, September 1, 2009 to February 28, 2010, at full salary

The primary goal of the requested sabbatical leave is to finish several research papers which have

been delayed due to heavy commitment to teaching, internal and external services, and coordination of two national research projects in the past five years. Several short research trips are planned during the requested leave to visit co-authors at Carleton, UBC, Acadia, Iowa State and Texas A&M.

- **Sabbatical Leave Change**

Christian Jacobson, change from June 1, 2009 to November 30, 2009, at full salary, to July 1, 2009 to December 31, 2009, at full salary.

FOR INFORMATION

2. Administrative Appointments

Stephen Brown, re-appointed as Associate Dean, External Relations, Faculty of Mathematics, July 1, 2009 to December 31, 2009.

Serge D'Alessio, appointed as Associate Dean, Admissions and Outreach, Faculty of Mathematics, January 1, 2010 to June 30, 2013.

Mavis Fenn, appointed as Acting Chair, Religious Studies, Faculty of Arts, July 1, 2009 to June 30, 2010.

Gerd Hauck, appointed as Chair, Drama & Speech Communication, Faculty of Arts, January 1, 2010 to June 30, 2010.

Robert Park, appointed as Associate Dean, Computing, Faculty of Arts, July 1, 2009 to June 30, 2013.

Pearl Sullivan, re-appointed as Chair, Department of Mechanical & Mechatronics Engineering, Faculty of Engineering, July 1, 2009 to June 30, 2013.

Jill Tomasson Goodwin, appointed as Acting Chair, Drama & Speech Communication, Faculty of Arts, July 1, 2009 to December 31, 2009.

Peter Wood, re-appointed as Director, Math Business Programs, Faculty of Mathematics, July 1, 2009 to June 30, 2012.

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FOR APPROVAL

Incidental Fee Changes

Student Coordinated Plan

It is recommended that the compulsory fee for the Student Coordinated Plan, assessed and collected from all full-time undergraduate students, be decreased from \$46.31 per term to \$13.80 per term effective September 2009 (fall term).

Comments:

- This was a two part fee comprised of a \$32.51/term fee originating in 1992 to fund phase 1 of the student life capital expansion plan and a \$13.80/term fee approved in 2002 to fund phase 2
- The \$8.4 million phase 1 expansion has now been retired; excess funds collected during the Spring Term 2009 have been directed by the Federation of Students to enhancing the Student Life Centre

Federation of Students Fee

It is recommended that the compulsory Federation of Students Fee, assessed and collected from all full-time undergraduate students, be increased from \$35.43 to \$37.24 per term effective September 2009 (fall term).

Comments:

- The previous fee increase was \$0.76 per term effective September 2008
- The fee increase was approved at the Federation of Students' general meeting
- Payment of the fee is a requirement of registration and is non-refundable

Federation of Students Administered Fee

It is recommended that the Federation of Students Administered Fee be increased to reflect changes in the U-Pass (bus pass), health and dental components of the fee effective September 2009 (fall term).

	<u>Dental</u>	<u>Health</u>	<u>Bus Pass</u>	<u>SRP*</u>	<u>Total</u>
Regular	\$35.25	\$49.14	\$49.75	\$1.00	\$135.14 (previously \$122.81)
Co-op	\$66.09	\$92.14	\$49.75	\$1.00	\$208.98 (previously \$191.38)

Comments:

- SRP = Student Refugee Program
- The Federation of Students has contracted with StudentCare for the dental and health components and with Grand River Transit for the bus pass component
- The University assesses the fees on behalf of the Federation of Students and transfers the funds to the Federation of Students for disbursement

- Payment of the fee is a requirement of registration; the health and dental components are refundable through the Federation of Students and their service provider; the bus pass is non-refundable; the Student Refugee Program is refundable through the Federation of Students

Accounting Students Education Contribution Fund

It is recommended that the Accounting Student Education Contribution Fund be decreased from \$75/term to \$50/term effective September 2009 (fall term).

Comments:

- As required under the 1998 Board approved Constitution, a student referendum was held. Of 1,340 potential voters, 325 voted in favour, 73 against and 9 declined
- The original constitution and fee was approved in 1991
- All full-time undergraduate and graduate accounting students are assessed the fee. Payment is a requirement of registration but the fee is refundable.

Engineering Society Fee

It is recommended that the compulsory Engineering Society Fee, assessed and collected from all undergraduate engineering students, be increased to \$14.25 from \$14.00 per term effective September 2009 (fall term).

Comments:

- The fee increase was approved by a vote of the joint engineering society
- The fee is refundable during the first three weeks of the term
- Undergraduate students in the Software Engineering program are assessed both the Math Society and Engineering Society fees. Consequently, the Software Engineering Society fee will increase to \$26.75/term (\$14.25 Engineering + \$12.50 Math)

Pharmacy Society Fee

It is recommended that a new \$35/term society fee for undergraduate Pharmacy students be implemented effective September 2009 (fall term).

Comments:

- A student referendum was held. With 71 registered voters, 63 voted for and 8 voted against
- Initially, Pharmacy students were assessed the Science Society fee at \$9.00 term. Pharmacy students would no longer be assessed the Science Society fee

Tuition Fee Changes

Master of Actuarial Science

Recommendation: a tuition rate of \$9,500/term or \$1,900 per 0.5 credit course

Comments:

- New program with first enrolment expected this fall.
- This full-time professional master's degree will take 3 full-time terms to complete (5 courses/term)
- Targets primarily international students; domestic students would be assessed the same fee
- Applicable incidental fees include: Student Services Fee, Cancopy Fee, GSA Fee, GSA Administered Fees, and Graduate Endowment Fund. International students are also assessed UHIP fees.

Independent Studies Program

Recommendation: to convert the tuition fee assessment method from a per term fee to a per course/unit fee.

Comments:

- Since 2007, Independent Studies students have been required to register in courses with units equivalent to the course load they are taking
- The program is offered as both a 3-year general program or a 4-year honours program
- The tuition fee schedule will be identical to that used for existing Arts programs where the Independent Studies students have a specific Independent Studies Society Fee

Dennis Huber
Vice President,
Administration & Finance

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FOR INFORMATION

President's Specific Priorities 2009-10

1. Excellence

a. Vision

- Continue to build-out 6th Decade Plan through Faculty plans and regular benchmarking

b. Undergraduate Education

- Strengthen quality by raising admission standards systematically in every Faculty
- Diversify base with out-of-province and out-of-country increases
- Develop new academic plans and modify existing academic plans to respond to new opportunities and core strengths
- Nurture the culture of excellence in teaching and learning
- Support initiatives to enhance academic integrity
- Enhance students' research experience
- Continue internationalization enhancement
- Continue efforts to increase student financial aid

c. Graduate Students and Post Docs

- Increase domestic and international numbers
- Develop new grad programs where appropriate with special emphasis on professional and course master's
- Ensure greater recognition of post-doc presence and importance
- Continue efforts to increase student financial aid

d. Research

- Broaden base and increase intensity across university
- Strengthen clusters especially around five core research themes of information technology, health, environment, materials and systems, society and culture and build selected peaks of excellence
- Increase large multi-partner projects with top priority on building out the Institute for Quantum Computing, increasing links with Perimeter Institute and the Centre for International Governance Innovation
- Continue emphasis on technology transfer especially through Accelerator Centre and new Ontario Ministry of Research and Innovation and building out R&T Park

e. Focus on Core Strengths and Careful Choices

- Implement benchmarking with peer national and international institutions
- Recruit best faculty and staff, and accelerate their development to achieve excellent performance
- Ensure strategic resource allocation with emphasis on core quality areas
- Employ differing and innovative strategies for operating vs. capital budget constraints and opportunities and manage resources very prudently
- Build out and build up Co-op.

2. Income Diversification

- Continue UW Campaign beyond \$500m
- Achieve sustained annual private support towards 6th Decade Plan goal of \$100m per year
- Strengthen ODAA complement and further decentralize into Faculty and Academic Support Departments
- Strengthen innovative government support at all levels and particularly re: Kitchener/ Pharmacy/Health Sciences Campus, IQC/Nanotech, R&T Park North Campus, Stratford, and UAE
- Enhance direct and indirect research income by at least 15% per year for next five years and broaden grant, contract, license, royalty sources
- Continue mix of tuition rates within Board approved policy and work within MTCU multi-year tuition framework
- Seek innovative ways to manage revenue/expenditures to achieve ambitions in 6th Decade Plan

3. Strengthen Community

- Continue case for public support for PSE and R&D
- Focus available resources on core responsibilities
- Identify and respond to academic and administrative support stress points
- Expand student housing both on and off campus, continue implementation of the Living Learning Report and prepare for increase from 2,600 to 8,000 grad students over 10 years
- Use horizontal multi stake holder task forces for continuous improvement efforts
- Conduct studies/surveys to review performance and inform our benchmarks
- Build on mutually supportive relationships with the affiliated Colleges and Universities and collaborate on their academic growth initiatives and residence expansion
- Strengthen external community relations and alumni relationships
- Communicate regularly with external communities and with internal communities to ensure information flow and idea exchanges and improve morale
- Strengthen staff development opportunities
- Provide stable, competitive salaries and benefits with capacity to reward extraordinary merit
- Strengthen the openness and effectiveness of our collegial culture
- Focus IT and e-learning initiatives on opportunities to improve service quality and to reinforce culture of innovation
- Reinforce our culture of civility

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Environmental Scan

- **National Overview.** The Canada Millennium Scholarship Foundation has released a report on student employment and academic success. The report outlines how students between the ages of 20 and 24 are working in greater numbers than ever before, with 41 percent of males and 52 percent of females indicating that they were working during the 2007-08 academic year. While the conclusions are not particularly strong, the report suggests a small negative impact between the number of hours worked and the probability of academic persistence. It is important to consider the reasons why students choose to work part-time during the school year, in the context of historically high levels of student employment.

Two reports on the subject of business innovation and research and development should be cause for concern. The Council of Canadian Academies released a report called *Innovation and Business Strategy: Why Canada Falls Short*, and the Science, Technology and Innovation Council published *State of the Nation: Canada's Science, Technology and Innovation System*. Both reports outline Canada's serious productivity problem: Since 1984, productivity in Canada's business sector has fallen from 90 percent of the U.S. level to 76 percent in 2007. Over that time period, Canada's labour productivity growth ranked 15th out of 18 comparator OECD countries. Business R&D as a proportion of GDP puts Canada sixth in the G-7. One of the most significant gaps that have emerged between Canada and its comparators is in the area of ICT, which is troubling. However, the Canadian Council of Academies has singled Waterloo Region out as "an area that has developed a cluster of successful startup firms with a particular focus on information technologies," and one of the prime factors in Waterloo's success, according to the report, has been the co-operative education model.

- **Provincial Overview.** In response to fears of a brain drain to the United States, the provincial government is providing \$100 million in new research monies to be administered through the Ontario Research Fund, primarily in genomics and stem cell research. Unfortunately, the province is also rolling back planned increases to the university student Textbook and Technology Grants in an effort to save \$100 million.
- **Local Overview.** The federal government is considering a location for the Southern Ontario Development Agency (SODA), an investment and development agency announced in the 2009 Budget. Canada's Technology Triangle is working with a region-wide task force to promote Waterloo Region as the ideal location for SODA's head office. Waterloo makes geographic sense; its strategic location in central southern Ontario makes it a gateway to the entire region. Beyond that, this community's collaborative tradition along with its proven track record as a transformational economy make it the logical choice to deliver SODA's programs and investments.

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Principal Gifts and Campaigns:

In the 2008-09 fiscal year approximately \$51 million in cash gifts were received (unaudited). A second transformational gift from the Lazaridis Family Foundation, at \$25 million, raises total giving from Mike and Ophelia to the University of Waterloo to \$101.5 million. It is significant to note that with this recent new support, Mike and Ophelia now become the third largest donor to a single organization in Canada, after the Chagnon Foundation (\$200 million to obesity research through Quebec government partnership), and Michael Degroote (\$105 million to McMaster University). Total cash gifts to Campaign Waterloo since May 2000 now stands at \$462 million.

In addition to cash gifts received during the academic year, Waterloo booked over \$42 million in outstanding pledges. We are pleased to report that Hydro One recently pledged \$2.5 million toward Electrical Engineering and the Waterloo Institute for Sustainable Energy (WISE), through support toward an endowed Chair, graduate student awards across Engineering, Science and Environment faculties, and a research fund. This gift will also leverage additional funding from combined government and university sources of up to \$4.5 million.

Our fundraising and friend raising activity extends far beyond our local and national borders. Waterloo has over 1200 alumni in Hong Kong and China who are helping the University to achieve its 6th Decade Plan's internationalization goals. The HK Alumni Association runs the most active alumni chapter in the world and has raised \$868,000 towards its UW Alumni @HK Campaign \$1M goal for scholarships for students from China to attend UW. This is helping UW attract the best and brightest and increase our population of international students. ODAA has been working with the faculties to identify opportunities, build relationships, spearhead fundraising and coordinate alumni engagement in HK and China. Some highlights include: with the help of a number of HK alumni, the Math faculty CEMC is now offering its Mathematics Contests and Canadian Computing Contest at a number of high schools and universities in HK and China, helping us to raise the Waterloo profile among prospective students and their parents. A recent trip in April celebrated a new \$100,000 donation from two HK friends to fund a research project led by the Dean of Arts to improve the teaching of English as a second language. Significant effort is being made to build a relationship with the Li Kai Shing Foundation for potential funding of Professor Geoff Fong's International Tobacco Control project in China. A HK alumni committee has been established to engage engineering alumni and raise support for Vision 2010. Clearly, there are lots of opportunities in HK and China, and much work to be done to achieve our 6th decade goals.

Other international development activities have been and continue to be planned where opportunities exist for collaborative engagement and donor relations, across our alumni, for recruiting, co-op expansion, research, and to explore government and business partnership opportunities.

Finally, the focus we have made to enhance stewardship and donor relations through enhanced donor reporting and contacting our major donors has been well received. Through our proactive response to financial concerns of the general public and our stakeholders on the status of endowment funds, we have been able to secure some additional top up gifts as well as to reaffirm our commitment as a donor centric university.

Leadership Development Team:

Annual Giving Program

In 2008-09, our Annual Giving Program received \$5,126,225, representing gifts from 17,584 donors and a modest increase in giving over last year. Given the challenges posed by the economic crisis, we are extremely pleased that we were successful in implementing strategies to offset the decrease in personal giving that we experienced in the Fall Term. Our student callers raised \$2,826,423 of this total with the balance representing gifts from individuals of <\$10,000 that were received from other sources (direct mail, pledge payments from previous years, personal visits, unsolicited).

Of note, 2,957 new donors made a first gift this year, a significant increase over last year (2007-08, 1855). This is also a special achievement given the economic conditions and can be attributed, in part, to the strength and commitment of our student caller team.

Although securing gifts is a primary goal, there are many secondary benefits for the University. Last year, we reached more than 32,000 of our alumni and parents and provided them with news about the University, offered thanks for past support and updated contact information, where appropriate. During these calls, we secured new business information for 6,400 of our alumni and 4,200 new email addresses.

Our Annual Giving program is in *Phase 1: Implementation* of its new program strategy for the 2009-10 fiscal year. Phase 1 includes a “summer slowdown” for staffing the Call Centre. This strategy will contribute to our ability to decrease the program’s annual operating budget and also allow professional staff to prepare for the changes to our traditional alumni solicitations, addition of specialized fundraising appeals, revised prospect segmentation and development of new training programs.

In May, the annual giving team met with all internal stakeholders (Faculties/Colleges) to discuss specific goals (monetary and non-monetary) and strategies for increasing participation and overall giving from our alumni. A case for support of President’s Scholarships has been developed for use in development of direct mail, electronic and phone program key messages and materials.

Donor Relations & Stewardship

During the winter term, a Philanthropic Culture Strategy Team was struck to serve as an ad hoc committee to provide insight and advice related to enhancing the philanthropic culture of the UW community, a recommendation of the 2007 KCI Task Force Report. Three half-day workshops were attended by 17 committee members representing Development, Alumni Affairs, Communications & Public Affairs, Finance Office, Student Awards & Financial Aid, University Colleges, Faculty Development staff and the Library.

The Team developed recommendations that focused on building stronger internal relationships and meaningfully engaging all campus resources, individuals and departments in understanding the positive impact of philanthropy on the institution and our students. Strategies were developed to broaden the level of involvement of faculty and staff in student experience, alumni engagement and donor stewardship programs, further aligning these programs for maximum leverage and synergy.

The findings and recommendations of the Philanthropic Culture Strategy Team will be incorporated into the ODAA plan that identifies the central development strategies and tactics associated with building our fundraising capacity to a level that can sustain \$100 million annually. The recommendations will also be reviewed by the Office of Development’s Stewardship Committee, which will take a leadership position in advancing select short term tactics.

Current donor communications projects include:

- early stages of development for the 2008-09 Donor Report,

- new “brag sheets” have been developed for select faculties and schools, to highlight key facts and giving priorities, and
- activity continues around contacting our endowment fund donors to provide verbal updates on the status of their fund and the university’s plans for 2009-10.

Leadership Giving

The Leadership Giving Team continues to focus on qualification and retention of donors with the capacity to make gifts in the range of \$10,000 - \$100,000. In addition to their local and GTA call activity, the Leadership Giving Team travelled to Windsor and London in April leveraging the Waterloo Alumni events being held in both cities.

Planned Giving

2008-09 was another very successful year for our Planned Giving Program:

- Cash received from Estate Gifts: \$4,069,265
- 40 new bequests were confirmed, with an estimated future value of \$3,367,500
- Estates pending (anticipated for receipt of cash in 2009-10): \$2,525,000

Advancement Services:

The Advancement Services team continues to support the programs and activities involved with Development and Alumni Affairs by providing timely gift processing and acknowledgement; recording new pledges; providing systems support; updating donor and alumni records with address, degree, telephone, and other demographic information; event registration support; providing research profiles; and other consultation and advice as necessary.

Since the last report in March, our focus has been on several key projects, namely:

- Financial Year-end activities associated with gift processing, reconciliation of accounts, government and financial reporting, and preparations for upcoming audits
- Budget planning and review for 2009-10, with a focus on doing more with less; planning resource allocation to gain the most benefit
- Beginning the new BBNC (Blackbaud Net Community) implementation; a two-day discovery session was held May 5 & 6 with Blackbaud consultants to launch the project. Next steps include the creation of a test environment; working with Blackbaud to conduct a phase one system build; planning for technical and end-user training; data clean-up on Raiser’s Edge to allow data integration to happen seamlessly between systems

PCI compliance project for E-Commerce at UW. Due to the volume of credit card activity at UW we are now in a higher class level with regard to E-Commerce best practises. UW has an August 2009 deadline to comply with the new standards. The primary change for ODAA requires that we upgrade our systems to new PCI-compliant software where credit card numbers are not stored within the system. A token is stored instead, which in turn, links to another external server where card numbers are stored in a secure environment and are not accessible. Upgrades to Raiser’s Edge and BBNC by August 2009 will be required to comply with these new standards.

Public Affairs/Events and Internal Communications:

Media Relations

- The double-ender studio has been fully tested and is now operational, though it will function with a temporary background until one can be created that reflects the new branding strategy. Anticipate using for Herschel launch on May 14 and World Tobacco Day on May 31.
- Populating our new online media guide continues to move slowly.
- A media-relations effort around the creation of magnetically levitated micro robots produced stories in a number of publications, including The Economist.

- Worked with the Faculty of Math on response claim in Wired magazine that UW alumni David X. Li Developed financial model leading to economic crisis.
- Helped CBC produce radio documentary on Waterloo Region economy and UW's role in economic prosperity.
- Organized TVO Agenda Camp, which produced positive UW references repeated on The Agenda with Steve Paikin.
 - For highlight clippings, please see distributed package.

Public Affairs/Events and Internal Communications

- IQC celebration of \$50-million federal government contribution, April 7, held at IQC
- Town Hall meeting with President David Johnston, Provost Amit Chakma and Vice-President External Meg Beckel, 700 attendees, video posted to UW Website, April 8
- School of Pharmacy Grand Opening, April 17, with MTCU Minister John Milloy, Minister of Health David Caplan, and Kitchener Mayor Carl Zehr
- NSERC research grant announcement on campus at Waterloo with Dr. Suzanne Fortier and Gary Goodyear, minister of state for science and technology, April 17 (*event organized in 18 hours after NSERC request came in the evening of April 16*).
- Community open house for Pharmacy School in downtown Kitchener on April 18, attracting 3,000 community visitors. CPA and Pharmacy representatives are also meeting with neighbourhood association on June 16 to address concerns about the health sciences campus development.
- CPA working with Health Services and other parties to communicate prevention messages to campus in light of H1N1 (swine) flu outbreaks.

Events upcoming:

- May 14 launch (rescheduled) of Herschel Space Observatory: breakfast and launch-watch event at Humanities Theatre
- May 28: Inaugural lecture in the Health and Healing series at School of Pharmacy
- June 5: official opening, addition, School of Optometry.
- July 1: Canada Day Celebrations, north campus

Marketing and Communications:

- A new set of "Waterloo Quality" stories have been rotated onto the university's main webpage, highlighting stories of Waterloo being innovative, unconventional, collaborative, and connected.
- Promotional materials to support the April 18 pharmacy open house included a four-page supplement in The Record, radio ads on News 570, posters, and media relations/media alerts.
- Waterloo has four graduates among the Top 40 Under 40 and is creating an advertisement/marketing strategy to build on this achievement.
- CPA providing consulting to CBRPE in its renaming/branding exercise; to International Office in its development of a fact sheet/handout; and to Office of Research for an advertising initiative.
- Balsillie School for International Affairs marketing: serving as part of team
- "UW Mobile" (once-a-week information magazine that loads directly to BlackBerry users) being reconfigured and redesigned as Waterloo Mobile, available for download on any "smart phone" application. To download, go to: <http://www.polarmobile.com/uw/alt/>

Government Relations:

- Knowledge Infrastructure Program submission sent to the federal government by the March 30th deadline
- Private visits scheduled in May from Minister of the Environment Jim Prentice and from the Consul-General of Japan
- Supporting Region initiatives re: public/rapid transit infrastructure planning

- Ignatieff visit to region, luncheon at Waterloo Inn

Alumni Relations:

Since the last board meeting the focus of the alumni team has been to move ahead with a series of strategic plans for 2009-10. Here are some items in progress or recently completed:

- @Uwaterloo newsletter was redesigned under the guidance of an Alumni Council Ad Hoc Committee. This newsletter is delivered to approximately 65,000 alumni monthly and informs the audience of the most important news items from UW. The new version launched in April includes a series of new features designed to increase two way communications. For example, an Ad this feature allows readers to share stories to their social networks including Facebook, MySpace, LinkedIn, Twitter, etc. An editor's inbox allows for alumni comments, complaints, etc.
- UW Mobile a Blackberry application that publishes weekly news from UW is being transitioned into an RSS platform that will allow more immediate (daily) delivery to a broad range of smart phones including the Blackberry and iPhone.
- The Alumni Affairs annual strategic plan, event plan and budget are in there final stages.
- In order to increase subscription to the alumni e-community (current membership is approx 44,000), Alumni Affairs has launched a partnership with TicketOps to provide on-line ticket discounts for alumni. TicketOps is a leading on-line ticket vendor and runs programs like CAA, Shoppers Optimum and Costco's affinity ticket programs. UW is the first academic partner of TicketOps.
- Marketing is underway for the new Alumni Mastercard partnership with BMO Mosaik. This program provides alumni with a BMO Mosaik card including all of the available platform options (e.g. Airmiles, cash back, low interest, etc.). Alumni select their features and all cards come with a Waterloo picture and logo. The alumni program gets a percentage on net purchases made on the alumni cards. This revenue is part of the almost \$900k annually earned by our alumni affinity partnerships (Meloche Monnex, Manulife, Wellington West, BMO, Key West frame sales). The revenue from these programs funds all alumni communications, services, events and some staff salaries.
- A campus wide committee on student transition has been struck in partnership with the Student Life Office. This committee will work over the summer to create a series of recommendations for implementation in spring 2010.

Meg Beckel
Vice-President, External Relations

University of Waterloo
BOARD OF GOVERNORS
Report of the Vice-President, University Research
June 2, 2009

FOR INFORMATION

Total sponsored research awards of \$144,089,362 – an increase of 9.6% over previous year.

- Grants up 9.5%
- Contracts up 9.9%

Tri-Council Application Growth

- National Sciences and Engineering Research Council (NSERC)
 - Discovery Grants 27% for new applications
 - Equipment Grants 38%
- Social Sciences and Humanities Research Council (SSHRC)
 - Standard Research Grants 35%
 - Strategic Grants 167%
- Canadian Institutes of Health Research (CIHR)
 - Open competitions 50%

NSERC all partnership programs – 2007-08 fiscal year total dollars awarded

- UW 3rd in country

Recognizing Research Funding

- Improving how we calculate research funding to reflect the “use of funds” not the “source of funding”
 - UW cash contributions
 - UW cash committed to a research project (i.e. CFI, ERA) will be recorded as we would any source of funds
 - Funding for Research Centres and Institutes
 - Income generated by a research centre or institute is used to support research

Selected Major Announcements

- Premier’s Catalyst Award
 - Best Young Innovator – Bin Ma (Computer Science)
 - Lifetime Leadership in Innovation – Scott Vanstone (Combinatorics & Optimization)
- Premier’s Discover Award in Innovation Leadership – Ming Li (Computer Science)
- IDRC International Research Chair in Information Technology
 - Partnering Tsinghua University and UW – Ming Li
- Global Human Body Model Consortium (GHBMC) – Auto Research project
- NSERC Industrial Research Chairs
 - 2 new chairs
 - 1 fourth term renewal - Peter Huck (Civil Engineering)
- Canada Research Chairs – gained two chairs in Engineering – one tier I, one tier II
- Ten new Early Researcher Awards (ERA)
- CIHR Training Grant - CBRPE partnering with institutions across Canada - \$1.95M

George Dixon
Vice-President, University Research

University of Waterloo
Board of Governors
BUILDING AND PROPERTIES COMMITTEE
Report to the Board of Governors
June 2, 2009

FOR APPROVAL

1. KNOWLEDGE INFRASTRUCTURE PROGRAM [Attachment A]

Motion: that the Board of Governors delegate to the Building & Properties Committee authority to award construction contracts for projects approved from the Knowledge Infrastructure Program.

Congruence with 6th Decade Plan: strive for excellence in everything; grow graduate enrolment; grow research revenue to 40 percent of operating budget by 2012; increase space to accommodate graduate enrolment growth.

Risk: Projects remain ‘potential’ until such time as the federal government approves them and UW secures matching funding from the province.

Background:

On March 9 and following from the January federal budget, Industry Canada advised universities that \$2 billion would be made available to Canadian universities and colleges under the Federal Knowledge Infrastructure Program (KIP). For those projects which qualify under the KIP, the federal government will pay up to 50% of the costs. The Ontario provincial budget brought down in March included \$780 million campus renewal support to be phased in over two years as the provincial match of the federal governments infrastructure funding. UW’s share of the federal \$2 billion is ‘notionally’ ~\$40 million.

The federal government has not yet approved any projects, notwithstanding that to qualify for funding under the KIP, projects have to be ‘in the ground’ by August 31, 2009 and substantially completed by March 31, 2011. When such awards are made, UW will have to move very quickly. The projects in UW’s KIP submission, approved in principle by the Executive Committee of the Board (on delegated authority and with prior opportunity provided to governors to comment on / raise questions concerning the list) and reported to the Board for information at the Board’s April 7 meeting, are listed on Attachment A.

Catherine Booth
Chair

University of Waterloo - Knowledge Infrastructure Program Submission

CONFIDENTIAL

26-Mar-09 Final Project	(\$ millions) Estimated Budget	50% Federal Contribution	UW Funding Available ***	Comments
1. Research Advancement Cluster	35.0	17.5	10.0	design/build
RAC Phase 2 - 70,000 gsf	\$10			Phase 2 - 90% design & have contractor
RAC 2 - 150,000 gsf	\$25			includes fit-out costs
2. Mathematics & Engineering Expansion - includes two separate building expansions	47.0	23.5		design/build program
3. Faculty of Science	25.0	12.5	7.0	design/build + \$2m for fit-out
4. Faculty of Environment - expansion of 40,000gsf - renovations to existing	14.0 \$12 \$2	7.0	5.0	design/build + \$2m for fit-out
5. Reno/Modernize Research/Teaching Space/Maintenance	40.0	20.0		
- 4th floor Pharmacy	\$6			80% design
- PAS - Animal Facility	\$6			50% design
- Arts - ECH/ML/HH	\$3			
- AHS - BMH	\$1			
- Optometry Clinic	\$4			50% design
- Library	\$2		0.5	
- Architecture @ Cambridge	\$1			
- UW - maintenance & energy conservation - includes Renison/CGC/StPauls \$2m	\$17		2.0 1.0	some design complete, labs & classrooms
6. St. Paul's - Centre for Aboriginal Post Secondary Success	1.2	0.6	0.6	
7. Renison - Language Instruction Lab	0.6	0.3	0.3	
Total	162.8	81.4	26.4	

*** excludes uncommitted graduate growth funding

University of Waterloo
Board of Governors
FINANCE & INVESTMENT COMMITTEE
Report to the Board of Governors
June 2, 2009

FOR INFORMATION

The committee continues to meet monthly, by conference call, to monitor the endowment and pension plan investments and, with respect to asset rebalancing, has endorsed gradual movement to the targets in both the endowment and pension plan investments.

Tim Jackson
Chair

**University of Waterloo
PENSION & BENEFITS COMMITTEE
Report to the Board of Governors
June 2, 2009**

FOR APPROVAL

Actuarial Valuation of the UW Pension Plan as at January 1, 2009

Motion: To approve the “Actuarial Report: University of Waterloo Pension Plan” as of January 1, 2009, recognizing that the report will not be filed with the Financial Services Commission of Ontario (FSCO).

Background: The University of Waterloo Pension Plan is an inflation-indexed defined-benefit plan. The plan is funded by contributions from employees and the university and by investment returns. The total annual contribution is determined by applying actuarial methods with assumptions about investment returns, mortality, inflation and salaries.

Risk: Though not required to do so, the university is making additional contributions (as are plan members) to meet the unfunded liability in the event the plan remains in a deficit position when the university is next required to file (2011; valuations must be filed at least every three years).

A copy of the complete report can be requested through the committee’s secretary, ext. 35924.

Financial Position of the Plan

Going Concern Basis. A valuation conducted on a going-concern basis is to determine the relationship between the respective values of assets and accumulated liabilities, assuming the plan will be maintained indefinitely.

	01.01.2008	01.01.2009
Actuarial value of assets	\$915,107,398	\$863,421,845
Actuarial liability	\$891,611,018	\$936,496,855
Funding excess (unfunded liability)	\$23,496,380	\$(73,075,010)
Deferred asset gain (loss) due to asset smoothing	\$(8,509,027)	\$(117,140,379)
Market value of assets	\$938,089,603	\$773,067,997

The actuarial liabilities shown above have been discounted based on a 3.85% real rate of return. The actuarial value of assets for assets other than real return bonds reflects a smoothing over a three-year period of investment gains/losses in relation to the expected return on these assets and is limited to a maximum of 120% of market value. For the real return bonds, the actuarial value of assets is calculated by discounting the projected cash flow from the bonds using a discount rate of 3.85%, to be consistent with the rate used to discount the liabilities.

Solvency Basis. A valuation conducted on a solvency basis is to determine the relationship between the respective values of the plan's assets and its liabilities assuming the plan was wound up and settled on the valuation date. In accordance with the *Pension Benefits Act*, it is permissible to exclude certain contractual benefits (e.g., indexing) from the solvency liabilities in order to limit the magnitude of additional funding requirements for solvency purposes. This is because such additional solvency funding obligations are quite volatile and erratic as they are based on market interest rates and the market value of the assets in effect at each particular valuation date. Ignoring these obligations for solvency funding purposes does not, however, alter the contractual obligation with respect to indexing in place under the terms of the pension plan (the liability for indexation benefits is reflected in the going concern valuation position and funding requirements). The solvency calculation reported below excludes indexation. The solvency liability for indexation benefits is approximately \$245 million at January 1, 2009, resulting in a wind-up deficit of approximately \$331 million at January 1, 2009 (including indexation).

	01.01.08	01.01.09
Market value of assets (net of wind-up expenses)	\$937,589,603	\$772,567,997
Solvency liability	\$821,143,562	\$858,426,427
Solvency excess	\$116,446,041	\$(85,858,430)

Funding Requirements. In 2009, the university's current service cost is 134.5% (January 1/09 to April 30/09) and 114.9% (May 1/09 to December 31/09) of member contributions (reflecting the increase in member contribution rates as of May 1, 2009) which represents 8.33% and 7.81%, respectively, of pensionable earnings. On an ongoing basis, the university contribution to the registered pension plan and payroll pension plan will be 145% of member contributions which represents 9.85% (\$26,538,316 in 2009 dollars) with members contributing 6.79% (\$18,302,287 in 2009 dollars).

Asset Mix

	As of January 1, 2008	As of January 1, 2009
Asset Mix (% of Total Market Value)*		
Canadian Equities	20.9%	16.9%
Foreign Equities	28.6%	20.8%
Fixed Income	29.5%	37.5%
Real Return Bonds	19.9%	23.9%
Cash, Short Term Notes and Accrued Income	1.1%	0.9%
Total	100.0%	100.0%

* Asset mix is based on the underlying assets excluding in-transit contributions and payments.

Membership Data

Membership Data	Jan. 1/07	Jan. 1/08	Jan. 1/09
Active Members	3265	3402	3455
LTD Members	85	87	90
Suspended Members	10	10	15
Current Pensioners	1279	1306	1345
Deferred Pensioners	387	381	395
Total	5026	5186	5300

History of Asset Returns. The following table shows the history of asset returns for the last six years:

Year Ending	Return on Market Value * (After Expenses)	Credited Interest on Employee Contributions **
December 31, 2000	8.04%	12.88%
December 31, 2001	-4.18%	9.86%
December 31, 2002	-4.59%	5.65%
December 31, 2003	12.16%	2.51%
December 31, 2004	9.40%	2.86%
December 31, 2005	9.65%	3.20%
December 31, 2006	13.25%	6.66%
December 31, 2007	1.62%	11.11%
December 31, 2008	-21.51%	8.48%

The returns (after all expenses) on market value have been calculated assuming contributions and benefit payments take place in the middle of the year.

* Excluding real return bonds

** Four-year arithmetical average rate of return on assets, excluding real return bonds, calculated at December 31st of prior year. Credited interest to December 31, 2009 is 0.75%.

FOR INFORMATION

Payroll Pension Plan

The University of Waterloo payroll pension plan provides pension benefits (subject to caps) that cannot be paid from the registered pension plan because of the application of the *Income Tax Act* maximum pension. The registered pension plan and payroll pension plan are integrated from a financial management perspective. Assets are set aside within the university funds in respect of the obligations under the payroll pension plan. A going concern valuation of the payroll pension plan is also performed in conjunction with the annual valuation of the pension plan, using the same actuarial assumptions. As of January 1, 2009, the actuarial liabilities of the payroll pension plan were \$11.2 million. The market value of the funds set aside was \$9.3 million. The current service cost for 2009 is \$360,000 or 0.13% of pensionable earnings, bringing the combined university current service cost for the regular pension plan and payroll pension plan to 7.94% of pensionable earnings after May 1, 2009.

In conjunction with the increase in member contributions, the university has increased its budgeted current service cost from 8.95% of pensionable earnings to 9.85% of pensionable earnings. This results in higher contributions than the actual current service cost. The additional contributions are being set aside in the funds for the payroll pension plan as a reserve against future special payment requirements to the registered pension plan and/or to fund part of the future liabilities associated with deficits and possibly increasing the pension caps. The assets set aside for the payroll pension plan also provide the University with funding flexibility in the event there are short-term increases in contribution requirements resulting from funding deficits in the registered pension plan.

Premium Increases and Indexing Provisions for Benefits Plan

Following a negotiation process among the carrier, UW and Hewitt, premium rates as of May 1, 2009 will change as follows:

Group Life Insurance – 8.2% decrease in the group contract rate (1x, 2x and 3x base salary only) and 5% decrease in optional rates

LTD – 10.6% increase in employee paid rate (0% in contract rate); this rate is being subsidized by a reserve which is gradually being depleted; models suggest a 10% increase for the next two years will be necessary to avoid a large increase when the reserves are gone

There was no change to the following: extended health care; dental (other than the automatic move to the next year's fee schedule); health maximum and out-of-pocket limit; dispensing fee maximum; lifetime health maximum out-of-province.

The following indexing provisions will take effect May 1, 2009 (unless otherwise noted):

UW Pension, Deferred Pension and Pre-LTD Salary for Pension Purposes – 1.94% (10/12 of 2.33%)

LTD Benefit – 2.13% (Manulife; 01 Jan 09); 2.33% (GWL)

Maximum Salary Protected by LTD – 2.33% (\$153,495)

/tlm

Janet Passmore
Chair

**University of Waterloo
BOARD OF GOVERNORS
June 2, 2009**

FOR APPROVAL

University of Waterloo Report to the Minister of Industry

Motion:

That the Board approve the attached report: Developing Quantum Information to become the economic engine of the 21st Century for submission to Industry Canada.

Background:

The UW / Industry Canada \$50 million grant agreement (2009) requires UW to submit annually a report, approved by UW's Board of Governors, that addresses the following:

- a statement of the institute's objectives for that year and a statement on the extent to which the institute met those objectives;
- a list of activities undertaken with the grant;
- a statement of the institute's objectives for the next year and for the foreseeable future;
- a description of the proposed activities for the next year to be undertaken within the context of this agreement, and a description of how the institute intends to implement them;
- a proposed schedule for the implementation of the activities for the next year;
- the anticipated results of those activities;
- results achieved in the past year in accordance with a performance measurement strategy developed by Industry Canada; and
- risk assessments and mitigation strategies and ongoing performance monitoring strategies.

The attached report addresses these contractual requirements.

George Dixon
Vice-President, University Research



www.iqc.uwaterloo.ca

May 21, 2009

**Developing Quantum Information to become the
economic engine of the 21st Century**

Prepared for Industry Canada



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Note: The full Industry Canada report, including appendices on Accomplishments, is available on IQC's web site: www.iqc.uwaterloo.ca

1. Executive Summary

Research at IQC is focused on quantum computing and communication at both theoretical and experimental levels. Within each level, we can think of the research tackling three intertwined paths. First, there are the algorithms and protocols, which address how to control quantum information processors and how we would use them; second, we have building blocks that make proof-of-principle experimental demonstration of how we can control quantum effects for information processing; and third, there is the integration of the various parts to turn proof-of-principle experiments into quantum technologies.

In the coming year, the focus in the direction of algorithms and protocols will be on quantum walk algorithms, quantum control and foundations/tests of quantum mechanics. For building blocks, we will investigate elements of blueprints for quantum computers such as magnetic quantum bits (qubits), photonics and superconducting materials both for quantum computing and quantum cryptography. Finally, on the path of integration, we will focus on quantum key distribution (QKD), a branch of quantum cryptography and a promising application of quantum technologies. Building on our recent QKD prototype, we will investigate the possibility of placing single photon sources on a satellite, allowing us to explore global quantum communication. Research results will be communicated to the academic world both through the usual peer-reviewed journals and through international workshops and conferences.

We have devised a strategy to attract the best students to IQC, not only by taking advantage of the strength and breadth of our research, but also through a series of summer schools, workshops and tours targeted to students, and a nascent graduate program.

Furthermore, over the next year IQC will undertake various initiatives including the development of a graduate program, our outreach plans, and the construction of a new building to house the IQC, in addition to communications, information technology and financial strategies.

2. IQC Vision and Strategic Objectives

Vision of the Institute

Harnessing quantum mechanics will lead to transformational technologies that will benefit society and become a new engine of economic development in the 21st Century.

Mission of the Institute

The mission of IQC is to develop and advance quantum information science and technology at the highest international level through the collaboration of computer scientists, engineers, mathematicians and physical scientists.

Strategic Objectives

The IQC strives:

- To establish Waterloo and Canada as the world centre of research in quantum technologies and their applications by bringing together the best researchers from mathematics, science and engineering.
- To become a magnet for the best undergraduate, and postgraduate students and postdoctoral researchers to engage in research activities that significantly advance quantum information science, and widely disseminate their results.
- To become a source of information, analysis and commentary on the state of quantum information processing and provide the essential knowledge for Canada's industry to be ahead of the international community.

The rest of this document outlines how we have made progress in achieving these goals, but in very brief, IQC has gained a better and better reputation in the world. In 2006 and 2008 expert Reviewers were asked by Industry Canada to carry out a review of the Institute and its strategic operational plans for the future. The following comments highlight the positive view of IQC by the Expert Reviewers:

“In 2006 the review panel believes IQC to be the best institution of its type in the world. Since then IQC has made further impressive progress and there is every indication that its aggressive expansion plan will continue to give IQC, and therefore Canada, sustained world leadership.”

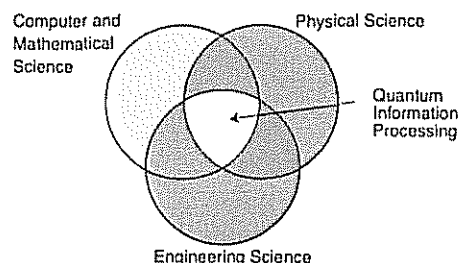
“IQC is arguably the leading achiever in the world in its field of endeavor, on all fronts.”

“The overall consensus is that IQC is a world leader in quantum computing and has continued to make impressive progress towards its vision of becoming the world leader in quantum information science and meeting the strategic objectives they set out for themselves.”

3. Research Focus

Background

Research is and has been at the heart of IQC's strategy to establish itself as a world leader. It is, not surprisingly, focused on both theoretical and experimental quantum information science and technology. It encompasses the broader areas of computer science, mathematics, physics, chemistry and engineering. There are three main themes of research: algorithms and protocols, experiments, and integration of both theoretical and experimental components. Building on the recent research successes and the new faculty arrivals at IQC in the last year, below we describe projects in each theme in more detail.



Algorithms and protocols

This theme primarily addresses the following question: if we had quantum information processing devices today, what would we do with them? This theme is theoretical in nature, but can involve the use of feedback from experiments. It includes research on the degree of difference between quantum and classical information processing. It also addresses questions on how to make quantum devices more robust with respect to error, either due to imperfection of the control or impact of their surroundings.

At the foundation of quantum information science is the belief that it allows us to solve some problems using much fewer resources than with a classical computer. In order to do this, a detailed resource assessment and a classification of problems are needed, leading to the field of quantum complexity theory. Researchers at IQC are making breakthroughs in this area. This research also entails what is possible and not possible with quantum computers, i.e. understanding their limitations.

The most famous quantum algorithm, discovered by Shor about fifteen years ago, is designed to factor numbers that are products of primes. This has critical implications for today's cryptographic systems. Having a large quantum computer today would allow eavesdropping on most (public-key) cryptographic systems in use at the present time. Much progress has occurred since Shor's discovery, and new quantum methods and techniques have been discovered, providing new algorithms. IQC has good-sized group of researchers investigating algorithms, and they have contributed too many of these recent advancements.

One family of algorithms is the quantum random walk. Random walks are useful tools for classical computers to search for solutions to problems in computer science, physics, ecology and economics, in particular when random processes are at work. It turns out that the quantum version of random walks allows for more efficient solutions. This is a very active area of research and IQC will contribute to it. An interesting new idea is the quantum snake algorithms. Usually quantum walk algorithms focus on reaching a point in a graph, but in quantum snake algorithms the goal is to find a path. This is a new direction that has potentially important applications for pattern recognition.

Other potential applications of quantum walks are large-girth Cayley graphs, scattering algorithms, span programs, directed graphs and mixing on graphs. They will be studied in the coming years.

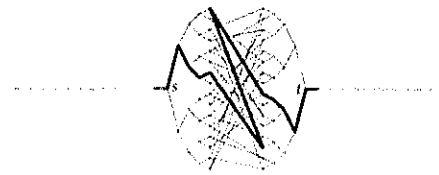


Figure 1: A snake algorithm finds a path instead of reaching a point in a path. Research will aim to determine if the quantum version is more efficient than the classical one.

One of the reasons why it is very hard to predict the behavior of quantum systems with the tools we have today is that it is difficult to simulate quantum systems using classical computers. One of the applications of quantum computers is to simulate quantum systems. This could have great benefits in areas such as chemistry, material science and drug design, where it could be possible to build and understand a larger and larger base of information from the ground up. IQC researchers have had success in this area and will continue to pursue this research direction.

An important area of theoretical research that is getting strong experimental feedback is the control of quantum systems, an essential ingredient in building quantum technologies. Many rules of quantum mechanics are profoundly different from those in the classical world. One such example is that it is impossible to extract information from a quantum system without perturbing it. It turns out that this property is at the basis of the quantum key distribution (a branch of quantum cryptography). However, this same property makes life difficult when we try to control quantum systems. In fact, until recently, it was thought that it would be impossible to control them reliably. In 1995, quantum error correcting codes that protect quantum information from corruption were discovered. Building on this work researchers showed that not only could the memory of quantum computers be protected, but this robustness could be transferred to the logical operations. There are still important questions to be answered, such as: what kind of noise can be corrected; what is the amount of noise that can be tolerated; what is the minimal amount of extra resources that is needed? Another point is how to achieve sufficient control to be able to implement quantum error correction protocols. Researchers at IQC are actively seeking answers to these questions.

Implementations

Since its inception, IQC has created an experimental quantum information processing program with a focus on spin qubits, in particular in liquid and solid state Nuclear Magnetic Resonance (NMR). We have expanded to accommodate groups covering more experimental areas, including optics, with one group focused on quantum key distribution and the other on multi-photon entanglement; a group working on quantum dots; and groups working on superconducting devices.

One of the first proposals for a quantum processor has been through NMR technology. Using the magnetic moment of atoms in molecules to encode quantum information, NMR technology has been able to control up to a dozen qubits. This allowed us to develop methods of control in a realistic setting and understand how they can be implemented. The work in NMR was initially performed in the liquid state and has recently been expanded to include work on the solid state. In both liquid and solid states, the emphasis

has been on implementing ideas of quantum error correction protocols and testing their assumptions.

In particular, work has been done to determine the error model of quantum devices – a task that is intractable if done exactly. A series of protocols have been devised which give information necessary to implement quantum error correction codes. In a similar vein, we have devised methods to characterize noise in the presence of gates. Recently, they have been implemented in an NMR quantum information processor. We are also proceeding with a comparative analysis of the benchmark results for a variety of platforms.

The work in NMR is being extended to include magnetic systems where electrons and the nuclei are being manipulated. It is possible to do so using similar systems to those used in solid state NMR and also in quantum dots. The advantage of using electrons is that they interact much more strongly than the nucleus and thus allow for faster operation of the quantum device. On the other hand this leads also to an increased corruption rate. We are investigating the compromise needed to deal with these two processes.

Another platform for quantum information processing that is being investigated at IQC is



photonics. Photons, or particles of light, are excellent qubits (physical systems that encode bits of quantum information) as they can robustly encode quantum information and are easily produced. Quantum systems can be entangled, meaning that they can have correlations that cannot be explained by classical laws of physics. Researchers in quantum photonics have been producing entangled photons for some years now, but the quest to have ever-larger systems of entangled photons persists. At IQC, we will develop new sources of entangled photons that will be used in quantum computation and communication experiments at the Institute.

Figure 2. Researchers at IQC uses photons to the encode and process of quantum information

phenomenon called superconductivity. It is fundamentally a quantum phenomenon that researchers have known about for years, but it is only recently that these materials have been used for quantum information processing. One application is to fabricate large, extremely sensitive bandwidth detectors for photons called SNSPD. The fundamental process leading to superconductivity is the pairing of electrons (Cooper pairs) in materials. The detectors built at IQC rely on photons breaking the bond between pairs and creating a temporary increase in the electrical resistance of the material. In the coming year IQC will adapt these detectors and use them in quantum photonic experiments conducted at the Institute.

At low enough temperatures, some materials exhibit essentially zero electrical resistance, in a

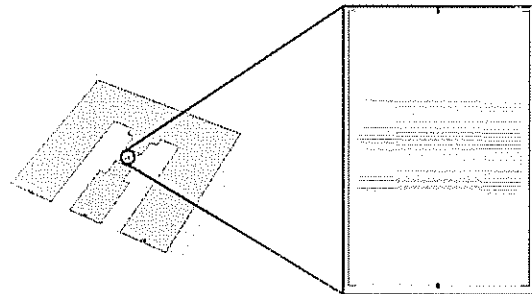


Figure 3. Sonnet ® schematic representation of an SNSPD and its surrounding tapered gold coplanar waveguide with three pads (G-S-G). The overall device is about 3 mm by 3 mm. The insert shows a magnification of the meandered structure.

A second use of superconductivity is to create another type of qubit. By making rings of superconducting material, we can generate an electrical current that will create a magnetic field. From there, it is possible to encode a qubit of information in the magnetic field. IQC has recently hired a new faculty member whose goal it is to fabricate and use circuits of superconducting material for quantum information processing.

In an effort to allow some of our key research initiatives to move forward, particularly in the areas of quantum dots and superconducting material, we have begun to construct a nanofabrication (nanofab) facility in the IQC's current headquarters on the university's north campus. This temporary cleanroom will have a lower certification level than the cleanroom that will eventually be part of the Quantum-Nano Centre, but it will certainly be adequate as an important first step to create several types of devices needed for the research initiatives in question.

The temporary nanofab will house approximately \$5M worth of the \$28M in scientific equipment funding granted for this project. The fabrication equipment will be installed over the course of the summer and fall 2009. Some of the major components of the toolset to be installed include an electron-beam lithography system for writing patterns as small as 15 billionths of a metre across, two physical vapour deposition systems for depositing various types of materials such as aluminum, iron and germanium, and two inductively coupled reactive ion etch (ICP-RIE) systems which will allow for the selective etching of a very large assortment of materials ranging from metals to insulators to semiconductors.

The equipment, which we will soon have access to, is similar to the types of machines typically used to manufacture integrated circuits and MEMS components, such as those found in many consumer products today (the Nintendo Wii handset for instance). Our aim is to adapt these fabrication technologies to manufacture various types of devices needed by our researchers such as include superconducting Josephson junctions and quantum dots.

Integration

One of the most advanced quantum technologies is quantum key distribution (QKD). The goal of QKD is to exchange (more precisely, expand) a key between two interlocutors in order for them to be able to exchange private information. A detailed introduction about QKD and the state of the technology in the world can be found at www.iqc.ca/~laflamme/reports/CSERreport.pdf. QKD is often mentioned as the low-hanging fruit of quantum technologies. A few start-up companies have already been created, and companies such as HP, IBM, NEC, Toshiba and NTT have active group investigations into various aspects of these technologies.

A QKD system would make use of many of IQC's capabilities – the theoretical group, sources of entangled photons and superconducting detectors mentioned above – and integrate them in a common system. IQC is well

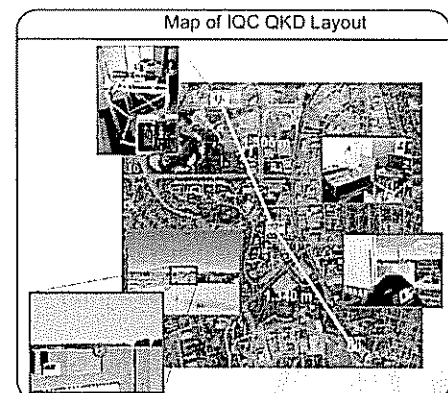


Figure 4 Operational quantum key distribution system at the IQC. A source of entangled photons is sent from the CEIT building at the university, reaching both the IQC and the Perimeter Institute where keys are established and tested for eavesdropping

placed to make breakthrough in this new technology.

One of the weak links of QKD is its distance limitations. The absorption rate of photons going through optical fibres has limited point-to-point key distribution to about one hundred kilometres. One potential solution is to use quantum repeaters that would correct for errors during transmission and extend the distance with a reasonable amount of overhead. Although we know how to theoretically devise quantum repeaters, only simple proofs-of-experiments are available in the lab and thus QKD is at present, distance limited.

Another QKD implementation is based on using free space as a communication link. It is usually limited through the line of sight between the source and the interlocutors but it could be possible to place the source in a way to extend the distance limitation present in optical fibres systems.

In the last two years researchers at the IQC have built and operated a QKD prototype. It has allowed IQC researchers to have hands-on experience with the devices, particularly with determining their security in a practical setting.

A project that IQC will focus on is studying the possibility of placing a source of photons on a satellite and allowing quantum communication in space in collaboration with the Canadian Space Agency (CSA). Combining the CSA fast-tracking optical terminals and IQC quantum transceivers will advance quantum communication technology and form a basis for the design of future quantum communication space missions.

A table with citations/year of papers since 2007 that have been written by IQC members can be found in Appendix D.

4. Objectives

This section identifies IQC's objectives for the next fiscal year (May 1, 2009 through April 30, 2010).

Each objective starts with some context and a goal statement, and then the goal is tied to IQC's strategic plan. Next, key milestones and related target dates are set out with expected results. Finally risk assessment and mitigation plans are outlined.

The objectives for next year include:

1. Research
2. Graduate Program and Teaching
3. Outreach
4. IQC Building
5. Communications
6. Information Technology
7. Financial

IQC's leadership team – Raymond Laflamme, Mike Mosca and Steve MacDonald – meet weekly to discuss IQC's strategic and operational issues. The objectives identified in this report are key success factors for IQC, and will be monitored at these meetings.

4.1 Research

Background

The research conducted at IQC is focused on both theoretical and experimental quantum information science and technology. It encompasses the broader areas of computer science, mathematics, physics, chemistry and engineering. There are three main themes of research: algorithms and protocols, experiments, and integration of both theoretical and experimental components.

IQC's research team currently consists of 18 faculty, 20 postdoctoral fellows, and 65 graduate students and undergraduate research assistants.

Research at IQC is focused on quantum computing and communication at both theoretical and experimental levels. Within each level, we can think of the research tackling three intertwined paths:

- First, there are the algorithms and protocols, which address how to control quantum information processors and how we would use them;
- Second, we have building blocks that make proof-of-principle experimental demonstration of how we can control quantum effects for information processing;
- Third, there is the integration of the various parts to turn proof-of-principle experiments into quantum technologies.

In the coming year, the focus in the direction of algorithms and protocols will be on quantum walk algorithms, quantum error correction and foundations/tests of quantum mechanics. For building blocks, we will investigate elements of blueprints for quantum computers such as magnetic quantum bits (qubits), photonics and superconducting materials both for quantum computing and quantum cryptography. Finally, on the path of integration, we will focus on quantum key distribution (QKD), a branch of quantum cryptography and a promising application of quantum technologies. Building on our recent QKD prototype, we will investigate the possibility of placing single photon sources on a satellite, exploring global quantum communication. Research results will be communicated to the academic world both through the usual peer-reviewed journals and through international workshops and conferences.

We have devised a strategy to attract the best students to IQC by taking advantage, not only of the strength and breadth of our research, but also through a series of summer schools, workshops and tours targeted to students and a nascent graduate program.

Objectives

The IQC mission statement states that, "Our mission is to aggressively explore and advance the application of quantum mechanical systems to a vast array of relevant information processing techniques."

The strategic objectives of research at IQC are:

- To establish Waterloo and Canada as the world centre of research in quantum technologies and their applications by bringing together the best researchers from mathematics, science and engineering.

- To become a magnet for the best undergraduate, postgraduate and postdoctoral students to engage in research activities that significantly advance quantum information science, and widely disseminate their results.

Milestones and Timeline

For April 2010:

Hire 2 additional faculty
Hire 8 postdoctoral fellows
Hire 20 research students
Write more than 100 research papers
Organize 3 scientific workshops and/or conferences
Give more than 100 scientific presentation talks
Host 50 research seminars
Install equipment in nanofab facility

Expected Results

Results expected as above.

Risk Assessment

The primary risk to our ultimate objective is if IQC fails to add to its complement of researchers and to encourage these researchers to communicate and collaborate in their work.

4.2 Graduate Program and Teaching

Background

UW has been offering courses in quantum information since winter 2000, and several of these courses are now standard offerings in several departments and faculties. The core course, "Introduction to Quantum Information Processing," has been split into undergraduate and graduate sections due to overwhelming demand. Appendix F lists all future, current and previous courses in quantum information taught by IQC faculty.

IQC faculty (and associate faculty) have over this period supervised over 40 completed graduate theses in quantum information through the 6 units (School of Computer Science, Combinatorics & Optimization, Applied Mathematics, Physics & Astronomy, Chemistry, Electrical & Computer Engineering) and are currently supervising 50 theses in progress.

Several universities are forming, or have recently formed, graduate programs in quantum information (e.g. MIT, Imperial College, National University of Singapore, and Max Planck Institute of Quantum Optics).

We now have a sufficient number of faculty and base of courses in quantum information to launch a strong graduate program. We are developing more detailed plans to launch a graduate program in quantum information at IQC, and will also introduce additional opportunities to engage students at the undergraduate and high school level. This will include new Masters and PhD programs focusing on quantum information, with the opportunity for various specializations.

Objectives

One of IQC's strategic objectives is to become a magnet for the best undergraduate, postgraduate and postdoctoral students to engage in research activities that significantly advance quantum information science, and widely disseminate their results.

Having a graduate program in quantum information will serve several important purposes.

First, it will facilitate the advanced training of graduate students in quantum information and the various related disciplines. The program will nurture a new generation of researchers with a broader and deeper understanding of the field of quantum information.

Furthermore, advertising a quantum information program will be an excellent recruitment tool for prospective graduate students around the world. It will both encourage students to pursue research in quantum sciences, in particular in quantum information and related subjects. It will also encourage them to pursue these studies in Canada at Waterloo.

Finally, having a dedicated program will streamline the recruitment of quantum information students (since students can directly apply to the program).

Timeline

IQC has recently hired a contract staff person to work full time with Michele Mosca to plan the program and prepare an Ontario Council of Graduate Studies (OCGS) proposal

for a new graduate program (both Masters and PhD). Our target submission date is Fall 2009.

Expected Results

We anticipate that OCGS will approve the program by Summer 2010. Worldwide advertising will start in 2010, and relevant academic committees will be formed. New students will enter the program in 2011.

Risk Assessment

The most obvious risk is that internal negotiations for setting up the program delay the preparation of the OCGS proposal beyond Fall 2009. In this event, we hope to submit by Winter 2010. We would still be able to advertise the program pending approval.

Another risk is that OCGS rejects the proposal. While we don't think this is likely, the contingency plan would be to resubmit a revised proposal based on the feedback. With regard to students that applied for the proposed program, we would seek to obtain positions for the top students in the existing related programs at UW. In the immediate future we would continue to use the existing programs, until a new program is eventually approved and launched.

A project plan for the graduate program has been prepared and progress is tracked at weekly meetings.

4.3 Outreach

Background

To complement the research that has been done at IQC, we have organized meetings, workshops, outreach activities and conferences. Some of these are highly specialized, with topics such as security proofs in quantum cryptography, but others, including public lectures, are more general.

In addition to these activities, there is a strong visitor program that has brought more than 700 visitors since the inception of IQC; Appendix C contains a list of visitors for the past year. These visitors include researchers, students and teachers, business partners, journalists and members of government agencies.

Objectives

As part of our strategic objectives, IQC strives “To become a source of information, analysis and commentary on the state of quantum information processing and provide the essential knowledge for Canada’s industry to be ahead of the international community.”

Reaching out to its communities – both Waterloo and the international scientific community – will assist IQC in attracting the best and brightest students and researchers.

Milestones and Timelines

1. 4th Workshop on Theory of Quantum Computation, Communication and Cryptography – May 11-13, 2009
2. Undergraduate School on Experimental Quantum Information Processing – June 1-12, 2009
3. Quantum Cryptography School for Young Students – July 21-31, 2009
4. Fields Institute workshop (Mathematics in Experimental Quantum Information Processing) – August 10-14
5. 4th annual Sir Anthony Leggett Lecture Series – Summer 2009

Expected Results

We expect that, through our outreach programs, both the scientific and lay communities will become increasingly aware of IQC and its activities. As an additional benefit, we expect that outreach will help to attract excellent researchers and students from around the world.

Risk Assessment

In order to entice participants to attend these conferences, presenters should present material that is new, relevant and challenging to the field. Our researchers at IQC are on the cutting edge of quantum information, and through their own work and connections across the globe, are able to provide the necessary intellectual weight to encourage leading scientists to attend.

The conferences must also be flawlessly executed, requiring a consistent degree of commitment from organizers so that attendees have their needs met in order to fully benefit from the community atmosphere and the material being presented.

4.4 IQC Building

Background

The future home for IQC, currently under construction, is part of the Quantum Nano Centre (QNC). It is located at the heart of the university. The QNC is a 284 thousand square foot, five storey facility with a 10 thousand square foot clean room, and 20 thousand square feet of laboratory space. The IQC share of the building cost is \$80 million.

Objectives

These objectives were guided by two of IQC's strategic objectives:

1. To establish Waterloo and Canada as the world centre of research in quantum technologies and their applications by bringing together the best researchers from Mathematics, Science and Engineering.
2. To become a magnet for the best undergraduate, postgraduate and postdoctoral students to engage in research activities that significantly advance quantum information science, and widely disseminate their results.

The design of the building was guided by three principles:

1. The need to be functional and in particular to adhere to stringent requirements related to temperature control, low vibration and electromagnetic radiation;
2. Induce interaction between members of IQC; and
3. Serve as an attractor.

The primary goal now is to ensure the building gets constructed per specifications, on time and on budget.

Timeline

The building is scheduled for completion in early 2011. Milestone dates for the next year include:

- | | |
|----------------------------------|------------|
| 1. Forming the ground floor slab | May 2009 |
| 2. 2 nd floor slab | June |
| 3. 3 rd floor slab | July |
| 4. 4 th floor slab | August |
| 5. 5 th floor slab | October |
| 6. Super structure | November |
| 7. Building envelope completion | March 2010 |

Expected Results

It is expected that the building milestones will be completed on time, on budget and as per specifications.

Risk Assessment

This complex facility will face challenging environmental, financial and engineering and practical change management issues. To mitigate these risks, bi-weekly project management meetings take place with the contractor, the architect, university personnel that have direct responsibility for the project. Further, a steering committee meets quarterly (or as required) to ensure the mandate, as summarized in the objectives, is met. Also, the budget provides for a five per cent construction contingency.

4.5 Communications

Background

It is IQC's strategic objective, "To become a source of information, analysis and commentary on the state of quantum information processing and provide the essential knowledge for Canada's industry to be ahead of the international community." The leadership team at IQC identified Communications as their highest administrative priority. To further this objective a Communications initiative is being undertaken.

Objectives

The purpose of the communications initiative is to develop a road map to fulfill IQC's strategic objective of becoming *the* source of quantum information. The map will identify the target audiences, and the processes and tools required to achieve alignment with the strategy. This will involve the development of a strategy to create the IQC brand. This in turn entails identifying the unique IQC culture, knowing our key stakeholders and their information requirements, and becoming an aggregator of quantum information. And finally, we will need to identify outreach partners to work with in order to get the message out.

Milestones and Timeline

Milestones and the related dates for the next year include:

- | | |
|--|-----------|
| 1. Select working team members/kick-off meeting | July 2009 |
| 2. Gather feedback from key stakeholders | October |
| 3. Establish initial priorities to focus Communication efforts | November |
| 4. Set Communication budget | December |
| 5. Decide on Communication people structure | January |
| 6. Decide key messages (themes, look & feel, branding) | April |
| 7. Identify/develop tools to use for communication | May 2010 |

Expected Results

The stakeholder engagement process will inform the strategy and will help focus efforts to areas that will advance the objective of becoming *the* source of quantum information. Once the direction is set, the skills required to deliver the strategy will become clear. This in turn will lead to the development of an IQC brand and to clarity around the methods or tools to use to become *the* source of quantum information, analysis and commentary.

Performance will be assessed based on meeting target dates and the feedback of stakeholders. A future measurement will be the growth in volume of traffic on our web site. A baseline will be established as part of the information gathering process.

Risk Assessment

This initiative faces financial and human resource risks. Further, because branding is so judgmental, making a decision on themes, look and feel and tools could become complex. To mitigate the financial and human risks, project plans and budgets will be established and bi-weekly project management meetings will be set up to track performance against the plan, and to ensure resources are focused on key deliverables. To assist the decision making process around branding, principles to inform decision making will be developed prior to initiating discussions on the brand.

4.6 Information Technology

Background

As IQC has grown rapidly since its inception in 2002, it is not surprising that its administrative capabilities lag behind the needs of the scientists, students and administrative staff. Information Technology is an integral aspect of the administrative infrastructure for the Institute, and it has been identified as the primary area in which the administrative team can further support the IQC mission.

Objectives

These objectives were guided by one of IQC's main objective: to become a source of information, analysis and commentary on the state of quantum information processing and provide the essential knowledge for Canada's industry to be ahead of the international community.

The purpose of the Information Technology (IT) initiative is to develop a road map for the delivery of IT that aligns with IQC's scientific mission. The road map will spell out the people, processes and tools required to achieve alignment. This will involve the development of a strategy for the IT portfolio components, viz. infrastructure, transactional, information management and strategic technology. Ideally many of the strategy components will be implemented concurrently. Realistically, the plan is to start at the foundational level and move towards the more strategic elements over time.

Infrastructure includes the server architecture, communication systems and client service standards. This component of the strategy will define the service standards for how IT operates at IQC, and our relationship with the University of Waterloo's IT departments.

Transactional and information management systems include inventory tracking, groupware and financial data base tools. The delivery of robust end user tools will better enable the scientists, students and administrative staff to collaborate and interpret information.

Milestones and Timeline

Milestones and the related dates for the next year include:

- | | |
|---|--------------|
| 1. Engage stakeholders in IT strategy development | Summer 2009 |
| 2. IT strategy approval | September |
| 3. Implement one piece of infrastructure | January 2010 |
| 4. Implement a second piece of infrastructure | April |
| 5. Implement a transactional component | June |

Expected Results

The stakeholder engagement process will inform the strategy and will help focus efforts to areas that will provide the scientists with resources that most enable their work. The strategy will provide the road map to guide implementation. Implementing components will lead to tools end users will benefit from either directly (e.g., groupware) or indirectly (e.g., enhanced data security). Performance will be assessed based on meeting target dates and feedback from end user surveys.

Risk Assessment

This initiative faces financial, human and scope creep risks. To mitigate these risks, project plans will be established for each initiative and bi-weekly project management meetings will be set up to track performance against the plan, and to ensure resources are focused on key deliverables.

4.7 Finance

Background

The financial viability of IQC has been strengthened by the tremendous support received by the federal and provincial governments, private benefactors and the University of Waterloo. The recent announcement of \$50 million in Industry Canada funding has removed much uncertainty as to the ongoing sustainability of the Institute.

The leadership team at IQC has identified the need for a financial plan for the new IQC building to be finalized, the need for a financial plan to fund the equipment that will be used in the fabrication facility and in the labs, and critically, a plan that addresses the ongoing operational sustainability of the research efforts.

Objectives

The purpose of the financial initiative is to document the funding requirements to complete the construction of the building, to equip the facility with state of the art equipment, and to document the funding required to support the strategic objectives of IQC. The financial planning will entail documenting the source of funding, estimating capital and operational charges, as well as investment income and future funding needs, and potential new sources of funding as required.

Milestones and Timeline

Milestones and the related dates for the next year include:

- | | |
|--|------------|
| 1. Finalize funding plans for the IQC building | June 2009 |
| 2. Prepare a financial plan for equipping the facility | July |
| 3. Prepare a 10-year financial plan for ongoing operations | November |
| 4. Draft a proposal to address funding shortfalls | March 2010 |

Expected Results

The financial plans will identify IQC's cash flow requirements and any shortfall in funding that will limit the Institutes ability to achieve its vision and related strategic objectives. This will lead to a clear understanding of ongoing support required to sustain operations, and will inform further planning if and as required.

Risk Assessment

Naturally the primary risk is that IQC presently has insufficient funding to meet its strategic objectives. The primary purpose of updating the cash flow analysis is to determine the size of the exposure, and to prepare mitigation strategies as applicable.

The leadership team and the Board will oversee each stage of this initiative.

5. Accomplishments

This section highlights some of the accomplishments of the IQC and its members over the past year (May 1, 2008 to April 30, 2009). Accomplishments have been subdivided into seven categories: Hiring, Publications, Teaching and Outreach, Grants, Awards, Visitors, and the Quantum Nano Centre. Each invites the reader to refer to the appropriate appendix for more detailed information on each area.

Where applicable, we have provided comparisons with IQC's objectives for the upcoming year.

Hiring

Since April 2008, IQC has hired two faculty members, bringing the number of faculty to 18, and plans to add two more in the coming year, in keeping with the expected results outlined in section 6.1.

In the past year, seven postdoctoral researchers have moved on from the Institute. Five new postdoctoral fellows have been hired and it is expected that eight more will be added over the next year.

For a more detailed examination of IQC's team, please see Appendix H.

Publications

Since 2008, IQC members have contributed to 100 publications in refereed journals including leading periodicals such as Science, Nature, Nature Physics and Physical Review. They have contributed eight chapters to books and proceedings and have published an introductory textbook for quantum computing.

Over the next year, the Institute aims to produce more than 100 research papers, in keeping with the expected results outlined in section 4.1 of this report (Objectives – Research).

A complete list of publication citations can be found in Appendix E.

Teaching and Outreach

IQC is working towards starting a graduate program in quantum information, building on the base of courses already offered by the Institute.

Last year, the IQC offered three summer programs and conferences for students ranging from secondary to post-graduate level who were interested in learning more about various aspects of quantum computing.

This year, the IQC plans to organize at least three scientific workshops and/or conferences.

For a complete list of courses in quantum information taught by IQC faculty members since 2008, please see Appendix F. A detailed list of upcoming conferences at IQC can be found in Appendix G.

Grants

In 2008-2009, IQC received \$3.2 million in grants from industry, government and academic partners. These funds are in addition to previous year's extraordinary \$50M donation from Mike and Ophelia Lazaridis, a \$50M grant from the government of Ontario and a \$36M from CFI/MRI grant for the joint fabrication facility in the QNC.

Starting next year, the IQC will receive a total of \$50 million over five years from the federal government. A further \$3.0 million in research grants is also expected.

A complete list of grants from 2008-2009, as well as the total of grants received since our inception in 2002, is available in Appendix A.

Awards

IQC faculty, board members, postdoctoral researchers and students received much recognition for their work over the past year.

In April 2008, IQC researcher Dr. Richard Cleve received the 2008 CAP/CRM Prize in Theoretical and Mathematical Physics.

Institute director Dr. Raymond Laflamme has had his Canada Research Chair renewed, in addition to receiving a Premier's Discovery Award and being elected as a Fellow of the Royal Society of Canada.

Earlier in 2009, new faculty member Dr. Adrian Lupascu received the largest NSERC Discovery Grant ever awarded to a newcomer and PhD student Gina Passante received NSERC's Vanier Graduate Scholarship.

For a complete list of awards received by IQC members, please see Appendix B.

Visitors

From May 2008 to April 2009, IQC hosted 129 groups of visitors, ranging from community groups to business leaders, fellow academics and members of the media.

A complete list of visitors since 2008 can be found in Appendix C.

Quantum Nano Centre

Construction of the Quantum Nano Centre, located at the heart of the UW campus, began in July 2008. It is expected that the building will be completed per specifications, on time and on budget.

For more information on the Quantum Nano Centre, please refer to Appendix K.

Note: The appendices referred to above can be accessed via our web site at: www.iqc.uwaterloo.ca