January 12, 2010

NOTICE OF MEETING
Graduate Education Council

To: Members of Graduate Education Council
From: Jane Alderdice, Secretary, Graduate Education Council

This is your notice of the Graduate Education Council meeting starting at 3:00 p.m. on Tuesday, January 19, 2010, in the Governing Council Chamber (Room 214) at Simcoe Hall, 27 King’s College Circle (please note the location).

If you have any questions or comments about the attached agenda, or wish to send regrets, contact Mr. Anil Purandaré, SGS Governance Officer, at 416 946-3427 or sgs.governanceofficer@utoronto.ca. If you would like to discuss any aspect of Council business, I would be pleased to hear from you at jane.alderdice@utoronto.ca.

[SIGNED]
AGENDA
Graduate Education Council

Tuesday, January 19, 2010
3:00 p.m. - 6:00 p.m.
Governing Council Chamber, Simcoe Hall
Room 214, 27 King’s College Circle (PLEASE NOTE LOCATION)

Refreshments will be served

Regrets only to Anil Purandaré, SGS Governance Officer: 416-946-3427 or sgs.governanceofficer@utoronto.ca

1 Minutes of the Graduate Education Council Meeting of November 17, 2009  
(Documentation attached)

2 Business Arising from the Minutes

3 Dean’s Remarks

4 Report of the Vice-Dean, Programs

5 Report of the Vice-Dean, Students

6 New Degree Program: Environmental Science, PhD
(Documentation attached)

7 New Collaborative Programs:
(Documentation attached)

7.1 Developmental Biology (adding the master’s level to the existing program)
7.2 Educational Policy, master’s and doctoral levels

8 Closure of Collaborative Program: Developmental Science, master’s and doctoral levels
(Documentation attached)

9 Program Name Change: from Clinical Biomedical Engineering, MHSc, to Clinical Engineering, MHSc
(Documentation attached)
10 New Hood: Health Informatics, MHI
   (Documentation attached)

11 Admission & Program Requirement Change: Sociology in Education, MA, MEd, EdD, PhD
   (Documentation attached)

12 Program Requirement Changes:
   (Documentation attached)
   12.1 Health Informatics, MHI
   12.2 Music PhD (Flexible Delivery Option)
   12.3 Nursing Science, PhD
   12.4 School and Clinical Child Psychology, MA, PhD

13 Other Business

14 For Information:
   (Documentation attached)
   14.1 Admissions and Program Committee Annual Report 2008-09
   14.2 Registration Statistics Annual Report 2009-10
GRADUATE EDUCATION COUNCIL
MINUTES OF THE MEETING
of
Tuesday, November 17, 2009, 3:10 p.m. – 6:00 p.m.
Held in the Council Chamber, Galbraith Building

The meeting was called to order at 3:10 pm. Dean Brian Corman welcomed all members and visitors, especially new members. The Dean called for a motion to adjourn no later than 5:00 p.m.

MOTION (duly moved and seconded)
THAT the Graduate Education Council meeting of November 17, 2009 will adjourn no later than 5:00 p.m.

The motion was CARRIED.

The Dean called for a motion to approve the agenda.

MOTION (duly moved and seconded)
THAT the agenda of the Graduate Education Council meeting of November 17, 2009 be approved.

The motion was CARRIED.

1 Minutes of the Graduate Education Council Meeting of May 19, 2009
The minutes of the May 19, 2009 meeting were distributed with the agenda.

MOTION (duly moved and seconded)
THAT the minutes of the Graduate Education Council meeting of May 19, 2009 be approved.

The motion was CARRIED.

2 Business Arising from the Minutes

2.1 Subsequent Considerations of GEC-approved items

Master of Global Affairs (MGA) (new program)
The new Master of Global Affairs (MGA) program was approved by the Graduate Education Council (GEC) on January 20, 2009. It was subsequently approved by Governing Council on April 16, 2009 and by the Ontario Council on Graduate Studies (OCGS) on September 21, 2009. The program now has final approval to commence, effective September 1, 2010.

Centre for Industrial Relations and Human Resources (CIRHR) (disestablishment & reestablishment)
Disestablishment of the Centre for Industrial Relations and Human Resources as an EDU:A within SGS and its reestablishment as an EDU:A within the Faculty of Arts and Science was approved by
GEC on April 21, 2009. The proposal received final approval from Governing Council on June 23, 2009 with an effective date of July 1, 2009.

With this move there are no longer any Centres or Institutes residing in the School of Graduate Studies (SGS)

Public Health Sciences program (renaming of degree from MHSc to MPH)

The proposal to change the name of the Master of Health Science (MHSc) degree in the Public Health Sciences program to Master of Public Health (MPH) degree was approved by GEC on May 19, 2009, and subsequently by the Committee on Academic Policy and Programs of Academic Board (AP&P) on September 15, 2009. It was approved under Summer Executive Authority of Academic Board on September 24, 2009 and approved by OCGS on September 29, 2009, effective the November 2009 Convocation.

The hood for the Master of Public Health (MPH) degree is the same as the Master of Health Science (MHSc) degree, approved by GEC on May 19, 2009. Approval to use the MHSc hood for the MPH degree was granted by the Ceremonials Committee of Academic Board on October 26, 2009.

Master of Science in Applied Computing (MScAC) (new program)

The proposed Master of Science in Applied Computing (MScAC) program was approved by GEC on May 19, 2009. It has since been approved by AP&P on September 15, by the Planning and Budget Committee of Academic Board (P&B) on October 28, and by Academic Board on November 12, 2009. Final approvals from Governing Council and OCGS are still pending.

Master of Engineering in Telecommunications (MEngTel) (program closure)

The closure of the Master of Engineering in Telecommunications (MEngTel) program was approved by GEC on May 19, 2009. It has since been approved by AP&P on September 15, 2009, by P&B on October 28, 2009, and by Academic Board on November 12, 2009. Final approval from Governing Council is still pending.

3 Dean’s Remarks

3.1 Introductions

The Dean introduced the Deans and senior staff of SGS:
Berry Smith, Vice-Dean Students
Liz Smyth, Vice-Dean Programs
Jane Alderdice, Director of Quality Assessment and Governance, and Secretary to Council
Rodney Branch, Director of Information Systems
Jane Freeman, Director of English Language and Writing Support
Heather Kelly, Director of Student Services
Christy Kim, Director of Support Services
Anil Purandaré, Governance Officer and Assistant Secretary to Council

3.2 Orientation for GEC Members

Dean Corman explained that new policies and regulations, changes to existing ones, and new program proposals of all kinds require GEC approval before going to higher levels of governance. New policies and regulations, and changes to existing policies and regulations, may be reviewed by the GEC as the first step in governance action. Admission and program regulation changes are proposed by departments, and are first approved by Faculty Council and then reviewed for final approval by GEC. New program proposals are approved by the Faculty Council before being presented at GEC and will
proceed to Academic Board and its committees and Governing Council for final approvals. The Dean stressed the importance of scrutiny, especially where approval is final, and the importance of questioning items where information is not clear. However, GEC is not expected to question the academic judgment of individual programs in the construct of their regulations or proposals. GEC members should focus on whether procedures have been followed appropriately, whether the appropriate consultations have taken place, whether the proposals are clear, sensible, transparent, and so forth. If proposals are found wanting, GEC can send them back to the Faculty Councils they came from to request further information; but it is not the role of GEC to amend Faculty Council proposals with regard to programs or courses. The Dean noted that the role of members in decision making required them to use their own good judgment, but as elected representatives; that is, members are not representing their department or division directly. The Dean concluded by remarking on the diverse policies and guidelines in existence and invited members to ask questions when they had any about the regulatory environment affecting a given proposal.

Ms. Alderdice, Secretary to GEC, discussed the different types of documents for approval: policies, new programs, program changes and OCGS Briefs. For items requiring approval, there will be a motion cover sheet. Besides the motion itself, the motion sheet advises of previous governance action and consultations, including a summary of discussion points that occurred to date. The motion sheet also identifies the approval route to final approvals and identifies the set of supporting documents for that item. The defined routing for all graduate governance items can be found on the SGS website under the Governance and Policy tab, Governance Procedures drop-down menu. Any proposal requiring GEC approval, including admission or program requirement changes, is considered a “Major” change for routing purposes – even if the change itself is relatively “minor”. Ms. Alderdice went on to describe the governance process in more detail: the Faculty Graduate Affairs Offices, which consist of a Vice-Dean, Graduate Studies, and a graduate administrator, are involved in the initial stages of proposal development involving proposed curriculum changes or new program proposals. The Graduate Webposting System (GWS) is the first step in graduate governance prior to Faculty Council approval. It is an opportunity for any member of the University community to provide feedback. The GWS is accessible on the SGS website as the first item in the dropdown from the Resources and Services tab. More information is available on the website; a handout on yellow paper was distributed at the start of the meeting with the relevant links, as was the SGS staff directory (on plain paper). She concluded by saying that staff at SGS are available to answer questions that arise during the year including, of course, Mr. Anil Purandaré and herself for Council-related matters.

A member asked whether proposals could come forward without following the defined procedures. The Dean replied that while it was impossible to completely prevent such things from happening, he hoped that they would not, and that members had a part to play in directing proposals through established governance steps.

3.3 SGS Orientation for Academic Administrators (October 13, 2009)
SGS held an orientation for new graduate Chairs, Directors and Graduate Coordinators on October 13, 2009. Topics on the agenda included student academic progress and completion, quality and graduate education, governance and academic appeals, information services, and student services. The presentation slides are available on the SGS website.

SGS also held an orientation for graduate staff administrators on October 8, 2009 with a similar list of topics.

3.4 Update on the Ontario Council on Graduate Studies (OCGS)
The major change underway is the end of the periodic reviews run by Ontario Council on Graduate Studies (OCGS). OCGS reviews are in their final year. What will replace them is a new
Quality Assurance (QA) Board which will generate a system that responds much more to the individual university sense of what is appropriate for assurance. In other words, the University will need to have a QA process approved by the new Board. Once approval is in place, will be a new framework for reviews of programs, and no longer a need for those reviews to focus on graduate programs only. The new procedures will affect programs, departments and units, both graduate and undergraduate. There is great potential gain for U of T in this new model. The final framework document for the new QA Board is under final revision. The matter is now in the hands of the Ontario Council of Academic Vice-Presidents.

A member asked what the frequency of reviews would be in the new model and whether they could be aligned with department reviews. The Dean responded that the maximum time would be eight years (according to the latest draft), and that the intention was to have them aligned; i.e. if a department required 5 year reviews, it could do this one at the same time.

3.5 Reimbursement for Thesis Honoraria and Travel Expenses for External Examiners (SGS Memo 2009-003)

The School of Graduate Studies provides graduate units with a $100 honorarium for the appraisal of each doctoral thesis and $500.00 to help defray travel costs for each exam where the examiner attends in-person. In the past, a memo has been sent to graduate units every fall requesting the estimated number of doctoral oral exams expected to take place in the current fiscal year. Following from the responses received from graduate units, transfers are made based upon the estimated number of doctoral oral exams less the reconciled adjustment from the prior fiscal year.

Effective for the 2009/2010 academic year, SGS will synchronize payments of honoraria with remuneration to graduate units for external examiners’ travel. This transfer will occur twice per year, in March and in May.

4 Report of the Vice-Dean, Programs

4.1 Final Oral Examinations (FOE) Online Preapproval Form Revisions

Vice-Dean Liz Smyth described how SGS had been attempting to further streamline the on-line approval process. A handout on plain paper was distributed at the start of the meeting, depicting two versions of the Final Oral Examination Online Pre-Approval form: 1) the Grad Admin Interface, and 2) the SGS Interface. Most members might be unfamiliar with the first version of the form because it is completed by administrative staff. She noted that SGS was requesting that external examiner CVs be uploaded directly. SGS regulations require four people for quorum, but recommended an additional person, particularly if an exam involved electronic collaboration, to ensure that quorum is available at all times. She drew members’ attention to the second version of the form, explaining that there are times when SGS requires additional clarification, e.g., to determine the arm’s-length relationship of external examiners. SGS has found the online preapproval an efficient way of tracking Final Oral Examinations.

A member asked how the arm’s-length relationship was defined. The Vice-Dean replied that some collaborations may be acceptable, such as contributing to a common dataset. Any information that departments provide is appreciated.

4.2 Updates on Graduate Appointments

All participants at a Final Oral Examination and members of examining committee must be members of Graduate Faculty. Departmental administrators and Graduate Coordinators will understand the categories of appointments more clearly. The Vice-Dean indicated that there might be further clarifications at the next meeting of GEC. SGS is trying to streamline and clarify the categories and
understands the frustrations experienced by departmental administrators and Graduate Coordinators who must make use of the categories

5 Report of the Vice-Dean, Students

5.1 Graduate Professional Skills (GPS) program

Vice-Dean Berry Smith reported that the GPS program was a success in its first stages, with 500 enrolled. The program offers 35 distinct offerings from 12 service areas around the University. Some offerings were already extant, but there are a few new ones as well. A website with more information is available. If there are any questions, they can be directed to the Program Coordinator, Jeff Richardson, to Ms. Heather Kelly, Director of Student Services, or to the Vice-Dean.

5.2 Graduate Room:

This facility is available for graduate students and associated graduate activities. It is located at the north-west corner of campus, at Graduate House at the corner of Harbord St. and Spadina Ave. It has two levels. On the main floor is a drop-in centre with coffee and snacks, fully wired for laptops, etc; its hours are from 7 a.m. to 8 p.m. Downstairs is a multi-purpose space available for graduate functions – bookable at no charge for the room itself, and able to accommodate 40 to 50 people. It can be configured for meetings or as empty space, and is equipped with surround sound. Book ahead as demand is heavy, but there is availability. Contact Jeff Richardson for more information.

5.3 Electronic Theses

The transition to electronic submission is complete – all theses must now be submitted electronically and are deposited in the University’s electronic repository, T-Space. Submitters can choose to restrict access, but if no restrictions are specified, theses are generally available. The transition has been very smooth.

6 New Diploma Programs: 1) Anesthesia Care, Master of Nursing (Nurse Practitioner field) Concurrent Diploma (GDipNPAC) and 2) Anesthesia Care, Post Master of Nursing (Nurse Practitioner field) Diploma (GDipNPAC)

The proposal was unanimously approved at the Faculty of Nursing Council meeting on November 9, 2009. No substantive discussion arose at the meeting. If approved by GEC, the proposal will be brought to the Academic Policy and Programs Committee, the Planning and Budget Committee, and the Academic Board of Governing Council for approval, and to Governing Council for final University of Toronto approval. The proposal will be submitted to OCGS for a standard appraisal.

Professor Elizabeth Peter had sent her regrets. Professor Judy Watt-Watson and Professor Krista Keilty (Director of the Nurse Practitioner Program) were available to present the item to Council and to answer questions.

At the Dean’s invitation, Professor Watt-Watson explained that two new graduate diplomas were envisioned. The first is a concurrent diploma, which is an OCGS Type 2 diploma for students currently enrolled in the Master of Nursing, Nurse Practitioner Field. The second diploma is an OCGS Type 4 post master’s diploma, for those who have already graduated with a master’s degree and are Nurse Practitioners. The concurrent diploma has 2 sessions embedded in the master’s program and 1 separate session for the diploma; students enrolled in the concurrent diploma program cannot obtain it without graduating with the Master of Nursing. The post master’s diploma requires three sessions. The Faculty has been a leader in Canada in Nurse Practitioner education for many years. There are no other Anaesthesia Care graduate diplomas offered in Canada, so there is need for the proposed program.
Funding from Ministry of Health and Long-term Care has been secured. There have been extensive consultations both in the internal Faculty community as well as with external affiliates, including the Department of Anesthesia, Faculty of Medicine, and other nursing organizations. Total enrolment is projected at ten students. No field changes are required for this program, nor are there additional facility or space needs. The workload will be shared by faculty and colleagues at hospitals and affiliates.

The Dean called on Vice-Dean Smyth to present the motion.

**MOTION (duly moved and seconded)**

**THAT** Graduate Education Council approve the proposal of the Bloomberg Faculty of Nursing for a new graduate program leading to a Master of Nursing (Nurse Practitioner field) Concurrent Diploma in Anesthesia Care (GDipNPAC) (OCGS Type 2) for students in the Master of Nursing program, and for a new graduate program leading to a Post Master of Nursing (Nurse Practitioner field) Diploma in Anesthesia Care (GDipNPAC) (OCGS Type 4) for students who have already completed the Master of Nursing (Nurse Practitioner field) program, effective January 1, 2011.

A member asked if there was a restriction on completing two credentials at the same time and if so, whether this might contravene it. The Dean replied that obtaining a graduate diploma and degree is acceptable within an approved program structure such as this.

A member noted that the concurrent diploma appears to require a steep increase in clinical hours in year two of the program, and asked how students had responded to this. Professor Watt-Watson noted that the program requirements were needed to ensure students met requirements for scope of practice, and that the hours were broken across three sessions. Professor Keilty added that the number of hours had been chosen after consulting with bodies such as the Faculty of Medicine and the College of Nurses of Ontario; it is important that students are prepared for College requirements. As well, benchmarks set by universities in the United States and qualifications required in Europe and other jurisdictions had been considered. Feedback from students indicated that the program structure is feasible. There is demand for the program.

Seeing no further discussion, the Dean called the question.

The motion was **CARRIED**.

7 Admission Requirement Changes: East Asian Studies, MA

The proposal was approved by the Departmental Faculty Meeting on March 20, 2009. It was subsequently approved by the Faculty of Arts and Science Three-Campus Graduate Curriculum Committee on October 15, 2009; no substantive discussion arose at the meeting. GEC approval is final. It will be sent for information to the Academic Policy and Programs Committee of Academic Board in SGS’s annual report.

The Dean invited Professor Atsuko Sakaki to speak to Council. Professor Sakaki remarked that the case for the proposal was very clear, and that it involved a few changes to the MA program admission requirements.

The Dean called on Vice-Dean Smyth to present the motion.

**MOTION (duly moved and seconded)**

**THAT** Graduate Education Council approve the proposal of the Faculty of Arts and Science to change the admission requirements of the MA in East Asian Studies as follows:
• remove mention of a Specialist in East Asian Studies from the undergraduate degree requirements;
• allow those without an undergraduate Major in East Asian Studies to be considered for admission, provided they demonstrate sufficient scholarly interest and academic preparation in East Asian Studies;
• make the change effective September 1, 2010.

As no discussion arose, the Dean called the question.

The motion was CARRIED.

8 Admission and Program Requirement Changes: Classics, MA, PhD
The proposal was approved by at a department meeting on May 8, 2009. The Faculty of Arts and Science Three-Campus Graduate Curriculum Committee subsequently approved it on October 15, 2009; no substantive discussion arose at the meeting. GEC approval is final for admission and program requirement change proposals. They will be sent for information to the Academic Policy and Programs Committee of Academic Board in SGS’s annual report.

Professor Alison Keith remarked that in 2008-09, the department recently undertook a comprehensive review of its programs. The review was guided by the OCGS and Faculty of Arts and Science reviews. It concluded that the program had insufficient breadth and depth. The proposal includes a new and broader stream of courses. These will help provide students with skills for the Qualifying Exams, which are reformatted in the proposal. The proposal also brings the program in line with SGS norms, and aligns the Calendar with current practice in the department.

The Dean called on Vice-Dean Smyth to present the motion for the MA admission requirement changes.

MOTION (duly moved and seconded)
THAT Graduate Education Council approve the proposal of the Faculty of Arts and Science to change the admission requirements of the MA in Classics by allowing applications from undergraduates with degrees in related disciplines other than Classics and by easing the language requirements by requiring two full years of training in either Latin or Greek (the language requirement for the other language is unchanged: at least three and preferably four full years of training). This change is effective September 1, 2010.

The Dean called on Vice-Dean Smyth to present the motion for the MA program requirement changes.

MOTION (duly moved and seconded)
THAT Graduate Education Council approve the proposal of the Faculty of Arts and Science to change the program requirements of the MA in Classics as follows:
• replace the required courses GRK 2000H, GRK 2100H, LAT 2000H and LAT 2100H with a requirement to take 2.5 FCEs from the GRK and LAT 13XX and 18XX series of courses chosen in consultation with the graduate coordinator. This does not change overall FCE requirements.
• reformat the MA Examination cycle, which was previously linked to GRK 2000H, GRK 2100H, LAT 2000H and LAT 2100H, by having the exams stand on their own and be graded. The new format of the exams will contain translation only (no commentary,
which will now become a component of the new GRK and LAT 18XX-series courses), and will include both prose and poetry.

- change the name of the “MA Special Essay” to “Graduate Research Paper” (without changing it in substance).
- clarify the requirement to complete GRK and LAT 1000H or their equivalents. The minimum grade required for all MA students is B-. For equivalent undergraduate courses taken in lieu of GRK and LAT 1000H, the minimum grade required is B+.
- make the changes effective September 1, 2010.

The Dean called on Vice-Dean Smyth to present the motion for the PhD admission requirement changes.

**MOTION (duly moved and seconded)**

THAT Graduate Education Council approve the proposal of the Faculty of Arts and Science to change the admission requirements of the PhD in Classics by allowing applications from students with MA degrees in related disciplines other than Classics. This change is effective September 1, 2010.

The Dean called on Vice-Dean Smyth to present the motion for the PhD program requirement changes.

**MOTION (duly moved and seconded)**

THAT Graduate Education Council approve the proposal of the Faculty of Arts and Science to change the program requirements of the PhD in Classics as follows:

- remove the requirement to take courses GRK 2000H, GRK 2100H, LAT 2000H and LAT 2100H. This does not change overall FCE requirements.
- reformat the Qualifying Examination cycle, which was previously linked to GRK 2000H, GRK 2100H, LAT 2000H and LAT 2100H by having the exams stand on their own and be graded. The new format of the exams will contain translation only (no commentary, which will now become a component of new GRK and LAT 18XX-series courses), and will include both prose and poetry.
- add the requirement of sight translation as part of the Qualifying Examination cycle.
- changing the name of the “Qualifying Essay” to “Graduate Research Paper” (without changing it in substance).
- replace the Minor field requirement (CLA 3500H) with increased research seminar requirements. Increase the number of seminars from five research seminars to eleven seminars, including at least six research seminars, of which two must be outside the student’s area of concentration. Require students to maintain an at least A- average in seminars. Relax the timing of the seminar requirements.
- make the change effective September 1, 2010.

A member asked why the entrance language requirements were being relaxed. Professor Keith replied that there were fewer and fewer applicants every year meeting the existing requirements in both languages. The department wanted to relax the requirements for one of the languages so as to continue attracting students with excellent research skills who had sufficient depth in one but not both languages. She also noted that the exit language standards of the program were not changing.
A member inquired whether there really were non-Classics students who had sufficient background in one but not both languages. Professor Keith answered that this was surprisingly frequent based on the department’s undergraduate offerings. For example, students can take a double-major in Classics and another discipline, and obtain this type of background as a result.

A member noted that the proposal seemed intended to streamline and shorten the program, but appeared to be adding an exam. Professor Keith explained that the proposal was not adding an exam, as the existing program already had these exams embedded as part of required courses. The proposal is dropping a minor field requirement and replacing this with new coursework requirements.

A member asked whether students who had benefitted from the broadened entrance language requirements might have difficulty in meeting the maintained language levels in the exams. Professor Keith responded that the department had worked hard to ensure the program was paced so that students with lower language skills would be able to succeed by the time they faced the exams, and that the department had good supports for such students.

There being no further discussion, the Dean called the question.

The motion was CARRIED.

9 Program Requirement Changes:

9.1 Biomedical Communications, MScBMC

The proposal was approved by the Faculty of Medicine Graduate Curriculum Committee on October 15, 2009; no substantive discussion arose at the meeting. GEC approval is final. It will be sent for information to the Academic Policy and Programs Committee of Academic Board in SGS’s annual report.

The Dean invited Professor Shelley Wall to speak to Council. Professor Wall remarked that the supporting documentation was very clear. The proposal is simply a change to how the department provides one course and is meant to accommodate students since the program has moved physically to UTM campus from St. George earlier this year.

The Dean called on Vice-Dean Smyth to present the motion.

MOTION (duly moved and seconded)

THAT Graduate Education Council approve the proposal of the Faculty of Medicine to change the program requirements of the Master of Science in Biomedical Communications (MScBMC) by replacing the required course LMP 1012H with the required course MSC 2018H, effective September 1, 2010.

There being no discussion arising, the Dean called the question.

The motion was CARRIED.

9.2 History of Art, PhD

The change would bring the Calendar wording into line with longstanding practice at the Department. The proposal was approved by the Faculty of Arts and Science Three-Campus Curriculum Committee on October 15, 2009; no substantive discussion arose at the meeting. GEC approval is final. It will be sent for information to the Academic Policy and Programs Committee of Academic Board in SGS’s annual report.
Professor Carl Knappett was present to answer questions, and was invited by the Dean to speak to Council. Professor Knappett explained that the proposal was merely a clarification stating that the exam is a three-part exam not a two-part exam.

The Dean called on Vice-Dean Smyth to present the motion.

**MOTION (duly moved and seconded)**

**THAT** Graduate Education Council approve the proposal of the Faculty of Arts and Science to change the program requirements of the PhD in History of Art by configuring the comprehensive examinations as a three-part exam, effective September 1, 2009.

No discussion arose; the Dean called the question.

The motion was **CARRIED**.

### 9.3 Information, MI and Museum Studies, MMSt (Concurrent Registration Option)

The proposal was approved by the Faculty’s Programs Committee on May 25, 2009. It was discussed at the meeting of the Faculty’s Executive Committee on September 24, 2009; details on the discussion arising at the meeting are on the motion sheet distributed with the agenda. The proposal was approved by the Executive Committee unanimously on October 5, 2009 by an e-mail vote. A revised Governance Form which more clearly explained the proposal was distributed at the beginning of the meeting on blue paper. GEC approval is final. It will be sent for information to the Academic Policy and Programs Committee of Academic Board in SGS’s annual report.

The Dean invited Professor Lynne Howarth to speak to Council. Professor Howarth explained that the impetus for the proposal came from two constituencies. Two years ago, the Museum Studies program moved to within the Faculty of Information. Students have since become familiar with each other and interest had grown in pursuing programs from the two programs. The second constituency from which impetus came was the marketplace, which has shown growing interest in backgrounds of both these groups.

The Dean called on Vice-Dean Smyth to present the motion.

**MOTION (duly moved and seconded)**

**THAT** Graduate Education Council approve the proposal of the Faculty of Information to change the program requirements of the Master of Information (MI) in Information program and Master of Museum Studies in Museum Studies (MMSt) program to introduce a Concurrent Registration Option involving the two programs as outlined in the attached proposal, effective January 2010.

A member remarked that he was unfamiliar with the Concurrent Registration Option and asked whether this meant that students would receive two degrees at the end of their program. Another member noted that, at the January 2009 GEC meeting, Council had approved the introduction of the Concurrent Registration Option framework, where students would pursue two master’s level programs and receive two degrees at the same time; this proposal was just the first example of a Concurrent Registration Option under this framework. The Dean remarked that there already existed concurrent programs at the University that resulted in combined degrees.

Seeing no further discussion, the Dean called the question.

The motion was **CARRIED**.
9.4  **Management, MBA (GEMBA option)**

The proposal was approved by the Faculty’s Executive Council on May 22, 2009; no substantive discussion arose at the meeting. GEC approval is final. It will be sent for information to the Academic Policy and Programs Committee of Academic Board in SGS’s annual report.

The Dean invited Professor Peter Pauly to speak to Council. Professor Pauly noted that the proposal was purely a technical matter which would not substantially change the program but would just make its delivery more flexible.

The Dean called on Vice-Dean Smyth to present the motion.

**MOTION (duly moved and seconded)**

**THAT** Graduate Education Council approve the proposal of the Rotman School of Management to change the requirements of the Management program, Global Executive Master of Business Administration (GEMBA) (MBA degree) option, to extend the program length from 16 to 18 months and remove the list of specific international locations to allow for more flexibility, effective May 1, 2009.

A member inquired whether there would be any increase in the program’s fees. Professor Pauly answered in the negative.

As there was no further discussion, the Dean called the question.

The motion was **CARRIED**.

9.5  **Music, MMus**

The proposal was approved by the Faculty Council on April 28, 2009. The original required course (MUS 4620Y) is no longer offered. GEC approval is final. It will be sent for information to the Academic Policy and Programs Committee of Academic Board in SGS’s annual report.

The Dean invited Professor Gillian MacKay to speak to Council. Professor MacKay explained that the proposal was simply a housekeeping change, eliminating one course that was a more general course and replacing with a course specific to opera.

The Dean called on Vice-Dean Smyth to present the motion. The Vice-Dean noted that a minor change to the motion from what was distributed with the agenda was necessary. The name of the program should read Music Performance (as Master of Music is the name of the degree). No revised motion sheet was distributed since there were no substantive changes. Vice-Dean Smyth read the revised motion aloud to Council as follows:

**REVISED MOTION (duly moved and seconded)**

**THAT** Graduate Education Council approve the proposal of the Faculty of Music to change the program requirements of the Master of Music (MMus) degree in the Music Performance program (Opera field only) by replacing the required course MUS 4620Y with the required course MUS 4513Y “Operatic Repertory Studies”, without altering the overall number of required courses. This change is effective retroactive to September 1, 2009.

Seeing no discussion, the Dean called the question.

The motion was **CARRIED**.
9.6  Collaborative master’s and doctoral program in Neuroscience

The proposal was approved by the Program Committee on July 17, 2009. It was subsequently approved by the Faculty of Medicine Graduate Curriculum Committee on October 15, 2009; a summary of discussion at the meeting is on the motion sheet distributed with the agenda. GEC approval is final. It will be sent for information to the Academic Policy and Programs Committee of Academic Board in SGS’s annual report.

The Dean expressed regret at the absence of Professor David Hampson. The Dean called on Vice-Dean Smyth to present the motion.

**MOTION (duly moved and seconded)**

**THAT** Graduate Education Council approve the proposal of the Faculty of Medicine to change the program requirements of the Collaborative Master’s and Doctoral Program in Neuroscience as follows:

- for the master’s and doctoral levels, make explicit the attendance requirements for the University of Toronto Neuroscience Program Distinguished Lecture Series (1 year in consecutive sessions for the master’s level, and 3 years consecutively for the doctoral level).
- increase the number of poster days at which doctoral-level students must present from one to two.
- make the changes effective September 1, 2010.

No substantive discussion arose; the Dean called the question.

The motion was CARRIED.

9.7  Pharmaceutical Sciences, MSc, PhD

An updated motion sheet was distributed at the start of the meeting on blue paper. The update expanded the Prior Discussion section with more background information on the proposal and brings minor changes to the motion text. The proposal was previously approved by a Faculty Meeting which included faculty members as well as students. The change has been proposed retroactively to bring the Calendar into line with current practice; the changes already appear in the print version of the 2009-10 SGS Calendar with the notation “pending approval”. GEC approval is final. It will be sent for information to the Academic Policy and Programs Committee of Academic Board in SGS’s annual report.

The Dean invited Professor Reina Bendayan to speak to Council. Professor Bendayan explained that the proposal was intended to refine the requirements of presentations at research day. PhD students had been required to make two presentations. This requirement is being reduced to one oral presentation for students who have an MSc, and poster and presentation for direct entry students. The department could not accommodate so many students as there recently has been unprecedented graduate expansion – almost triple graduate enrolment. The Department has eliminated multiple research days and replaced them with group seminars within fields of study. The annual research day is being refined to make it more feasible and to provide more opportunities for students to present on a monthly basis.

The Dean called on Vice-Dean Smyth to present the motion.

**MOTION (duly moved and seconded)**

**THAT** Graduate Education Council approve the proposal of the Faculty of Pharmacy to change the Pharmaceutical Sciences program requirements as follows:
• for the part-time MSc, change the research presentation and Graduate Research in Progress (GRIP) attendance requirements so that all part-time M.Sc. requirements match those of the full-time MSc program.
• for the full-time MSc, eliminate the requirement for yearly attendance at Post-GRIP events, and change the timeline for oral presentation of students’ own research work from “within 12 – 24 months of beginning the program” to “after the first 12 months of registration in the program”.
• for the full-time PhD:
  • increase the normal time for coursework completion from two years to three years;
  • revise the requirement to attend Pharmaceutical Sciences departmental seminars so all students must attend a minimum of eight seminars in each academic year;
  • eliminate the requirement for students to give an oral research presentation of approximately 20-30 minutes every year after the first 12 months of registration in the program if a student presents at GRIP;
  • eliminate the requirement for yearly attendance at post-GRIP events;
  • revise the GRIP research presentation requirement so that:
    • students entering the program with an M.Sc. are only required to complete one oral presentation at GRIP, and
    • direct-entry PhD students are required to complete one oral and one poster presentation at GRIP;
  • for the flexible-time PhD, reduce the requirements compared to full-time PhD students, allowing flexible-time students to complete four departmental seminars each academic year instead of eight.
• make these changes effective retroactively to September 1, 2009.

A member asked why the department was reducing the seminar requirement for flexible-time option PhD students to four seminars from eight seminars for full-time PhD students. Professor Bendayan remarked that the flexible-time students are primarily based in industrial settings and as a result attend a number of seminars in those settings; they present a record of these at their annual advisory committee meetings. Therefore, these students would have the equivalent number of presentations, and often more.

A member asked what “Post-GRIP” was. Professor Bendayan explained that it is a half-day event held to accommodate all the students who could not present at GRIP. Part of the rationale for the current proposal was that it had become not feasible to have all graduate students and all faculty attend both GRIP and Post-GRIP.

A member asked whether the proposal was removing annual committee meetings. Professor Bendayan replied that there would still be annual advisory committee meetings, and that these were mandatory for all graduate students.

Seeing no further discussion, the Dean called the question.

The motion was CARRIED.

9.8 Political Science, MA

The proposal consists of a program requirement change affecting the Political Economy of International Development field (the third bullet of the motion only). This proposal was approved by the Faculty of Arts and Science Three-Campus Graduate Curriculum Committee on October 15, 2009; no substantive discussion arose at the meeting.
The other changes relate to Calendar text changes which were flagged in the SGS 2009-10 Calendar review process as requiring governance approval. These other changes had not yet been formally approved by the Faculty of Arts and Science. The changed text was incorporated in the 2009-10 Calendar, marked “pending final approval”. SGS proposed that GEC approve this motion pending approval by the Faculty of Arts and Science. Pending Faculty of Arts and Science approvals, GEC approval is final for changes to admission requirements and program requirements. They will be sent for information to the Academic Policy and Programs Committee of Academic Board in SGS’s annual report.

Professor Grace Skogstad sent her regrets; Ms. Carolynn Branton (Graduate Administrator) was present to answer questions.

The Dean called on Vice-Dean Smyth to present the motion.

**MOTION (duly moved and seconded)**

THAT Graduate Education Council approve the proposal of the Faculty of Arts and Science to change the program requirements of the MA in Political Science as follows:

- require students in the Political Science field to take at least 0.5 FCE in political theory, which can be either the 0.5 FCE offered by the department specifically for this purpose (POL 2040H) or any other theory course. Also required is at least 0.5 FCE in statistics or research design. Note that POL 2502Y, POL 2503H and POL 2504H are among the courses currently offered by the department which meet this requirement.

- require all students, except those who declare Political Theory as a field, or who are enrolled in collaborative programs with a similar requirement, to complete a full year research seminar course and its required assignment of a 30-50 page research major paper. Note that POL 2810Y and POL 2811Y are the two seminars currently offered which meet this requirement.

- among other requirements, students in the field of Political Economy of International Development (PEID) must currently take 1 FCE from either the political science or political economy course lists. Change this to require students to complete one of the MA Research Seminars, POL2810Y or POL2811Y, and make political economy the focus of their research paper. This does not change the overall FCE requirements.

- make these changes effective September 1, 2009.

A member noted that the proposal was intended to bring the Calendar text into line with existing practice at the department, but that it appeared the proposal was adding a requirement for a course. Vice-Dean Smyth replied that the requirement had been listed in the Calendar previously but had not had governance approval.

A member asked why the requirements for the Political Theory field were being added. Ms. Branton explained that this had to do with a new field which had been added to the program last year; at the same time that an older field had been removed. The requirements in question existed in the old field but due to an oversight had not been listed when introducing the new field.

A member asked whether it would be more desirable to wait for Faculty of Arts and Science approval for the entire proposal before GEC approving it. The Dean remarked that this did not appear to be a difficult proposal and that it had seemed desirable to expedite the proposal. Another member noted that it might set a precedent whereby a unit might list something in the Calendar without governance approval and then have it approved retroactively as a housekeeping measure. The Dean responded that this would be unwelcome if it were done deliberately, but this did not seem to be the case with the
proposal under discussion. Another member suggested withdrawing the motion until approved by the Faculty. The Dean agreed.

The motion was WITHDRAWN.

10 Other Business

There was no other business.

11 For Information:

11.1 Fall 2009 By-Election Committee Report and Updated GEC Membership
Following the last annual election, several seats remained vacant on Graduate Education Council. A by-election was held in fall 2009 which filled all the vacant seats. The report outlining the results was distributed with the agenda.

The Dean thanked Professor Jens-Erik Mai and Ms. Diana Choi, GEC members who served on the Elections Committee.

11.2 Graduate Academic Appeals Board of GEC: 2008-09 Annual Report
The Graduate Academic Appeals Board is a standing committee of Graduate Education Council which is empowered to deal with and decide upon all academic appeals by graduate students. The Board’s annual report to GEC was distributed with the agenda.

11.3 GEC Annual Report to AP&P 2008-09
Graduate Education Council (GEC) reports annually to the Academic Policy and Planning (AP&P) Committee of Academic Board on approved items where GEC approval is the final University approval. The report for 2008-09 was made at the September 15, 2009 AP&P meeting, and was distributed with the agenda of today’s meeting for information.

The Dean reminded members that the next meeting is scheduled for January 19, 2010.

Adjournment

The meeting adjourned at 4:25 pm.
Appendix to the Minutes

UNIVERSITY OF TORONTO
Record of Attendance
GRADUATE EDUCATION COUNCIL
November 17, 2009

Present (Voting & Non-voting Members)
Corman, Brian (Chair)
Bina, Bardia
Bondy, Susan
Campbell, Malcolm
Capotorto, Arianna
Damaren, Chris
Daniere, Anrira
De Nil, Luc
Gopaul, Bryan
Julian, Stephen
Keil, Charlie
Keith, Alison
Knight, Keith
Litvack, Andrea
Mai, Jens-Erik
Martin, Peter
Mount, Howard
Papangelakis, Vladimiros
Pauly, Peter
Piccin, David
Pirraglia, Daniela
Radmacher, Kimberly
Roach, Lisa
Smith, Berry
Smyth, Liz
St-Amour, Michelle
Stiles, David
Sztainbok, Iliana
Tannock, Rosemary
Williams, David
Wilson, Adele
Wong, Bernard
Young, Paul

In Attendance (Guests & SGS Staff)
Branch, Rodney
Bendayan, Reina
Branton, Carolyn
Godwin, Michael
Freeman, Jane
Haley, Lisa
Hampson, David
Howarth, Lynne
Hurlhey, Victoria
Kelly, Heather
Keilty, Krista
Kim, Christy
Knappett, Carl
MacKay, Gillian
Makarovska, Vesna
Rutchinski, Steve
Sakaki, Atsuko
Sarsyan, Hasmik
Wall, Shelley
Watt-Watson, Judy
Yee-Sloan, Lily

Absent
Campbell, Elizabeth
Johnston, Gregory
McKenzie, Christine
Moore, Carole
Stabile, Mark

Alderdice, Jane (Secretary to Council)
Purandaré, Anil (Assistant to Secretary)
MOTION
Graduate Education Council
Tuesday, January 19, 2010

ITEM 6

Proposal for the following new degree program:
Environmental Science, PhD
Department of Physical and Environmental Sciences, University of Toronto Scarborough (UTSC)

MOTION
THAT Graduate Education Council approve the proposal of the University of Toronto Scarborough for a graduate program leading to a Doctor of Philosophy (PhD) degree in Environmental Science, effective September 2010.

See attached documents:
- Governance Form E
- U of T Proposal Document
- Chief Librarian’s Report
- OCGS Brief, Vol. I
- Calendar Entry

Prior Approvals and Discussion

The proposal evolved out of extensive discussions undertaken within the Department, with the Director of the Centre for Environment, with other Departments at UTSC, and with the Faculties of Arts and Science and Applied Science and Engineering. This is detailed on the Governance Form E attached.

The proposal was approved by the UTSC Academic Committee on November 17, 2009, the UTSC Executive Committee on December 8, 2009, and the Faculty of Arts and Science Three-Campus Graduate Curriculum Committee on December 15, 2009. No substantive discussion arose at these meetings.

Further Governance

If approved by GEC, the proposal will be brought to the Academic Policy and Programs Committee, the Planning and Budget Committee, and the Academic Board of Governing Council for approval, and to Governing Council for final University of Toronto approval. The proposal will be submitted to OCGS for a standard appraisal.
Governance Form E:
New Program
2009-2010

Name of Proposed Graduate Program:
Doctor of Philosophy (Ph.D.) in Environmental Science

Faculty Affiliation:
University of Toronto Scarborough (UTSC)

Name of Graduate Unit involved, if any:
Department of Physical & Environmental Sciences (DPES)

Brief Summary of Proposal:
The natural physical, chemical and biological environment within which humans exist is under increasing stress generated by both man’s interference with the natural world, and the natural changes which inevitably occur in this dynamic world. Climate and all the natural environmental systems which depend upon it are now recognized to have a human-induced component of change which will dramatically affect existing environmental systems within human lifetimes, and a vast number of fundamental problems will need solutions in the short and medium term.

The proposed new graduate research program for the degree of Doctor of Philosophy (Ph.D.) in Environmental Science will build upon the extremely successful Master of Environmental Science Program (M.Env.Sc.), which has been in existence since January 2006 and, as of 2009, enrols 54 full-time and 20 part-time students. A significant number of these students wish to pursue doctoral research in a truly interdisciplinary mode, and it is appropriate that the University of Toronto provide such an opportunity. The program is designed to provide the advanced expertise required to search for scientific solutions to our growing environmental problems as it is only in understanding the interactions among the physical, chemical and biological systems of the world that solutions will be found. This demands scientists trained at the interface between traditional disciplines with a holistic view of environmental issues. UTSC already has a faculty committed to research and teaching at this interface, and is well-placed to contribute to the challenge of training highly qualified personnel in the discipline of environmental science.

The Ph.D. program will be extremely attractive to newly graduated M.Sc. students and also direct entry B.Sc., and BA.Sc. students with the requisite background. Students admitted to the program will require a minimum B+ average in a master’s degree in an appropriate discipline. Exceptional students may enter the program with a minimum A- average grade from a 4-year University of Toronto baccalaureate degree, or equivalent, in science or relevant post graduation experience as evidenced by a resume, a written statement outlining the applicant’s research objectives in applying to the program, and three letters of reference from the student’s academic advisors. Admission of students and administration of the program will lie solely in the hands of the Graduate Chair of DPES at UTSC in conjunction with a Graduate Program Committee.

The requirements for the degree of PhD in Environmental Science will consist of: (i) the completion of a total of 2.0 full course equivalent courses approved by the Graduate Program Committee; (ii) a mandatory Advanced
Environmental Seminar half-course (part of the 2.0 FCEs); and submission of a thesis documenting original scientific work in environmental science carried out under the supervision of graduate faculty members. This new Ph.D. program in Environmental Science will be the first of its kind within the University of Toronto and will be one of a relatively small number in Ontario and in Canada to highlight the value of research at the interface of traditional disciplines to solve fundamental environmental problems.

An initial enrolment in the new Ph.D. stream at UTSC of between five and ten students is expected, with increasing numbers as the program develops, as new faculty are brought on stream and as existing faculty include the graduate supervision of students in the new doctoral program. A steady state enrolment of about 40 students will be attained within the first seven years of program initiation.

Prior Approvals/Actions and Comments:

The decision to establish a Ph.D. program in Environmental Science in the Department of Physical & Environmental Sciences (DPES) developed as a natural response to the noteworthy success of the M.Env.Sc. program on the Scarborough campus. Extensive discussions were undertaken within the Department and at UTSC in a series of formal meetings from 2007 to 2009. Subsequent to this a detailed proposal for a Ph.D. in Environmental Science was prepared. This document evolved over several meetings of a large subset of faculty members within DPES and was widely circulated to interested individuals. These discussions produced a final document that was then forwarded to the Dean by the Chair of DPES. Coincident with all these discussions, the Director of the Centre for Environment was consulted and had been fully supportive of the curriculum and of the need to provide a doctoral program in Environmental Science to University of Toronto students.

Further discussions were held at the University decanal level and the proposal was considered in detail by the School of Graduate Studies. UTSC has established a new academic administrative position – of Vice-Dean, Graduate Education and Program Development – with the aim of establishing a formal office for focusing graduate training carried out at UTSC. Approval for the development of a full proposal was given at a meeting between the Vice-Dean, Graduate Education and Program Development at UTSC and the Dean and Vice-Dean Programs of the School of Graduate Studies. The Vice-Dean, Graduate Education and Program Development had discussions with the respective Deans or Chairs of all the relevant Faculties and Departments concerned with the environment at the University (the Faculty of Applied Science and Engineering – in particular the Departments of Chemical Engineering and Applied Chemistry and Civil Engineering; the Faculty of Arts and Science – in particular the Departments of Chemistry, Ecology and Evolutionary Biology, Geography, Geology; and the Faculty of Forestry). Members of many of these faculties/departments are part of the core faculty supporting this proposal.

In addition, extensive discussions with faculty in other departments at UTSC involved in environmental research, and with other faculty at the St. George and Mississauga campuses, were initiated in 2008 and have continued to the present. The proposal was widely circulated to all interested faculty, with an invitation for involvement; substantive comments were made and the document has evolved into the present proposal. A similar process was also followed for those research colleagues working in other local universities and in government research laboratories. Discussions with current graduate students and especially the graduating M.Env.Sc. students at UTSC have shown them to be fully supportive of this initiative.

Proposed Effective Date:

Month  September  Year  2010

Chair/Director Name and Contact Information:

Cormack, D, BASc, MASc, PhD, PEng
Full Professor & Chair, Department of Physical & Environmental Sciences, University of Toronto Scarborough
Faculty Dean Name and Contact Information:

Halpern, R, BA, MA, PhD
Full Professor, & Dean and Vice-Principal (Academic), University of Toronto Scarborough

Date:  November 27, 2009
UNIVERSITY OF TORONTO

Proposal for a

Ph.D. in Environmental Science

In

the Department of Physical & Environmental Sciences
University of Toronto Scarborough

December 17, 2009
TABLE OF CONTENTS

1 Executive Summary .................................................................................................................................................. 03

2 Academic ............................................................................................................................................................... 04
   2.1 Description and rationale for the proposal ........................................................................................................ 04
      2.1.1 Description of proposed program ................................................................................................................ 04
      2.1.2 Rationale for proposal .................................................................................................................................. 05
   2.2 Pedagogical and other academic objectives, including expected benefits of the proposed program .............................................................................................................................. 08
   2.3 Projected student demand ................................................................................................................................. 08
   2.4 Impact on the Department's and Division's program of study, including impact on other divisions, if any ........................................................................................................................................ 09
   2.5 Evidence of consultation with other affected divisions ....................................................................................... 10
   2.6 Appropriateness of the name and designation of the new program ...................................................................... 11
      2.7 Program description and requirements, course titles/numbers, faculty members ............................................. 11
         2.7.1 Program description and requirements ........................................................................................................ 11
         2.7.2 Course titles/numbers .................................................................................................................................. 13
         2.7.3 Faculty members ......................................................................................................................................... 16

3 Planning and Budget ............................................................................................................................................... 21
   3.1 Resource implications ........................................................................................................................................ 21
      3.1.1 Staffing ............................................................................................................................................................ 21
      3.1.2 Space ............................................................................................................................................................. 22
      3.1.3 Libraries ......................................................................................................................................................... 22
      3.1.4 Computing facilities ....................................................................................................................................... 22
      3.1.5 Enrolment/admissions .................................................................................................................................. 23
      3.1.6 Revenues/costs .............................................................................................................................................. 23
      3.1.7 Financial Aid .................................................................................................................................................. 24

4 Space and Facility ................................................................................................................................................... 24
   4.1 Requirements for physical facilities .................................................................................................................... 24
   4.2 Capital projects for approvals ............................................................................................................................. 24

5 Students .................................................................................................................................................................. 24
   5.1 Student affairs and services ................................................................................................................................. 24
   5.2 Student conduct and discipline ............................................................................................................................. 24
   5.3 Financial Support ............................................................................................................................................... 25
   5.4 Student registration and information systems .................................................................................................... 25

Appendix I: Canadian Graduate Programs in the Environment .................................................................................... 26
Appendix II: Budget Statement ........................................................................................................................................ 28
1 Executive Summary

Canada and the world currently face a number of significant and serious environmental challenges: thawing of vast areas of permafrost in the north, shrinking of the surface area of Arctic pack ice, changing water levels in rivers and lakes, the active retreat of many glaciers, risk associated with rising deforestation, and the remediation of abandoned mine and industrial sites. Unfortunately, our ability to find solutions to these challenges is increasingly constrained by a severe shortage of suitably qualified scientists who are trained in Environmental Science at the graduate level.

This proposal is for a new tri-campus graduate program to be housed in the Department of Physical & Environmental Sciences at the University of Toronto Scarborough (UTSC) leading to a degree of Ph.D. in Environmental Science.¹ This program will build directly on the Department’s undergraduate program in Environmental Science and Master’s level programs. The Department’s extremely successful Master of Environmental Science Program (M.Env.Sc.) was established in 2005 and currently has enrolments of 54 full-time and 20 part-time students². A significant number of these students now wish to pursue doctoral research in a truly interdisciplinary mode, and it is appropriate that the University of Toronto provide these, and other like-minded students, from across Canada and abroad, the opportunity to further their education at a higher level.

Academic:

The University of Toronto is recognized internationally for its disciplinary graduate programs focusing on scientific environmental issues. In particular, Environmental Chemistry in the graduate Department of Chemistry, the Environmental Engineering Collaborative graduate program, Environmental Geosciences in the graduate Department of Geology, Physical Geography and Natural Systems in the graduate Departments of Geography, and the Faculty of Forestry have all offered high quality Ph.D. programs in their disciplines for many years. In all likelihood, chemistry graduates wishing to pursue research in environmental interactions at the molecular level are expected to register in the graduate Department of Chemistry. Similarly, those students wishing to research the engineering needs and solutions to environmental problems (generally engineering graduates) will pursue their degrees through the Faculty of Applied Science and Engineering. Students focusing on environmental geosciences, including biogeochemistry, contaminant hydrogeology, oceanography and global climate change can still choose a Ph.D. program in Geology. Further, students pursuing graduate studies in forestry, forest-sciences and forest ecosystems are likely to enter the Faculty of Forestry. The proposed program will appeal to those students wishing to carry out research into environmental issues that involve an interdisciplinary approach, yet at a fundamental scientific level. Such students may have done an undergraduate degree in a subject area (e.g. Environmental Science) that may be deemed to have insufficient chemistry, engineering, geology or forestry content to be considered for admission to these other disciplines. Yet such students are well-suited to the interdisciplinary nature of the proposed program.

The main requirement for this Ph.D. will be the execution of an original piece of laboratory or field research in Environmental Science carried out under faculty supervision and presented in thesis form. To ensure students are aware of emerging issues not only in their own research field but also in closely allied fields, and to ensure the interdisciplinary nature of the program in Environmental Science, there will be a mandatory advanced seminar on environmental research. The program also requires a minimum of 1.5 full-course equivalent courses from an approved course list in the graduate program, bringing the full course load to 2.0 FCE.

¹ The Department of Physical & Environmental Sciences at UTSC will assume graduate responsibilities, the first department to do so at UTSC.
² Once the graduate Chair of the Department of Physical & Environmental Sciences has been established, the Master of Environmental Science will be moved from the Centre for Environment to the Department of Physical & Environmental Sciences so as to align its administrative and operational homes.
Planning and Budget:

The University of Toronto has a minimum level of funding for doctoral and doctoral-stream students ("funding commitment"). At present this funding stands at $21,914 per year for a maximum of 4 or 5 years (depending on the support provided for Master’s students). All students registered in the proposed Environmental Science Ph.D. program at UTSC will be funded at least at this minimum level; the funding package which will be included with the letter of offer, will be made up from a number of possible components: external scholarships (e.g. NSERC, OGS, etc.); departmental fellowships derived from BIU and tuition income; university scholarships; teaching assistantships; and research assistantships.

It is expected that students accepted into this program will be competitive on the provincial and national stage with respect to NSERC and OGS Scholarship funding. Faculty at UTSC already hold significant funds from research agencies and are committed to providing the Research Assistantships necessary to supplement student fellowship and scholarship money for their students. The Department of Physical & Environmental Sciences also has sufficient Teaching Assistantship funding available.

Space and Facilities:

Significant equipment pools already exist at UTSC that are associated with the M.Env.Sc. program and the research laboratories of the faculty – no further purchases are necessary to provide internationally “cutting edge” technologies for Ph.D. students to access; however, the Department of Physical & Environmental Sciences plans to continue augmenting its research equipment with new, state-of-the-art pieces, in an approved four year plan. There will be some demands on physical space in the short term, but plans are already in place to allow a significant space expansion in the near future to allow for the necessary growth of both faculty and students – e.g. a new $78 million Instructional Centre at UTSC began construction in the summer of 2009 with completion planned for 2011. This building is expected to increase the available space on campus by about 25%.

Students:

The initial enrolment in the proposed Ph.D. is expected to be between 5 and 10 students, with numbers continuing to increase as the program develops, as new faculty are brought on stream and as existing faculty focus their graduate supervision on students in the new doctoral program. A stable annual enrolment of between 20 and 25 students will be attained within the first 7 years.

2 Academic

2.1 Description and rationale for the proposal

2.1.1 Description of proposed program

This proposal is for a new tri-campus graduate program housed in the Department of Physical & Environmental Sciences (DPES) at UTSC leading to a degree of Ph.D. in Environmental Science. The Department will assume graduate responsibilities and a graduate Chair will be appointed. The expected start date is September 2010. This program will build directly on the Department’s undergraduate program in Environmental Science and Master’s level programs. The Department’s extremely successful Master of Environmental Science Program (M.Env.Sc.) was established in 2005 and currently has enrolments of 54 full-time and 20 part-time students. A significant number of these students now wish to pursue doctoral research in a truly interdisciplinary mode, and it is appropriate that the University of Toronto provide these, and other like-minded students, from across Canada and abroad, the opportunity to further their education at a higher level.

3 Once the graduate Chair of the Department of Physical & Environmental Sciences has been established, the Master of Environmental Science will be administratively transferred from the Centre for Environment to the Department of Physical & Environmental Sciences so as to align its administrative and operational homes.
The objective of the proposed Ph.D. program in Environmental Science is to prepare students for careers in teaching and research within universities and colleges, and also in government laboratories or private organizations where fundamental research on the environment is carried out. Graduates from this program will be expected to have acquired autonomy in conducting research, and in the preparation of scholarly publications. The Ph.D. program is designed to provide both a broad knowledge of current environmental research issues, especially those that exist at the interface between traditional disciplines, and specific training in the most appropriate research methodologies to tackle these scientific problems in the environment.

UTSC is ideally situated with respect to such a program as expertise in both research and training already exists in Environmental Science, and we have nationally and internationally recognized research facilities to which students have access. The addition of core faculty from other departments at UTSC, from other departments within the tri-campus system, as well as from the ranks of government scientists, will provide a program that will be unique. Ph.D. course work and research training may be carried out anywhere within the tri-campus system, although the core seminar course, ENV2200H, and the bulk of the other course offerings will be held at UTSC, and all students will have access to office space at UTSC. The main requirement for the Ph.D. is the execution of an original piece of laboratory or field research in Environmental Science carried out under faculty supervision and presented in thesis form. The program requires successful completion of a thesis proposal, a departmental thesis defense and a final thesis defense carried out under the auspices of the School of Graduate Studies involving examination by an appropriate at-arms-length examiner.

To ensure students are aware of emerging issues not only in their own research field but in closely allied fields, and to ensure the interdisciplinary nature of the program in Environmental Science, there will be a mandatory advanced seminar on environmental research. The program also requires a minimum of 1.5 full-course equivalent (FCE) courses from an approved course list in the graduate program, bringing the full course load to 2.0 FCE. The courses are required to provide the requisite background for the student’s research. Courses selected have to be approved by the departmental Program Director.

The areas of study that provide the primary focus for graduate training and research in the new program have emerged in part from the current M.Env.Sc. graduate program in the general field of “Biophysical Interactions in Aquatic and Terrestrial Systems” and are listed below:

- Contaminant flux through surface and subsurface environments and biogeochemical cycles
- Urban geosciences
- Remediation/restoration of degraded environmental systems
- The Great Lakes ecosystem
- Climate change and the environment
- Environmental science and transitional economies

Students admitted to the program will be required to have a strong background in the basic sciences (biology, chemistry, mathematics, physics), and a desire to do research at the interfaces between these disciplines. Students will be admitted with a completed M.Sc., M.Env.Sc., MA.Sc., etc., or, for exceptional students, they will be accepted as direct entry students with a B.Sc., BA.Sc., B.Eng., etc.

### 2.1.2 Rationale for proposal

Over the next several decades, the environment and its complexity will receive increasing attention locally, provincially, nationally and internationally. Many environmental problems are fundamental and cannot be solved using existing knowledge and methodologies. Furthermore, solutions to these problems may not necessarily be found within a single discipline; in fact, it is increasingly the norm that solutions are found at the interface between more traditional disciplines and interdisciplinary work. UTSC has been at the forefront of training students to work at this interface between disciplines ever since the formation of the undergraduate environmental science group in the early 1990s.
Canada took billions of years to form, hundreds of years to explore and decades to map, but within the last decade or so it has experienced the dramatic impacts of global change. These represent a major research frontier requiring a new generation of highly trained researchers using new and emerging technologies. Vast areas of permafrost are thawing across northern Canada, the surface area of Arctic pack ice has shrunk, water levels have changed in rivers and lakes, and many glaciers are in active retreat. At the same time timber, mineral and oil resources have been in increasing demand internationally requiring new approaches to environmentally-sustainable methods of extraction. Canada's resource based industries (particularly mineral and oil sands extraction) have expanded rapidly to meet world demand, and urban and industrial development has smothered entire watersheds under a built landscape. The remediation of abandoned mine and industrial sites is a major national priority. Effective management of Canadian forests remains crucial for minimizing forest ecosystem degradation while maintaining supply levels. Development in the far north has also accelerated with the search for new resources and for geopolitical reasons. The management of Canada's watersheds and lakes, and water resources in general, is a key priority.

Unfortunately, there are large gaps in our knowledge of the effects of environmental change, which has reduced our ability to manage their impacts and create effective policy. Our understanding of many natural processes is still incomplete, because we have had scant opportunity to study them over appropriate timeframes, and much of our existing knowledge has limited application to emerging issues. Filling these scientific gaps is necessary in order to create credible report cards on the state of our environment.

Canada's ability to meet these environmental challenges is constrained by a severe shortage of suitably qualified scientists trained at the graduate level in Environmental Science. The environmental sector is one of the world's fastest-growing industries - generating well over 120,000 new jobs in Canada in 2005, but ECO Canada's Environmental Labour Market (ELM) research in 2004 concluded that employers are facing a growing shortfall in the numbers of skilled people in this field – a shortage that is increasingly exacerbated by the retirements of the 'Baby Boom' generation. Industry and government are experiencing increasing difficulties hiring people who are appropriately trained in the application of a wide variety of environmental sciences to manage and remediate environmental problems, and there is an increased demand for suitably qualified instructors in colleges and universities. Our ability to cope with the environmental challenges of the future is dependent upon expanding the breadth of existing science teaching and particularly research programs in universities and government and private sector laboratories. This increasing demand for science-based environmental research cannot be met through existing Environmental Studies programs because, although there is a wide range of environmental programs across Canada, only programs in Environmental Science that are firmly rooted in the physical, chemical, biological and earth sciences can satisfy this demand. Furthermore, the environmental challenges we face need the contribution of individuals trained at the doctoral level, and at present there are relatively few dedicated doctoral programs in Environmental Science.

The UTSC proposal to establish a Ph.D. in Environmental Science supports the Federal Government's program aimed at environmental sustainability and the economic development that can flow from environmental research. In November 2006, the federal government released Advantage Canada, an economic plan to make Canada a world leader for current and future generations. Advantage Canada is based on the premise that Canada already has tremendous strengths — including the drive and ingenuity of our people, the relative strength of our fiscal position, and our strong research base. It also recognizes that Canada can do more to turn environmental research into innovations that provide solutions to environmental challenges and improve our economic competitiveness. This can only stem from research into the fundamental issues.

The science and technology (S&T) strategy — Mobilizing Science and Technology to Canada's Advantage — is the government's plan to achieve these goals. It sets out a comprehensive, multi-year science and technology agenda. The S&T initiatives announced in the Budget Plan 2007 demonstrate the government's commitment to take early action to implement this agenda. For Canadians to continue to

5 Visit: http://dsp-ped.pwgsc.gc.ca/Collection/F2-105-2006-3E.pdf
enjoy a high quality of life and standard of living, productivity and competitiveness must be improved through innovation. At the same time, economic activity must be sustainable over the long term. Clean air, land, and water are fundamental priorities. To succeed in an increasingly competitive global arena, Canadians must be at the leading edge of important developments that generate environmental benefits.

An aging population, combined with opportunities for Canadians to work anywhere in the world, challenge us to put in place the right conditions to attract, retain, and develop the talent and ingenuity that Canada needs. We believe that the Ph.D. program at UTSC will generate more interest among young people in pursuing advanced environmental careers, thereby encouraging a circle of talent generation and mobilization.

Canada’s federal government strategy focuses on research in areas that are in the national interest from a social and economic perspective. Special emphasis is given to:

- environmental science and technologies;
- natural resources and energy; and
- health and related life sciences and technologies.

Clearly all three are interrelated; the resource industry is a major user of environmental science research and technology, similarly the overall health of the environment is a strong determinant of human health, especially as our cities grow. The government is planning new investments in R&D ensuring that higher-education institutions have the leading-edge research equipment and facilities required to compete with the best in the world, and supporting domestic and international research and networks in areas of strategic importance to Canada. The objective is to increase the impact of federal investments, to leverage university and private sector strengths, to create better learning opportunities for students, and to foster research excellence.

Fundamental to all of the above is a steady supply of well-qualified practitioners of environmental science at the advanced graduate level. It is essential that we meet the environmental challenges of change by training a new generation of environmental scientists with advanced skills. Given the national strategic needs clearly identified by the Federal Government, we note significantly, that, at present, there are relatively very few dedicated graduate programs offering a Ph.D. in Environmental Science as a ‘stand alone’ degree. There are clearly opportunities for environmental research, but these are often linked through several departments. By far the largest numbers of environmental programs are in Environmental Studies, Geography and Natural Resources and these are often heavily biased towards the social sciences (see Appendix Ia). There are also a significant number (11) of environmental engineering programs (see Appendix Ib). However, the number of science-based Ph.D. degree programs in the environment is small (two in Environmental Biology – Appendix Ic; 1 in Environmental Health – Appendix Id; three in Environmental Chemistry and Toxicology – Appendix Ie; and four in Environmental Science - Appendix If). The proposed program differs from those listed in Appendix If in two fundamental ways. First, the program has a core faculty based in one department, whereas programs at McGill and Memorial are cobbled together with researchers within a faculty but belonging to different departments. The department-centric nature of this program, while not excluding the important participation from others, will provide a greater sense of coherency for students in the program and the development of a dynamic cohort. Second, other programs are smaller niche programs such as Trent (Watersheds) and RMC (Remediation) whereas the full range of Environmental Science is covered by the proposed program. The relatively large course load compared to other PhD programs in Environmental Science ensures that our students are provided a thorough foundation in the emerging discipline of Environmental Science, rather than a narrow aspect of it.

There is a clear need for a Ph.D. in Environmental Science to be offered at the University of Toronto, the most research intensive university in Canada.
2.2 Pedagogical and other academic issues, including expected benefits of the proposed program

There is a great deal of energy, enthusiasm and intellectual commitment within the Department of Physical & Environmental Sciences and across the three campuses to develop a Ph.D. in Environmental Science. This is the first program at the University built around researchers and teachers with a wide range of traditional disciplinary backgrounds, but who focus on the areas of interface between the disciplines involved and on a number of specific program objectives. Members of the core faculty at UTSC are trained in a range of traditional disciplines (e.g. biology, chemistry, ecology, engineering, geography, geology, and physics) and have been brought together within a single department at UTSC, the Department of Physical & Environmental Sciences. The synergies that produced this unique proposal resulted from the interactions among faculty within one department and the realization that many significant environmental science problems could not be resolved within a single traditional discipline. The M.Env.Sc. program which currently resides in the Centre for Environment but operates on the UTSC Campus, was started specifically to take advantage of these synergies and a Ph.D. program is a logical progression in graduate education in environmental science at the University of Toronto.

We will follow a holistic approach to both teaching and research by integrating the physical, chemical and biological sciences with the geosciences in the study of natural and human environments. We believe this is a truly modern philosophy designed to meet worldwide concern with environmental quality in the new millennium.

Our aim is to train researchers in environmental science at the doctoral level, where students can develop theoretical and practical skills, and can be exposed to the very latest research technologies. Training will be achieved primarily through direct interaction between faculty and student, although each student will also undertake course work as part of his/her program and one core course will be mandatory for all students. Each student entering the program will already have mutually agreed upon a supervisor for his/her research; this research will result in a thesis, which will be a required element for graduation. The primary supervisor will direct the research program, but final responsibility for the student’s progress will rest with a core advisory committee (supervisor plus at least two other faculty members with expertise in the research area) that will ensure the interdisciplinary nature of the Ph.D. program. However, the student’s primary supervisor will chair the core advisory committee, which will meet at least annually to oversee the student’s progress.

2.3 Projected student demand

As discussed above, there is a clear need for highly qualified environmental scientists working as faculty in universities and colleges and universities, and also as researchers in government laboratories or private organizations where fundamental research on the environment is carried out. The Ph.D. program builds upon the extremely successful and popular Master of Environmental Science Program, which has been in existence since January 2006. A significant number of these students now wish to pursue doctoral research in a truly interdisciplinary mode. It is therefore appropriate that the University of Toronto provide such an opportunity for these students and other like-minded students from across Canada and abroad to further their education at a higher level.

The existing M.Env.Sc. program, which currently resides in the Centre for Environment but operates on the UTSC campus, has generated a large body of students from all regions of Canada, as well as a significant number of international students. The Ph.D. program will garner Master’s students from the same market base, but will also provide a higher level of research training for the best M.Env.Sc. students graduating from UTSC.

Students enrolled in the M.Env.Sc. program have two options: 1, the internship option, which is normally chosen by those who seek employment immediately following graduation; or 2, the research option, which is most appropriate for students intending to continue into a Ph.D. Those who have chosen to pursue the
research option, although the minority, have proven to be excellent research students, capable of doctorate-level work. Of the approximately 68 students who have already graduated from the program we are aware of at least seven students who have gone on to doctoral programs at the University of Toronto. These include three in Geography, and one each in Ecology & Evolutionary Biology, Geology, Civil Engineering and Chemical Engineering. Of these, three were awarded external scholarships from either NSERC or OGS. We expect a small but steady stream of our own students to continue to go on to do doctoral work in the proposed Ph.D. program. We also anticipate that some successful Masters students from the graduate Departments of Chemistry, Chemical Engineering, Ecology & Evolutionary Biology, Forestry, Geography and Geology may find our program of interest. We also fully anticipate that students from other universities will find the Ph.D. program attractive and will choose to apply for admission to it.

The expected doctoral enrolment in the first year (2010-11) is a total of 5 students. This rather modest number will ensure that only the very best students are admitted; it must also be remembered that all the core faculty currently have both masters and doctoral students through their cross-appointments to other units. However, as more faculty are hired, and as the core faculty accept more students in the Environmental Science program, the number of Ph.D. enrolments will increase. The projected enrolment at the end of the initial spin-up phase is an annual intake of 10 students for a steady state enrollment of 40 students in the funded cohort. It is clearly important to assess the number and quality of graduating students and their careers, before further expansion is considered.

Table 1 below illustrates the projected intake of students and the overall enrollments in the proposed Ph.D. program and the continuing M.Env.Sc. program at UTSC.

2.4 Impact on the Department's and Division's program of study, including impact on other divisions

The proposed Ph.D. in Environmental Science has the full support of the Department of Physical & Environmental Sciences, and the program is one of the key initiatives put forth by the Department in its academic plan.

The University of Toronto is recognized internationally for its disciplinary undergraduate and graduate programs focusing on scientific environmental issues. In particular, Environmental Chemistry in the graduate Department of Chemistry, the Environmental Engineering Collaborative graduate program, Environmental Geosciences in the graduate Department of Geology, Physical Geography and Natural Systems in the graduate Departments of Geography, and the Faculty of Forestry have offered high quality
Ph.D. programs in their disciplines for many years. In all likelihood, chemistry graduates wishing to pursue research in environmental interactions at the molecular level are expected to register in the graduate Department of Chemistry. Similarly, those students wishing to research the engineering needs and solutions to environmental problems (generally engineering graduates) will pursue their degrees through an engineering graduate department. Students focusing on environmental geosciences, including biogeochemistry, contaminant hydrogeology, oceanography and global climate change can still choose a Ph.D. program in Geology. Further, students pursuing graduate studies in forestry, forest-sciences and forest ecosystems are likely to enter the Faculty of Forestry. The program proposed in this document will appeal to those students wishing to carry out research into environmental issues that involve an interdisciplinary approach, yet at a fundamental scientific level. Such students may have done an undergraduate degree in a subject area (e.g. Environmental Science) that may be deemed to have insufficient chemistry, engineering, geology or forestry content to be considered for admission to these other disciplines. Yet such students are well-suited to the interdisciplinary nature of the proposed program.

The Centre for Environment has been a major player in promoting cross-disciplinary collaborative programs particularly at the Masters’ degree level; indeed, the M.Env.Sc. program operating on the UTSC campus currently reports through the Centre. However, while a number of collaborative graduate programs already exist through the centre, there is no Ph.D. program committed explicitly to the training of graduates at the interface among disciplines.

The University of Toronto, including UTSC, has an impressive international reputation for research and training of highly qualified personnel in all the basic sciences. The introduction of a Ph.D. degree in Environmental Science at UTSC as a distinct and separate graduate program will enhance the profile both of UTSC and the University as a whole, and accords well with the tri-campus responsibilities of UTSC.

2.5 Evidence of consultation with other affected divisions

The decision to establish a Ph.D. program in Environmental Science in the Department of Physical & Environmental Sciences (DPES) developed as a natural response to the noteworthy success of the M.Env.Sc. program on the Scarborough campus. Extensive discussions were undertaken within the Department and at UTSC in a series of formal meetings from 2007 to 2009. Subsequent to this a detailed proposal for a Ph.D. in Environmental Science was prepared. This document evolved over several meetings of a large subset of faculty members within DPES and was widely circulated to interested individuals. These discussions produced a final document that was then forwarded to the Dean by the Chair of DPES. Coincident with all these discussions, the Director of the Centre for Environment was consulted and had been fully supportive of the curriculum and of the need to provide a doctoral program in Environmental Science to University of Toronto students.

Further discussions were held at the University decanal level and the proposal was considered in detail by the School of Graduate Studies. UTSC has established a new academic administrative position – of Vice-Dean, Graduate Education and Program Development – with the aim of establishing a formal office for focusing graduate training carried out at UTSC. Approval for the development of a full proposal was given at a meeting between the Vice-Dean, Graduate Education and Program Development at UTSC and the Dean and Vice-Dean Programs of the School of Graduate Studies. The Vice-Dean, Graduate Education and Program Development had discussions with the respective Deans or Chairs of all the relevant Faculties and Departments concerned with the environment at the University (the Faculty of Applied Science and Engineering – in particular the Departments of Chemical Engineering and Applied Chemistry and Civil Engineering; the Faculty of Arts and Science – in particular the Departments of Chemistry, Ecology and Evolutionary Biology, Geography, Geology; and the Faculty of Forestry). Members of many of these faculties/departments are part of the core faculty supporting this proposal.

In addition, extensive discussions with faculty in other departments at UTSC involved in environmental research, and with other faculty at the St. George and Mississauga campuses, were initiated in 2008 and have continued to the present. The proposal was widely circulated to all interested faculty, with an invitation for involvement; substantive comments were made and the document has evolved into the
present proposal. A similar process was also followed for those research colleagues working in other local universities and in government research laboratories. Discussions with current graduate students and especially the graduating M.Env.Sc. students at UTSC have shown them to be fully supportive of this initiative.

2.6 Appropriateness of the name and designation of the new program

The new graduate program will be a Doctor of Philosophy (Ph.D.) in Environmental Science. The program is designed to build directly on the existing undergraduate program in Environmental Science and the Master of Environmental Science degree (M.Env.Sc.), which currently resides in the Centre for the Environment, but operates on the UTSC campus. The Ph.D. designation signifies the depth of understanding that will be gained by students in this program and the expectation that graduates will become the leaders in this field both in Canada and around the world.

2.7 Program description and requirements, course titles/numbers, and faculty members

2.7.1 Program description and requirements

Admission Requirements

- Students are accepted under the general regulations.
- Normally, the degree program is completed in four years.
- Students may be accepted into the Ph.D. program through one of three routes:
  1. Following completion of the M.Env.Sc., M.Sc. degree in environmental sciences or a related discipline or M.A.Sc. degree in environmental engineering or a related discipline, or equivalent from a recognized university with a minimum of B+ average in all work completed in the master’s program;
  2. By requesting transfer from a suitable master’s program (see above): students may reclassify from the master’s program after 12 months of full-time study;
  3. In the case of exceptional students, by direct entry, that is, after completing an honours B.Sc. degree in a bachelor’s program in a related discipline with a minimum U of T average of A- or equivalent.

Program requirements

Degree Requirements

The degree requirements consist of successful completion of: coursework, a thesis proposal, and a thesis. The degree program has been designed so that it can be completed within four years for students who have completed a related master’s degree.

- Students transferring from the master’s program are expected to complete the Ph.D. program within five years from the start of enrolment in the M.Sc. program.
- Direct-entry students from a bachelor’s program are expected to complete the Ph.D. program within five years.

Thesis proposal and thesis requirement:

- Students are required to prepare and defend a thesis as per the regulations of the School of Graduate Studies (see http://www.sgs.utoronto.ca/current/thesis/index.asp).
- All Ph.D. program requirements must be completed within six years from first enrolment.

Course requirements

1. To ensure students are aware of research in their own research field and in closely allied fields, and also to ensure the interdisciplinary nature of the program in Environmental Science, course ENV 2200 H Advanced Seminar on Environmental Research is mandatory.
2. Each student must also successfully complete a minimum of 1.5 full-course equivalent (FCE) courses from an approved course list in the graduate program, bringing the full course load to 2.0 FCE. The courses are required to provide background relevant to the student's research. Courses selected have to be approved by the Program Director.

3. During admission, students' preparedness will be assessed, and where it is deemed insufficient, students will be required to take additional courses. It is expected that graduates of the M.Env.Sc. research stream, or other graduate programs listed in page 11 above, normally will have sufficient background at the time of admission.

Research Proposal
Program students are required to submit a detailed Research (Thesis) Proposal to their supervisory committee. The committee will advise the student on the acceptability of the proposal and will decide on any further steps to be taken in shaping the thesis research project. The Research Proposal should be presented at the beginning of the first term in Year II.

Thesis requirements
The candidate shall present a thesis embodying the results of original investigation, conducted by the candidate, on the approved topic from the field of specialization. The thesis shall constitute a significant contribution to the knowledge of the field and must be based on research conducted while registered for the Ph.D. program.

A thesis should have a coherent topic with an introduction presenting the general theme of the research and a conclusion summarizing and integrating the major findings. Nonetheless, it may contain a collection of three or more papers where the candidate is the primary author. The collection of papers may be expanded or supplemented by unpublished material, scholarly notes, and necessary appendices.

The SGS Calendar sets out criteria for “good academic standing” and “satisfactory academic progress”. The Program Director will apply these criteria in the evaluation of a student’s progress.

Progress through the Ph.D. Program for students admitted with a master’s degree:
- Year I: Complete course work
- Year II: Complete and defend thesis proposal/Start thesis research
- Year III: Research and thesis writing
- Year IV: Thesis writing and defense

Progress reports
Review meetings must be held in May of each year in the Ph.D. student's program. The Review Committees (normally the Supervisory Committee) must consist of at least three faculty from the graduate Department. The Ph.D. student must be present at the meetings. For the Review Meetings in Years II, III, and IV, the Ph.D. student must submit a Progress Report of between two to five pages. The Progress Reports can be accompanied by materials such as draft questionnaires, initial tabulations and analysis results, or draft thesis chapters. (For further details see the SGS Calendar).

Thesis evaluation procedures
Students will participate in two thesis defenses. For the Departmental Thesis Defense, the examination committee will consist of at least four faculty members (normally including the members of the Supervisory Committee). One or more members can be from outside the Department. The committee will notify the Program Director that the thesis is ready to be forwarded to SGS for the final oral examination (FOE).

Language requirements
There will be no language requirements for the Ph.D. program other than those specified by the candidate’s Ph.D. Committee. The Committee may require proficiency in a language other than English in cases where the thesis research is in a country where English is not the mother tongue.
2.7.2 Course titles/numbers\textsuperscript{6}

**ENV1102H** Analytical Chemistry for Geoscientists  
This course will familiarize students with a working knowledge of analytical chemistry and modern instrumentation and the common laboratory method used in the analysis of contaminants and ions in environmental media. Students will be introduced to a number of instruments and techniques and the method used to analyze soils, air and water.

**ENV1103H** Air and Water Quality Sampling and Monitoring  
This course will focus on the measurement of atmospheric contaminant fluxes, including dry and wet atmospheric deposition rates and gas fluxes (e.g. NOX, CO2) and from the surface. It will also consider the sampling of chemical storages and fluxes in the aqueous phase in soil, snow and snowmelt, stream flow and groundwater. Problems of sampling including spatial and temporal variability and process (pathway) uncertainty will be examined.

**ENV1104H** Methods for the Detection of Pathogens  
This course is focused on biological contaminants in the environment such as E. coli, Giardia, Cryptosporidium in public water supplies. Population pressure combined with a changing climate is increasing the range of Vibrio chlorae world wide, and the expansion of viruses such as West Nile. The ability to control these serious problems depends on our ability to detect these pathogens and to track their movements. This course will introduce students to the biology of the life history of these organisms, and will educate them in the state of the methods of high sensitivity detection.

**ENV1105H** Soil Contamination Chemistry  
This course will present fundamental chemical concepts and reactions that occur in soils with emphasis on contaminant behavior. The basics of soil chemistry will be introduced and the processes that relate to: quantities, attenuation, sequestration, and movement of ions, heavy metals, and organic molecules in terrestrial environments will be addressed in detail. Students will become familiar with geochemical computer models and these models will be used to predict the behavior of ions in soil. Soil chemical characteristics, which can be used to predict the fate of contaminants in terrestrial environments, will also be presented.

**ENV1106H** Geology and Geophysics of the Shallow Subsurface  
This course provides an overview of the principal geophysical techniques; emphasis will be placed on their use in understanding site conditions in glaciated terrains such as in Canada. Contaminants move through subsurface and surface environments along pathways controlled by geologic conditions and by surface processes. Identifying these complex pathways is fundamental to environmental assessments of contaminated sites and their remediation and in turn, is reliant on a good understanding of the local sedimentology and stratigraphy. In places, this can be gained by direct sampling or drilling but in most cases requires the application of geophysical techniques such as radar, on-land and marine seismic and down-hole logging.

**ENV1107H** Remediation Methods  
This course will examine the principal methods currently in use for remediating contaminated soils and waters. Emphasis will be placed on reviewing the advantages and limitations and site-specific applicability of remediation techniques and technologies.

\textsuperscript{6} Many of the courses listed below are also offered in the M.Env.Sc. program. The teaching capacity of these courses is sufficient to accommodate any students from the Ph.D. in Environmental Science wishing to enroll in them. We anticipate that on average it would mean an increase in enrolment of approximately 1-2 students per course. At present these courses range in enrolment from about 10 to 30. We anticipate new faculty and other planned hires will increase the number of graduate courses offered.

The M.Env.Sc. courses listed for the Ph.D. program are academic courses offered by our core faculty. Regularly doctoral stream students from the graduate Departments of Chemistry, Ecology & Evolutionary Biology, Geography have taken these courses for credit in its graduate programs.
ENV1109H  Advanced Techniques in Geographic Information Systems
This course covers an advanced set of techniques and applications of GIS, including a substantial practical component. Technical issues (including data format and conversion, geo-referencing, spatial indexing and terrain analysis), application/spatial modeling (including watershed analysis, land use classification, soil erosion modeling, etc) as well as visualization and incorporation of spatial data and analysis into decision support systems will be examined. Underlying programming techniques will be reviewed and extended on a student-project basis.

ENV1110H  Sediment and Contaminant Transport in Aquatic Systems
This course examines contaminant transport in water bodies such as rivers and the Great Lakes using numerical modeling and other techniques. Physical methods for determining mass circulation in response to wind and water temperatures at different times of the year will be examined; case studies will be reviewed.

ENV1111H  Freshwater Ecology and Biomonitoring
Freshwater environments support diverse communities of plants and animals that are controlled by both biotic and abiotic factors. Organisms respond to changes in the habitat through detectable shifts in population abundances and the loss/gain of species. Monitoring such biological changes in freshwater communities is an established protocol for assessing the condition of rivers, lakes and ponds subject to human influence. This new course will have a large practical component in which students will have the opportunity to learn the skills necessary to evaluate the condition of aquatic environments variously affected by urbanization.

ENV1112H  Boundary Layer Climates and Contaminant Fate
This course examines the dynamics and radiation physics of the atmospheric planetary boundary layers. Topics include the formation of a planetary boundary layer, vertical stability, temperature inversions, diurnal and seasonal variations and impacts of local and regional scale circulation. With this foundation the dispersion of airborne pollutants will be studied. The course will conclude with modeling of airborne pollutants and case studies.

ENV1113H  Groundwater Hydrochemistry and Contaminant Transport
This course focuses on groundwater contamination and the various methods used to investigate, assess and evaluate the movement and behavior of contaminants in the subsurface. Emphasis will be on urban groundwater issues with case study examples taken from North America, Europe, central Asia and Africa.

ENV1117H  Climate Change Impact Assessment
The study and consideration of climate change is of increasing significance to society. This course will review the evidence for climate change over the past 150 years using both direct measurements and proxy data. Projection of future climate change will also be considered by modeling. Students will complete a major case study and research paper.

ENV1118H  Fundamentals of Ecological Modelling
This course provides an introduction to the rapidly growing field of ecological and environmental modelling. Students will become familiar with most of the basic equations used to represent ecological processes. The course will also provide a comprehensive overview of the population and dynamic biogeochemical models; prey-predator, resource competition and eutrophication models will be used as illustrations. Emphasis will be placed on the rational model development, objective model evaluation and validation, extraction of the optimal complexity from complicated/intertwined ecological processes, explicit acknowledgment of the uncertainty in ecological forecasting and its implications for environmental management.

ENV1119H  Quantitative Environmental Analysis
This course provides an introduction to the field of ecological statistics. Students will become familiar with several methods of statistical analysis of categorical and multivariate environmental data. The course will provide a comprehensive presentation of the methods: analysis of variance, regression analysis, structural equation modeling, ordination (principal component & factor analysis) and classification (cluster &
discriminant analysis) methods, and basic concepts of Bayesian analysis. Emphasis will be placed on how these methods can be used to identify significant cause-effect relationships, detect spatiotemporal trends, and assist environment management by elucidating ecological patterns (e.g., classification of aquatic ecosystems based on their trophic status, assessment of climate variability signature on ecological time series, landscape analysis). The course will consist of 2 hr-lectures/tutorials where the students will be introduced to the basic concepts of the statistical methods and 2-hr lab exercises where the students will have the opportunity to get hands-on experience in statistical analysis of environmental data.

**ENV1120H** The Dynamics of Contaminant Dispersal in Fluids
This course will introduce the mechanisms of contaminant transport in lakes and the coastal ocean. The emphasis will be on a practical understanding of different dispersion regimes from point and distributed pollution sources. Students will learn to use the basic equations that model these processes and understand how these equations are used in water quality models. Students will also be introduced to field measurement techniques and learn to compare field data with model data. Among the subjects to be discussed are the dispersion of pollutants in lakes, rivers and the coastal zone, mixing in stratified estuaries and the dynamics of the seasonal thermocline.

**ENV1121H** Modelling the Fate of Organic Chemicals in the Environment
This course will give an introduction to quantitative approaches to describing the behaviour of organic chemicals in the environment. Building upon a quantitative treatment of equilibrium partitioning and kinetically controlled transfer processes of organic compounds between gaseous, liquid and solid phases of environmental significance, it will be shown how to build, use, and evaluate simulation models of organic chemical fate in the environment. The course will provide hands on experience with a variety of such models.

**ENV1122H** Global Environmental Security and Sustainable Development
The major objectives of ENV 1122H are to: 1) discuss major environmental challenges the planet earth is now facing and 2) examine how human interventions are deteriorating global environment and that affecting sustainable development; 3) analyse major environmental initiatives which include: the Stockholm Conference on Human Development, The Brundtland Commission Report, the Rio Earth Summit, the Johannesburg World Summit on Sustainable development, Montreal Protocol on Ozone Depletion, Kyoto Protocol and other global conventions, protocols and processes and their usefulness: 4) discuss extensive north-south cooperation in facilitating global environmental security and sustainable development.

**ENV1126H (new)** Environmental Tracers
This course focuses on the use of various isotope and chemical tracers for furthering our understanding of complex environmental problems, ranging from the characterization of freshwater resources to contaminant transport in aquatic systems. Particular focus will be placed on how chemical and isotope tracer studies can be coupled with physical measurements to understand complex problems in hydrology, biogeochemistry, and contaminant transport. This course will cover fundamentals of environmental tracer chemistry through to recent case studies, advanced models and applications.

**ENV2200H (new)** Advanced Seminar in Environmental Science
This course is designed to introduce doctoral students to the major issues in research in environmental science. It will also expose students to the diverse fields of research expertise within the core faculty of the Ph.D. program in Environmental Science. Students will be expected to contribute one seminar paper in their own field of interest. The class will meet weekly throughout the fall and winter and will act as a focus group for the Ph.D. program. The course is restricted to those students enrolled in the PhD in Environmental Science program.

**ENV2201H (new)** Advanced Readings in Environmental Science
Students may follow a structured independent readings course in any sub-discipline of Environmental Science. A faculty member will supervise the student and a short description of the objectives, scope and procedures for evaluation for the course must be approved by both the faculty member and Program Director. Students need the approval of the Program Director of the Ph.D. in Environmental Science to
register in this course.

The 1000 series courses listed above are currently available for credit in the M.Env.Sc. program. The purely professional courses taught by specialists from outside the core faculty in Program II of the M.Env.Sc. program are not included in this list and will not be eligible for credit towards the Ph.D. degree.

There are also a number of Ph.D. level courses taught by core faculty both within the department and outside the Department of Physical & Environmental Sciences that can be considered for the Ph.D. degree. For example:

- ENV1001H Environmental Decision Making
- ENV1002H Environmental Policy
- ENV1004H Urban Sustainability and Ecological Technology
- ENV1703H Water Resources Management
- ENV4002H Environment and Health of Vulnerable Populations
- GGR1203H Coastal Hydrodynamics, Sediment Mechanics and Morphodynamics
- GGR1214H Global Ecology and Biogeochemical Cycles
- GLG1450H Contaminant Fate and Transport in Subsurface Environments
- GLG2303H Earth System Evolution
- GLG2704H Isotope Geochemistry
- JGE1212H Fate of Contaminants in the Environment

Students may apply to take one of these half courses as part of their 1.5 FCE credits for the degree; however, all courses for PhD degree credit must be approved by the Program Director.

Note: ENV for Centre for Environment; GGR stands for Geography; and GLG stand for Geology.

2.7.3 Faculty members

Table 2 below, lists the 42 core faculty members (and their major fields of study) that are to be involved in the supervision of students and/or teaching of graduate courses in the proposed Ph.D. program in Environmental Science. Included are both faculty whose primary appointment is in the Department of Physical & Environmental Sciences (DPES), and faculty from the other two campuses within the Toronto system (St. George & UTM). This proposed Ph.D. program is therefore a fully “tri-campus” program, but with a home base at UTSC. Drawing on the wealth of professional expertise in the field of environmental science, a number of individuals will be appointed as Adjunct Faculty members. Table 2 lists their qualifications, existing cross-appointments to other graduate departments and institutions and gender.

There are a total of 18 Full Professors, 8 Associate Professors, 8 Assistant Professors, 7 Adjunct Faculty members who are Research Scientists, and 1 Professor Emeritus associated with the program. It is also worth noting that the core faculty includes four Tier 1 Canada Research Chairs (Dr. J. Chen, Chair of Remote Sensing of Terrestrial Ecosystems; Dr. D. Holdway, Chair of Aquatic Toxicology; Dr. H. Kronzucker, Chair of Metabolic Bioengineering of Crop Plants; and Dr. B. Sherwood Lollar, Chair of Isotopes of the Earth and Environment).

Furthermore, many core faculty are either holders of endowed chairs, directors of important laboratory facilities, holders of important research administrative positions at the University, or holders of positions with important scientific organizations both nationally and internationally (Dr. B. Branfireun, Dr. D. Cormack, Dr. M. Diamond, Dr. J. Donaldson, Dr. G. Evans, Dr. W. Gough, Dr. A. Miall, Dr. B. Sherwood Lollar, Dr. A. Simpson). The core faculty also hold important scientific editorial positions in international scientific journals dealing with the environment. This is an impressive list of individual researchers, who have published extensively in international refereed journals, and who have significant experience in graduate training and research.
The Environmental Science faculty in the Department of Physical & Environmental Sciences at UTSC is in a strong position to lead this proposed Ph.D. program at the University of Toronto, as this group already offers both undergraduate and masters programs in Environmental Science. Further, DPES faculty already support undergraduate and graduate teaching and research in the focus areas of the Ph.D. program, namely: contaminant flux through surface and subsurface environments and biogeochemical cycles; urban geoscience; remediation and restoration of degraded environmental systems; Great Lakes ecosystems; climate change and the environment; and environmental science in transitional economies. It should be noted that UTSC has had a long-standing educational interest in “transitional economies”, with a well-established undergraduate program in International Development Studies. A doctoral degree focusing, in part, on the environment and development is therefore a natural fit. At UTSC there is expertise in such diverse areas as geochemistry, biochemistry, hydrology, hydrogeology, aquatic ecology, atmospheric physics and chemistry, climatology, surface processes including atmospheric and lacustrine processes, sedimentology, soil science, stratigraphy, geophysics, geomorphology, etc. These fields are all essential building blocks for advanced graduate training in a truly interdisciplinary practice of environmental science. The foci of the graduate program will be strengthened by the addition of like-minded faculty from other campuses within the University of Toronto system, as well as researchers from other universities and government research laboratories.

The core faculty listed in Table 2 below has coalesced over several years, through shared research interests, joint research programs, shared research facilities and co-supervision of students within existing disciplinary programs. For example, Dr. F. Wania has collaborated extensively over several years with Dr. D. Muir, Environment Canada, Dr. T. Harner, Meteorological Service of Canada and Dr. T. Bidleman, Environment Canada. More recently Dr. M. Wells has collaborated with Dr. S. Bailey (DFO) and Dr. G. Arhonditsis has collaborated with Dr. R. Yerubandri (Environment Canada). Dr. W. Gough hosts a node of the Adaptations and Impacts Group of Environment Canada in his UTSC based Climate Lab providing an intellectual home for two Environment Canada scientists (Dr. M. Mirza, Dr. A. Fenech). Dr. M. Diamond has collaborated for many years with Dr. C. Marvin, L. Jantunen, S. Gagupatty, M. Aarts and others in Environment Canada, with Dr. P. Helm at the Ontario Ministry of the Environment, and with Dr. A. Wheeler at Health Canada. Such joint research is especially important for the graduate students who are involved with large government laboratories as part of their graduate training at UTSC. The opportunities for future careers in government research are clearly enhanced through this continued contact with government scientists at the graduate level.

The core faculty at UTSC are closely linked to other important research centres both within the university (e.g. the Centre for Global Change – Dr. J. Abbatt, Dr. M. Diamond, Dr. J. Donaldson, Dr. W. Gough, Dr. F. Wania, Dr. M. Wells, etc.), locally at other universities (e.g. Watershed Ecosystem Program at Trent – Dr. F. Wania, etc.) and nationally (e.g., CRESTtech at Waterloo; e.g. Dr. K. Howard, Dr. R. Fulthorpe, etc.). In addition, DPES faculty work closely with government research agencies such as the Federal Department of the Environment (e.g. Dr. G. Arhonditsis, Dr. W. Gough, Dr. F. Wania, etc.), the Federal Department of Fisheries and Oceans (e.g. Dr. M. Wells, etc.), the Ontario Ministry of Natural Resources, the Ontario Ministry of the Environment (e.g. Dr. M. Diamond), and area municipalities (e.g. Dr. N. Eyles; Dr. W. Gough, Dr. K. Howard). The adjunct appointments that have already occurred (e.g. Dr. A. Fenech, Dr. M. Mirza) and those that are proposed (Dr. T. Bidleman, Dr. S. Bailey, Dr. T. Harner, Dr. D. Muir and Dr. R. Yerubandri) have all emerged as part of past joint research with faculty in DPES.
TABLE 2: Core faculty members designated by rank, gender, home unit, supervisory privileges and fields of focus

<table>
<thead>
<tr>
<th>Faculty Name &amp; Rank</th>
<th>M/F</th>
<th>Home Unit 1</th>
<th>Supervisory Privileges 2</th>
<th>Fields</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 2 3 4 5 6</td>
<td></td>
</tr>
<tr>
<td>Category 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arhonditsis, G</td>
<td>M</td>
<td>DPES - UTSC</td>
<td>Full</td>
<td>x x x x</td>
</tr>
<tr>
<td>Assistant Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cormack, D</td>
<td>M</td>
<td>DPES - UTSC</td>
<td>Full</td>
<td>x</td>
</tr>
<tr>
<td>Full Professor &amp; Chair, Department of Physical &amp; Environmental Sciences</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dittrich, M</td>
<td>F</td>
<td>DPES - UTSC</td>
<td>Full</td>
<td>x x x x</td>
</tr>
<tr>
<td>Assistant Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Donaldson, J</td>
<td>M</td>
<td>DPES – UTSC</td>
<td>Full</td>
<td>x x</td>
</tr>
<tr>
<td>Full Professor &amp; Associate Chair, Graduate Studies (Chemistry)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eyles, N</td>
<td>M</td>
<td>DPES - UTSC</td>
<td>Full</td>
<td>x x x x</td>
</tr>
<tr>
<td>Full Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fulthorpe, R</td>
<td>F</td>
<td>DPES - UTSC</td>
<td>Full</td>
<td>x x x x</td>
</tr>
<tr>
<td>Associate Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gough, W</td>
<td>M</td>
<td>DPES - UTSC</td>
<td>Full</td>
<td>x x x x</td>
</tr>
<tr>
<td>Associate Professor &amp; Vice-Dean, Graduate Education &amp; Program Development, UTSC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Howard, K          | M   | DPES - UTSC | Full                     | x x x x x| x
<p>| Full Professor &amp; Vice-President, International Association of Hydrogeologists | |             |                          |        |
| Isaac, ME          | F   | DPES - UTSC | Associate                | x x x x|
| Assistant Professor|     |             |                          | x x    |
| Kerman, K          | M   | DPES - UTSC | Full                     | x x    |
| Assistant Professor|     |             |                          |        |
| Mitchell, C        | M   | DPES - UTSC | Full                     | x x    |
| Assistant Professor|     |             |                          |        |
| Simpson, A         | M   | DPES - UTSC | Full                     | x      |
| Associate Professor &amp; Director, Environmental NMR Centre (UTSC) | |             |                          |        |
| Simpson, M         | F   | DPES - UTSC | Full                     | x x x | x |
| Associate Professor &amp; Associate Director, Environmental NMR Centre at UTSC | |             |                          |        |
| Wania, F           | M   | DPES - UTSC | Full                     | x x x x|
| Full Professor     |     |             |                          |        |
| Wells, ME          | M   | DPES - UTSC | Full                     | x x    |
| Assistant Professor|     |             |                          |        |</p>
<table>
<thead>
<tr>
<th>Faculty Name &amp; Rank</th>
<th>M/ F</th>
<th>Home Unit</th>
<th>Supervisory Privileges</th>
<th>Fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbatt, JPD</td>
<td>M</td>
<td>Chemistry</td>
<td>Full</td>
<td>x x x</td>
</tr>
<tr>
<td>Full Professor &amp;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associate Director,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Centre for Global</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change Science</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Berquist, B</td>
<td>F</td>
<td>Geology</td>
<td>Full</td>
<td>x</td>
</tr>
<tr>
<td>Assistant Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boonstra, R</td>
<td>M</td>
<td>Biological Sciences - UTSC</td>
<td>Full</td>
<td>x x x</td>
</tr>
<tr>
<td>Full Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Branfireun, B</td>
<td>M</td>
<td>Geography - UTM</td>
<td>Full</td>
<td>x x</td>
</tr>
<tr>
<td>Associate Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&amp; Director, UTM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Programs in</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chen, JM</td>
<td>M</td>
<td>Geography</td>
<td>Full</td>
<td>x x x</td>
</tr>
<tr>
<td>Full Professor,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tier 1 Canada</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research Chair</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cowling, S</td>
<td>F</td>
<td>Geography</td>
<td>Full</td>
<td>x x x</td>
</tr>
<tr>
<td>Associate Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diamond, M</td>
<td>F</td>
<td>Geography</td>
<td>Full</td>
<td>x x x</td>
</tr>
<tr>
<td>Full Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edwards, E</td>
<td>F</td>
<td>Chemical Engineering &amp; Applied Chemistry</td>
<td>Full</td>
<td>x x</td>
</tr>
<tr>
<td>Full Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evans, G</td>
<td>M</td>
<td>Chemical Engineering &amp; Applied Chemistry</td>
<td>Full</td>
<td>x x x</td>
</tr>
<tr>
<td>Full Professor &amp;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Director, Southern</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ontario Centre for</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atmospheric Aerosol</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ferris, G</td>
<td>M</td>
<td>Geology</td>
<td>Full</td>
<td>x x x</td>
</tr>
<tr>
<td>Full Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>He, Y</td>
<td>F</td>
<td>Geography - UTM</td>
<td>Associate</td>
<td>x x</td>
</tr>
<tr>
<td>Assistant Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kronzucker, H</td>
<td>M</td>
<td>Biological Sciences - UTSC</td>
<td>Full</td>
<td>x</td>
</tr>
<tr>
<td>Full Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tier 1 Canada</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research Chair</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miall, A</td>
<td>M</td>
<td>Geology</td>
<td>Full</td>
<td>x x x</td>
</tr>
<tr>
<td>Full Professor &amp;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>President, Academy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of Science, Royal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Society of Canada</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sherwood-Lollar, B</td>
<td>F</td>
<td>Geology</td>
<td>Full</td>
<td>x x x</td>
</tr>
<tr>
<td>Full Professor &amp;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Director, Isotope</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tier 1 Canada</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research Chair</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Williams, D</td>
<td>M</td>
<td>Biological Sciences - UTSC</td>
<td>Full</td>
<td>x x x</td>
</tr>
<tr>
<td>Full Professor &amp;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Board of Directors,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toronto Zoo</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faculty Name &amp; Rank</td>
<td>M/ F</td>
<td>Home Unit</td>
<td>Supervisory Privileges</td>
<td>Fields</td>
</tr>
<tr>
<td>---------------------</td>
<td>------</td>
<td>-----------</td>
<td>------------------------</td>
<td>--------</td>
</tr>
<tr>
<td><strong>Category 3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wortmann, U</td>
<td>M</td>
<td>Geology</td>
<td>Full</td>
<td>x</td>
</tr>
<tr>
<td>Category 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bailey, S</td>
<td>F</td>
<td>Department of Fisheries &amp; Oceans</td>
<td>Associate</td>
<td>x x</td>
</tr>
<tr>
<td>Bidleman, TF</td>
<td>M</td>
<td>Environment Canada Centre for Atmospheric Research Experiments (CARE)</td>
<td>Associate</td>
<td>x x x</td>
</tr>
<tr>
<td>Droppo, IG</td>
<td>M</td>
<td>Environment Canada</td>
<td>Associate</td>
<td>x x x</td>
</tr>
<tr>
<td>Fenech, A</td>
<td>M</td>
<td>Environment Canada</td>
<td>Associate</td>
<td>x</td>
</tr>
<tr>
<td>Greenwood, B</td>
<td>M</td>
<td>DPES - UTSC</td>
<td>Full</td>
<td>x x x</td>
</tr>
<tr>
<td>Harner, T</td>
<td>M</td>
<td>Environment Canada</td>
<td>Associate</td>
<td>x x</td>
</tr>
<tr>
<td>Holdway, D</td>
<td>M</td>
<td>Faculty of Science at UOIT</td>
<td>Associate</td>
<td>x x</td>
</tr>
<tr>
<td>Hung, H</td>
<td>F</td>
<td>Environment Canada</td>
<td>Associate</td>
<td>x</td>
</tr>
<tr>
<td>Kirkwood, A</td>
<td>F</td>
<td>Faculty of Science at UOIT</td>
<td>Associate</td>
<td>x x x</td>
</tr>
<tr>
<td>Mirza, M</td>
<td>M</td>
<td>Environment Canada</td>
<td>Associate</td>
<td>x x</td>
</tr>
<tr>
<td>Muir, D</td>
<td>M</td>
<td>Environment Canada</td>
<td>Associate</td>
<td>x x x x x</td>
</tr>
<tr>
<td>Yerubandi, RR</td>
<td>M</td>
<td>Environment Canada</td>
<td>Associate</td>
<td>x x x</td>
</tr>
</tbody>
</table>

**Notes:**

1. The budget unit paying the salary of the faculty member. The Department of Physical & Environmental Sciences is the department in which the budgetary appointment for the first 15 faculty resides. Consistent with the University policy, all U of T graduate faculty have appointments in tri-campus graduate departments.
2. Full supervisory privileges allow student supervision or co-supervision up to the Ph.D. level. Associate supervisory privileges allow supervision or co-supervision up to the MSc level.


4. Category 3: these are tenured or tenure-track core faculty members who are involved in teaching and/or supervision in other graduate program(s) in addition to being a core member of the graduate program under review.

5. Category 5: other core faculty: this category includes emeritus professors with supervisory privileges and persons appointed from government laboratories as adjunct professors.

3 Planning and Budget

3.1 Resource implications

The University of Toronto has a minimum level of funding for doctoral and doctoral-stream students ("funding commitment"). At present this funding stands at $21,914 per year for a maximum of 4 or 5 years (depending on the support provided for Master’s students). All students registered in the proposed Environmental Ph.D. program at UTSC will be funded at least at this minimum level; the funding package which will be included with the letter of offer, will be made up from a number of possible components:

- external scholarships (e.g. NSERC, OGS, etc.);
- departmental fellowships derived from BIU and tuition income;
- university scholarships;
- teaching assistantships; and
- research assistantships.

As the minimum level of funding for Ph.D. students is changed by the University over time, similar changes will occur in the proposed program at UTSC to maintain competitiveness and equality of opportunity for students across the university and compliance to the funding commitment.

The core faculty at UTSC receive substantial research funds annually from various granting councils and other organizations supporting research and have already agreed to fund Research Assistantships at $8,500 for each year of research assistance. Normally this is the summer semester, when the student is involved in his/her own research working towards the graduate degree and is not a hindrance to progress on her/his Ph.D. program.

It is worth noting that UTSC has expanded its undergraduate enrolment significantly over the last five years and funds available to graduate students through Teaching Assistantships outstrips the graduate students available to assume the workload, even with the large number of M.Env.Sc. students now on campus. Thus, the TA component of the doctoral funding package is assured at least for the immediate future.

3.1.1 Staffing

No new faculty members are required to mount this program. However three additional faculty members in Environmental Science are scheduled to be hired over the next three years, increasing the Ph.D. supervisory capacity substantially. A half time administrative position, funded from program revenue, will be added to meet the increased administrative demand for this program. This position will be part of the administrative team for both M.Env.Sc. and Ph.D. programs. Finally a second Environmental Science technician, funded from program revenue, will be added.
3.1.2 Space

The Department of Physical & Environmental Sciences (DPES) is located partly in the Science Wing of the Andrews Building and partly in the Science Research Building on the University of Toronto Scarborough campus. At present there is a total of 2,000 m$^2$ assigned to research and research support activities, faculty and graduate student offices. Faculty members have access to private offices with telephone and computer lines to the UTSC servers. Graduate students participating in research (M.Env.Sc. Program I students and Ph.D. students) have access to shared office space dedicated to the research group to which they belong; some of this space may be within the supervisor's research laboratory, wherever safety rules permit. Graduate students in the professional M.Env.Sc. program have access to shared office space in the Corben Room. Office space totalling approximately 390 m$^2$ is allocated exclusively to the approximately 50 graduate students in the program. This combined laboratory/office space occupies approximately 1,335 m$^2$.

The space available for research and offices will increase dramatically over the next few years due to new construction that is currently underway and further campus expansion that is at an advanced stage of planning. The first expansion will result when the new Instructional Centre, just funded through at $70 million infrastructure grant from the federal and provincial governments, is completed in August 2011. Once this is accomplished, the Department of Computer and Mathematical Sciences will move out of the Andrews Science Building, freeing up space equal to ~300 m$^2$, a portion of which will be transferred to DPES to meet the needs of this program.

The second phase of campus expansion is expected to occur within five years. This will result in the movement of the Departments of Biological Sciences and Psychology out of both the Andrews Science Wing and the Science Research Building, providing DPES with the opportunity to triple its office, research and graduate student space. A secondary effect of campus expansion will be a major renovation of laboratories and offices in the Andrews Science Wing, bringing the space up to the same high standards as the Science Research Building and the other buildings under construction.

M.Env.Sc. students already have access to dedicated study space in a combined lounge/workroom in the Corben Room. This space will be expanded in 2009-10 to accommodate the increased enrolment projected for September 2009. Additional research and study space for graduate students became available when the Science Research Building opened in 2008 – here a study space and a common/seminar room are available to Ph.D. students.

3.1.3 Libraries

The University of Toronto Scarborough is just one part of a vast network of libraries within the University of Toronto Library System, to which the Ph.D. students will have automatic access. There are over 40 separate, but inter-linked, libraries and resource centres within the University of Toronto network, which is ranked fourth overall in total holdings for North American libraries. The UTSC Library has provided excellent support for an undergraduate program in Environmental Science for over 15 years, and for the M.Env.Sc. program since 2005. The existing library network, which provides the necessary support for a very large number of other Ph.D. programs at the University of Toronto, will continue to provide the necessary facilities to support the proposed Ph.D. degree in Environmental Science. Nevertheless, it is clear that some resources will need to be allocated to enable the purchase of research monographs and new e-journals as they emerge in the rapidly expanding environmental science field.

The report of the Head Librarian is included in this submission.

3.1.4 Computing facilities

UTSC has an excellent centralized computer system run by the Information and Instructional Technology Services (IITS), with fast internet links to other campuses within the University of Toronto system and to the outside world. IITS has a total of 52 individual servers, 116 server nodes in a High Performance Parallel Computing cluster, 58 wireless access points and 10 computer laboratories (one is currently
Proposed Ph.D. in Environmental Science

regularly used for graduate courses in the M.Env.Sc. program) with a total of 528 workstations (including the Informatics Commons in the library) available to students. IITS itself consists of four groups responsible for:

- Core server and networking infrastructure;
- Application development;
- A helpdesk to support faculty, undergraduate and graduate students; and
- Audio-visual support.

Specialized computer laboratories allow interactive teaching for the M.Env.Sc. courses (such as ENV 1109H and ENV 1118H) and will be available for the Ph.D. courses. In addition, the M.Env.Sc. students are provided with sole access to 4 computers and 2 printers in their dedicated workspace (the Corben Room); expansion of this space is planned as the M.Env.Sc. program has continued to expand and the Ph.D. program will require more dedicated study space. Of course, doctoral and masters students have access to more specialized computational facilities in the laboratories of their supervisors; many sensitive analytical instruments are driven by computers, where analyses are carried out and results explored under computer control (e.g. the computers in the Environmental NMR Centre).

All faculty and graduate students are provided with an account on the centralized computer system, which gives them access to electronic mail facilities, the Internet, statistical software packages, scientific graphics, computer language compilers, a rich mathematical software library, etc. Faculty and students have access to over 520 Mac and PC workstations in 10 computing laboratories. Over 40 software packages, from office suites to statistical packages (e.g. Statistica™), to mathematical and multimedia applications are available on the computer laboratories for academic use. Statistica™, for example, is currently used extensively by Dr. G. Arhonditsis in his M.Env.Sc. graduate course, ENV 1119H, Quantitative Environmental Analysis.

Computing kiosks are dispersed throughout the campus for easy access to both undergraduate and graduate students; wireless access to the Internet is available from a campus-wide wireless network. Computer users can print their output in all the IITS computer laboratories, using the laboratory computers or from their own laptop computers via wireless printing. UTSC faculty and graduate students also have access to a High Performance Computing (HPC) cluster that consists of 116 server nodes. HPC is the most efficient way to solve complex computational tasks in a wide variety of academic disciplines, including environmental science.

UTSC also offers two Learning Management Platforms and Communication Portals designed to help students with their studying and learning. Graduate students can download course materials, check their marks through ROSI (the centralized university student registration and course grades portal) and book appointments with support services. In addition to UTSC-specific services, UTSC faculty and students have access to a host of other IT services as members of the larger University of Toronto community.

3.1.5 Enrolment/admissions

The expected doctoral enrolment in the first year (2010-11) is a total of 5 students as outlined in Section 2.3. This rather modest number will ensure that only the very best students are admitted; it must also be remembered that all the core faculty currently have both masters and doctoral students through their cross-appointments to other units. However, as more faculty are hired, and as the core faculty accept more students in the Environmental Science program, the number of Ph.D. enrolments will increase. The projected enrolment at the end of the initial spin-up phase is an annual intake of 10 students for a steady state enrollment of 40 students in the funded cohort.

3.1.6 Revenues/costs

The program will be funded largely by BIU and tuition revenue. It is expected that students accepted into this program will be competitive on the provincial and national stage with respect to NSERC and OGS Scholarship funding. Faculty at UTSC already hold significant funds from the research agencies and are committed to providing the Research Assistantships necessary to supplement student fellowship and
Proposed Ph.D. in Environmental Science

The University of Toronto currently funds Ph.D. students in Science programs to the amount of $15,500 annually plus the cost of tuition for four years. Anticipated sources of funding for this commitment will typically include a combination of scholarships generated from BIU and tuition income, external scholarships, endowed fellowships, teaching assistantships (maximum of 140 hours over two terms), and research assistantships. Faculty members have agreed to contribute $8500 in RA per student.

4 Space and Facilities

4.1 Requirements for physical facilities

Some additional space will be required to house a program administrator, technician and the new graduate students. Some of the graduate students will be accommodated in the existing lab space of current faculty. Other space will be required as the enrollment ramps up over the first five or so years of the program when a steady state should be achieved.

A large instructional centre which will add 25% more space to the campus is currently being constructed with an opening date in 2011. As a secondary effect the office and lab space for the Department of Physical & Environmental Sciences will increase and easily accommodate the required administrative and student space.

4.2 Capital projects for approvals

This program will not require the construction of new space or renovations to current space; the additional space requirements discussed above is available in current space resources at UTSC.

5 Students

5.1 Student affairs and services

The Ph.D. students in Environmental Science will have access to all the services of the University of Toronto Scarborough as well as the University of Toronto, and will have dedicated workspace with the Department of Physical & Environmental Sciences. The students will also have access to the visiting fellows in environmental science, helping them to establish connections in the Canadian environmental science community, and the international academic community interested in environmental science.

5.2 Student conduct and discipline

All rules and regulations of the University of Toronto and the School of Graduate Studies that apply to graduate students will govern student conduct in the Ph.D. in Environmental Science program.
5.3 Financial Support

See our response to 3.1.7.

5.4 Student registration and information systems

The usual University procedures for registration and enrolment will apply to the incoming Ph.D. in Environmental Science.
Appendix I: Canadian Graduate Programs in the Environment

Appendix Ia: Canadian Graduate Programs in Environmental Studies, Geography and Natural Resources (Note: University of Toronto programs are given in bold)

Carleton University - Geography and Environmental Studies
Concordia University - Environmental Impact Assessment
Dalhousie University - Resource and Environmental Studies
Lakehead University - Master of Environmental Studies in Nature-Based Recreation & Tourism
Royal Roads University - Graduate Certificate in Environmental Education and Communication
Royal Roads University - Graduate Diploma in Environmental Education and Communication
Royal Roads University – Environment and Management (MA, MSc)
Royal Roads University - Environmental Education and Communication (MA)
Ryerson University - Environmental Applied Science and Management
Simon Fraser University - Resource and Environmental Management
University of British Columbia - Resource Management and Environmental Studies
University of British Columbia - Occupational and Environmental Hygiene
University of Calgary - Energy and the Environment
University of Calgary - Environmental Design (MA, PhD)
University of Guelph - Resource and Environmental Economics (PhD)
University of New Brunswick - Faculty of Forestry and Environmental Management
University of Northern British Columbia - International Studies (MA - Regional Relations, International Development, Global Environmental Policy)
University of Northern British Columbia - Natural Resources and Environmental Studies, MA (Geography, Environmental Studies, Tourism)
University of Northern British Columbia - Natural Resources and Environmental Studies (PhD & MNRES)

University of Toronto - Environmental Geography and Resource Management (MA, PhD)
University of Toronto - Environmental Planning (MA)
University of Toronto - Environmental Studies (MA, PhD)
University of Waterloo - Environment and Resource Studies
University of Western Ontario – Environment and Sustainability (MSc, PhD)
York University - Business and the Environment
York University - Graduate Diplomas in Environmental/Sustainability Education
York University - Graduate Diplomas in Environmental/Sustainability Education
York University - Environmental Studies (MSc, PhD)

Appendix Ib: Canadian Graduate Programs in Environmental Engineering (Note: University of Toronto programs are given in bold)

Carleton University - Ottawa-Carleton Institute for Environmental Engineering
Concordia University - Environmental Engineering
Dalhousie University - Graduate Studies in Environmental Engineering
Memorial University of Newfoundland - Environmental Engineering and Applied Science (MA, MSc)
Royal Military College of Canada - Environmental Engineering
University of Calgary - The Centre for Environmental Engineering, Research and Education
University of Toronto - Environmental Engineering

University of Toronto - Environmental Science and Engineering
University of Ottawa - Environmental Engineering (PhD/?)
University of Saskatchewan - Environmental Engineering
University of Windsor - Environmental Engineering (MA/MEng/PhD)

Appendix Ic: Canadian Graduate Programs in Environmental Biology (Note: University of Toronto programs are given in bold)

Simon Fraser University - Environmental Biology
University of Guelph - Environmental Biology (MSc/PhD)
Appendix Id: Canadian Graduate Programs in Environmental Health
(Note: University of Toronto programs are given in bold)

**University of Toronto** - Occupational and Environmental Health (MHSc/MSc)

Appendix Ie: Canadian Graduate Programs in Environmental Chemistry & Toxicology
(Note: University of Toronto programs are given in bold)

Carleton University - Ottawa-Carleton Collaborative Program in Chemical and Environmental Toxicology

**University of Toronto** - Environmental Chemistry (MSc, PhD)
University of Ottawa - Chemical and Environmental Toxicology (PhD)

Appendix If: Canadian Graduate Programs in Environmental Science
(Note: University of Toronto programs are given in bold)

McGill University – School of Environment (MA, MSc, PhD)
Memorial University of Newfoundland – Faculty of Science (PhD & Master of Environmental Science/Master of Science)
Royal Military College of Canada - Environmental Science
Trent University - Watershed Ecosystems (MSc, PhD)
University of Northern British Columbia (MSc, PhD)
University of Northern British Columbia - Natural Resources and Environmental Studies, MSc
    (Biology, Environmental Science, Forestry, Geography, Recreational Resource Management)

**University of Toronto Scarborough** - Environmental Science (MEnvSc)

University of Windsor – Great Lakes Institute for Environmental Research (MSc, PhD)
## Appendix II: Budget Statement

### Revenue

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Class</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Class</td>
<td>0</td>
<td>5</td>
<td>11</td>
<td>18</td>
<td>21</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>11</td>
<td>18</td>
<td>26</td>
<td>30</td>
<td>34</td>
</tr>
<tr>
<td>Nov</td>
<td>5</td>
<td>11</td>
<td>18</td>
<td>26</td>
<td>30</td>
<td>34</td>
</tr>
<tr>
<td>Total</td>
<td>10.00</td>
<td>27.00</td>
<td>47.00</td>
<td>70.00</td>
<td>81.00</td>
<td>92.00</td>
</tr>
<tr>
<td>New</td>
<td>10.00</td>
<td>12.00</td>
<td>14.00</td>
<td>16.00</td>
<td>18.00</td>
<td>20.00</td>
</tr>
<tr>
<td>Total</td>
<td>0.00</td>
<td>15.00</td>
<td>33.00</td>
<td>46.50</td>
<td>54.00</td>
<td>61.50</td>
</tr>
<tr>
<td>Dom</td>
<td>$6,621</td>
<td>$6,886</td>
<td>$7,161</td>
<td>$7,447</td>
<td>$7,745</td>
<td>$8,055</td>
</tr>
<tr>
<td>Gross</td>
<td>$33,105</td>
<td>$75,746</td>
<td>$128,898</td>
<td>$193,622</td>
<td>$232,350</td>
<td>$273,870</td>
</tr>
<tr>
<td>Less:</td>
<td>$397</td>
<td>$909</td>
<td>$1,547</td>
<td>$2,323</td>
<td>$2,788</td>
<td>$3,286</td>
</tr>
<tr>
<td>Rema</td>
<td>$32,708</td>
<td>$74,837</td>
<td>$127,351</td>
<td>$191,299</td>
<td>$229,562</td>
<td>$270,584</td>
</tr>
<tr>
<td>BIU</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>54</td>
<td>94</td>
<td>140</td>
<td>162</td>
<td>184</td>
</tr>
<tr>
<td>Effec</td>
<td>$5,629</td>
<td>$5,565</td>
<td>$5,526</td>
<td>$5,511</td>
<td>$5,511</td>
<td>$5,511</td>
</tr>
<tr>
<td>Gross</td>
<td>$112,583</td>
<td>$300,490</td>
<td>$519,425</td>
<td>$771,540</td>
<td>$892,782</td>
<td>$1,014,024</td>
</tr>
<tr>
<td>Less:</td>
<td>$11,980</td>
<td>$32,346</td>
<td>$56,306</td>
<td>$83,860</td>
<td>$97,038</td>
<td>$110,216</td>
</tr>
<tr>
<td>Rema</td>
<td>$100,603</td>
<td>$268,144</td>
<td>$463,119</td>
<td>$687,680</td>
<td>$795,744</td>
<td>$903,808</td>
</tr>
<tr>
<td>Dom</td>
<td>$133,311</td>
<td>$342,981</td>
<td>$590,470</td>
<td>$878,979</td>
<td>$1,025,306</td>
<td>$1,174,392</td>
</tr>
<tr>
<td>Less:</td>
<td>$13,331</td>
<td>$34,298</td>
<td>$59,047</td>
<td>$87,898</td>
<td>$102,531</td>
<td>$117,439</td>
</tr>
<tr>
<td>Less:</td>
<td>$21,330</td>
<td>$54,877</td>
<td>$94,475</td>
<td>$140,637</td>
<td>$164,049</td>
<td>$187,903</td>
</tr>
<tr>
<td>Net</td>
<td>$98,650</td>
<td>$253,806</td>
<td>$436,948</td>
<td>$650,444</td>
<td>$758,726</td>
<td>$869,050</td>
</tr>
<tr>
<td>Plus:</td>
<td>$25,000</td>
<td>$55,000</td>
<td>$55,000</td>
<td>$55,000</td>
<td>$55,000</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>$123,650</td>
<td>$308,806</td>
<td>$491,948</td>
<td>$650,921</td>
<td>$748,299</td>
<td>$792,717</td>
</tr>
</tbody>
</table>

### Expenses

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrator (+ ben)</td>
<td>$30,625</td>
<td>$31,850</td>
<td>$33,124</td>
<td>$34,449</td>
<td>$35,827</td>
<td>$37,260</td>
</tr>
<tr>
<td>Director Stipend (+22.5% ben)</td>
<td>$12,250</td>
<td>$12,250</td>
<td>$12,250</td>
<td>$12,250</td>
<td>$12,250</td>
<td>$12,250</td>
</tr>
<tr>
<td>Technician (+22.5% ben)</td>
<td>$85,750</td>
<td>$89,180</td>
<td>$92,747</td>
<td>$96,457</td>
<td>$100,315</td>
<td>$104,328</td>
</tr>
<tr>
<td>Student Stipends</td>
<td>$44,000</td>
<td>$52,800</td>
<td>$61,600</td>
<td>$70,400</td>
<td>$79,200</td>
<td>$88,000</td>
</tr>
<tr>
<td>Funded Cohort Tuition</td>
<td>$33,105</td>
<td>$75,746</td>
<td>$128,898</td>
<td>$193,622</td>
<td>$232,350</td>
<td>$273,870</td>
</tr>
<tr>
<td>Benefit - 10% UF</td>
<td>$840</td>
<td>$840</td>
<td>$840</td>
<td>$840</td>
<td>$840</td>
<td>$840</td>
</tr>
<tr>
<td>Benefit - 16% OH</td>
<td>$10,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Estimated Expenses</td>
<td>$216,570</td>
<td>$262,666</td>
<td>$412,125</td>
<td>$521,760</td>
<td>$591,947</td>
<td>$666,522</td>
</tr>
<tr>
<td>Net Revenue/(Shortfall)</td>
<td>(92,920)</td>
<td>$46,140</td>
<td>$79,823</td>
<td>$130,161</td>
<td>$156,352</td>
<td>$126,196</td>
</tr>
</tbody>
</table>
REPORT ON LIBRARY RESOURCES
FOR A PROPOSED DEGREE OF
DOCTOR OF PHILOSOPHY IN ENVIRONMENTAL SCIENCE
AT UNIVERSITY OF TORONTO SCARBOROUGH

BACKGROUND
The University of Toronto Scarborough Library is well positioned to provide the necessary scholarly resources and services required for a graduate program at the doctoral level in Environmental Science. Together with other libraries in the University of Toronto Library (UTL) system, the collection supports research in a full range of both traditional subjects of geology, geography, biology, ecology, chemistry, geophysics, engineering and the interdisciplinary subject of environmental sciences. Researchers in this program will draw on literature that is diverse in its coverage, from basic field and laboratory techniques to an examination of real world environmental problems.

All libraries are challenged by financial constraints in an environment characterized by an ‘information explosion’ of print and electronic resources. Accordingly, libraries are necessarily selective in materials that are purchased for their particular institution. The University of Toronto Library's holdings have been developed in a systematic way by U of T Scarborough and UTL selectors and through faculty requests to ensure that all commercially produced current imprints of books are received by the Library.

At U of T Scarborough, the best scholarly resources are purchased to support courses, programs and research activities at the campus. At the same time, U of T Scarborough enjoys the benefits of having access to the resources of all the other libraries in the UTL system. Access to the collection is provided through an integrated online catalogue of UTL records, searched by author, title, subject, or keyword. Using features of the online catalog, materials from any U of T library can be delivered to U of T Scarborough within 1-5 days through the InterCampus Delivery service. As such, irrespective of library affiliation, all users have access to the same UTL resources. Similarly, through Interlibrary Loan services, access to materials from academic institutions around the world can be requested in the library’s online environment.

Currency is of utmost importance in all science disciplines. Continuous improvements in the Library’s processing of materials ensure that newly acquired resources are made available to the University community as quickly as possible.

DESCRIPTION OF THE COLLECTION

Monographs
The University of Toronto Library is ranked fourth over-all in holdings for North American libraries¹.

It is the policy of UTL to acquire a single copy of all science books published in English that are considered to be of research value. These include print and/or electronic proceedings of conferences and symposia, professional society publications, review literature, technical handbooks, research monographs and reference books in the forms of handbooks, encyclopedias, dictionaries and biographies.

Given the interdisciplinary nature of environmental studies, environmental resources are distributed throughout the UTL system. In addition to holdings at U of T Scarborough, students and faculty in this program will find substantial resources in many other U of T libraries, such as Noranda Earth Sciences, Engineering and Computer Science, Robarts, Law, and the Gerstein Science Information Centre.

**Serials**
Periodical publications are the primary means by which information is made known to scientists and the U of T libraries have extensive journal holdings. However, like all North American libraries, UTL is experiencing great difficulty in keeping up with the rising cost of serial subscriptions. This situation has improved significantly in the recent past due to the Library's commitment to purchase an ever-increasing number of electronic journals. At the present time a total of 61,448 electronic journals, 1,053 electronic journal indexes and 4,195 electronic news services are available to students and faculty at the university. Many of these have full text availability.

A search of the ISI journal citation reports for the subject area "Environmental Studies" shows the Library system holding a print or full text electronic version of 157 of the 163 top ranked journals.

**ELECTRONIC RESOURCES**
The electronic information services at the University of Toronto Library have been evolving since 1987, when the first online catalogue was mounted. Within a year, the online catalogue was available in all the campus libraries, and dial-in access was introduced with a small number of lines. Abstracts and indexes had been computerized since the early 1970’s and through the 1980’s, searched by trained intermediaries. Beginning in the late 1980’s CD-ROMs and networked databases widened the access of electronic databases to the end-user to perform his or her own searches. Today most electronic resources are accessed through a web interface, and the U of T Library is a world leader in the provision of resources in this manner.

In support of Environmental Studies, the Library subscribes to major abstracting and indexing online services such as Science Citation Index, Scopus, Environmental Sciences and Pollution Management, Environment Abstracts and Geobase. Major organizations and agencies such as Environment Canada, the Environmental Protection Agency, and the United Nations are well represented in both electronic and print formats.
**STAFF and SERVICES**
Currently U of T Scarborough Library staff consists of 7.92 FTE librarians and 15.87 FTE library technicians. The Library is open 168 hours per week from September to May and 71.25 hours per week from May to August, which includes weekend hours of service. The library also provides 24/7 library services from mid-October to December and from February to early May.

Environmental science is complex and interdisciplinary in nature. Information research in today’s environment is also complex with increasingly important reliance on electronic databases, the Internet and the vast quantity of resources available in all formats at the University of Toronto and beyond. Service is the key to ensuring that the most relevant resources are found for research purposes. It is the support through U of T Scarborough Library’s Reference, Research and Instruction, Circulation and Media services which facilitates this efficiency in research. The Library has an information literacy specialist and librarians offer one-on-one instruction sessions to identify and optimize the use of scholarly resources.

The following are examples of the types of support available through the University or Toronto Library: connections to local, national and international scientific information networks, verification of citations, teaching and orientation in the use of the Library's collection, electronic indexes, networked databases, the Internet and more. During the Fall/Winter term, service in person, by telephone, email or chat is available in the U of T Scarborough Library until 10:30 p.m. (Fall) and 12 midnight (Winter) and in the Summer term, until 10:30 p.m.

Approximately 94 computers in the U of T Scarborough Library’s Informatics Commons are available, in addition to the 476 computers on campus, to provide access to the Library catalogue and other online resources. All electronic resources are also available from desktops in offices or from home. Together with the increasing online support services such as email and chat reference and online help guides, the complex world of information research is easily accessible to faculty and students beyond the limits of a physical library building.

**SUPPORTING COLLECTIONS**
While no one library can own every title that is published, we understand the importance of developing and maintaining efficient networks for quick and easy access to other libraries’ resources. As already mentioned, U of T Scarborough Library’s services enables users to obtain materials from other U of T libraries and from those outside of the University. U of T Scarborough places high priority in seeking ways to further expedite the process between when an item is ordered to when it arrives in the Library.

With a TCard, users have direct access and full privileges to all of U of T libraries. In addition, by presenting the card at any Canadian University, the holder may apply for direct borrowing privileges at that institution with no cost to the user.
BUDGET and LONG-TERM COMMITMENTS
The strength of the Library’s financial commitment to purchasing material over the next five to seven years depends upon University policy and government funding. To date it has been the University of Toronto’s stated policy to protect, as far as possible, the Library’s acquisition budget from rising costs and maintain this protected status. This present financial policy allows the Library to maintain its current purchasing levels for publications relevant to Environmental Science and ensures continued support for the program.

Prepared by: Cristina Sewerin
Physical & Applied Sciences Book Selector

Victoria Owen
Head Librarian, University of Toronto Scarborough

Submitted by: Carole Moore
Chief Librarian
University of Toronto Libraries

July 9, 2009
UNIVERSITY OF TORONTO SCARBOROUGH

Brief for the Standard Appraisal
of the
Ph.D.
in
ENVIRONMENTAL SCIENCE

Submitted to the
Ontario Council on Graduate Studies
January 08, 2010

VOLUME I: The Program
THE PROGRAM

1. INTRODUCTION ............................................................................................................... 3

1.1. Brief listing of programs ................................................................................................. 5
   1.1.1 Existing graduate programs in the Environment at the University of Toronto........... 6
   1.1.2 PhD and MEnvSc programs in Environmental Science at the University of Toronto
        Scarborough (UTSC) ...................................................................................................... 6

1.2. Objectives of the programs .......................................................................................... 7

1.3. Method used for the self-study as well as the preparation of the brief, including faculty and
    student input and involvement ......................................................................................... 9

1.4. Fields in the programs (indicate recent changes if any) .................................................... 9

1.5. Review concerns expressed in previous appraisal and actions taken .............................. 10

1.6. Special matters and innovative features ....................................................................... 10

2. THE FACULTY .................................................................................................................. 11

2.1. List of faculty by field ..................................................................................................... 11

2.2. External operating research funding ............................................................................. 16

2.3. Graduate supervision .................................................................................................... 18

2.4. Current teaching assignments ....................................................................................... 21

2.5. Commitment of faculty members from other graduate programs and/or from other
    institutions ......................................................................................................................... 31

3. PHYSICAL AND FINANCIAL RESOURCES .................................................................. 31

3.1. Library resources ......................................................................................................... 31

3.2. Laboratory facilities ...................................................................................................... 32

3.3. Computer facilities ...................................................................................................... 34

3.4. Space ............................................................................................................................ 35

3.5. Financial support of graduate students ......................................................................... 36

4. PROGRAM REGULATIONS AND COURSES ................................................................. 37

4.1. The intellectual development and the educational experience of the student .................. 37

4.2. Program regulations ...................................................................................................... 38

4.3. Part-time studies .......................................................................................................... 40

4.4. Total graduate courses listed and level ......................................................................... 40

4.5. Collateral and supporting departments ......................................................................... 44

5. OUTCOMES ..................................................................................................................... 45

5.1. Enrolment and graduations ........................................................................................... 45

5.2. Employment .................................................................................................................. 49

5.3. Publications .................................................................................................................. 49

5.4. Projected graduate intake and enrolments ..................................................................... 49

Appendix I – University of Toronto Statement on Funding .................................................. 51
Appendix II – SGS Regulations Concerning the Final Oral Examination .............................. 53
Appendix III – Calendar Entry ............................................................................................. 58
Appendix IV – Canadian graduate programs in the environment ........................................ 62
Appendix V – Statement from the Head Librarian ............................................................... 64
Appendix VI - Planned Laboratory Equipment Purchases, 2009-2012 ................................. 67
1. INTRODUCTION

Canada took billions of years to form, hundreds of years to explore and decades to map, but within the last decade or so it has experienced the dramatic impacts of global change. These represent a major research frontier requiring a new generation of highly trained researchers using new and emerging technologies. Vast areas of permafrost are thawing across northern Canada, the surface area of Arctic pack ice has shrunk, water levels have changed in rivers and lakes, and many glaciers are in active retreat. At the same time timber, mineral and oil resources have been in increasing demand internationally requiring new approaches to environmentally-sustainable methods of extraction. Canada’s resource based industries (particularly mineral and oil sands extraction) have expanded rapidly to meet world demand, and urban and industrial development has smothered entire watersheds under a built landscape. The remediation of abandoned mine and industrial sites is a major national priority. Effective management of Canadian forests remains crucial for minimizing forest ecosystem degradation while maintaining supply levels. Development in the far north has also accelerated with the search for new resources and for geopolitical reasons. The management of Canada’s watersheds and lakes, and water resources in general, is a key priority.

Unfortunately, there are large gaps in our knowledge of the effects of environmental change, which has reduced our ability to manage their impacts and create effective policy. Our understanding of many natural processes is still incomplete, because we have had scant opportunity to study them over appropriate timeframes and much of our existing knowledge has limited application to emerging issues. Filling these scientific gaps is an important need in order to create credible report cards on the state of our environment.

Canada’s ability to meet these environmental challenges is constrained by a severe shortage of suitably qualified scientists trained at the graduate level in Environmental Science. The environmental sector is one of the world’s fastest-growing industries - generating well over 120,000 new jobs in Canada in 2005, but ECO Canada’s Environmental Labour Market (ELM) research in 2004 concluded that employers are facing a growing shortfall in the numbers of skilled people in this field – a shortage that is increasingly exacerbated by the retirements of the “Baby Boom” generation. Industry and government are experiencing increasing difficulties hiring people who are appropriately trained in the application of a wide variety of environmental sciences to manage and remediate environmental problems, and there is an increased demand for suitably qualified instructors in colleges and universities. Our ability to cope with the environmental challenges of the future is dependent upon expanding the breadth of existing science teaching and particularly research programs in universities and government and private sector laboratories. This increasing demand for science-based environmental research cannot be met through existing Environmental Studies programs because, although there is a wide range of environmental programs across Canada, only programs in Environmental Science that are firmly rooted in the physical, chemical, biological and earth sciences can satisfy this demand. Furthermore, the environmental challenges we face need the contribution of individuals trained at the doctoral level, and at present there are relatively few dedicated doctoral programs in Environmental Science.

The University of Toronto Scarborough (UTSC) proposal to establish a Ph.D. in Environmental Science supports the Federal Government’s program aimed at environmental sustainability and the economic development that can flow from environmental research. In November 2006, the

---

federal government released *Advantage Canada*\(^2\), an economic plan to make Canada a world leader for current and future generations. *Advantage Canada* is based on the premise that Canada already has tremendous strengths — including the drive and ingenuity of our people, the relative strength of our fiscal position, and our strong research base. It also recognizes that Canada can do more to turn environmental research into innovations that provide solutions to environmental challenges and improve our economic competitiveness. This can only stem from research into the fundamental issues.

The science and technology (S&T) strategy — *Mobilizing Science and Technology to Canada's Advantage* — is the government's plan to achieve these goals. It sets out a comprehensive, multi-year science and technology agenda. The S&T initiatives announced in the Budget Plan 2007 demonstrate the government's commitment to take early action to implement this agenda. For Canadians to continue to enjoy a high quality of life and standard of living, productivity and competitiveness must be improved through innovation. At the same time, economic activity must be sustainable over the long term. Clean air, land, and water are fundamental priorities. To succeed in an increasingly competitive global arena, Canadians must be at the leading edge of important developments that generate environmental benefits.

An aging population, combined with opportunities for Canadians to work anywhere in the world, challenge us to put in place the right conditions to attract, retain, and develop the talent and ingenuity that Canada needs. We believe that the proposed Ph.D. program at UTSC will generate more interest among young people in pursuing advanced environmental careers, thereby encouraging a circle of talent generation and mobilization.

Canada's federal government strategy focuses on research in areas that are in the national interest from a social and economic perspective. Special emphasis is given to:
- environmental science and technologies;
- natural resources and energy; and
- health and related life sciences and technologies.

Clearly all three are interrelated; the resource industry is a major user of environmental science research and technology, similarly the overall health of the environment is a strong determinant of human health, especially as our cities grow. The government is planning new investments in R&D ensuring that higher-education institutions have the leading-edge research equipment and facilities required to compete with the best in the world, and supporting domestic and international research and networks in areas of strategic importance to Canada. The objective is to increase the impact of federal investments, to leverage university and private sector strengths, to create better learning opportunities for students, and to foster research excellence.

Fundamental to all of the above is a steady supply of well-qualified practitioners of environmental science at the advanced graduate level. It is essential that we meet the environmental challenges of change by training a new generation of environmental scientists with advanced skills. Given the national strategic needs clearly identified by the Federal Government, we note significantly, that, at present, there are relatively very few dedicated graduate programs offering a Ph.D. in Environmental Science as a ‘stand alone’ degree. There are clearly opportunities for environmental research, but these are often linked through several departments. By far the largest numbers of environmental programs are in Environmental

\(^2\) Visit: http://dsp-psd.pwgsc.gc.ca/Collection/F2-105-2006-3E.pdf
Studies, Geography and Natural Resources and these are often heavily biased towards the social sciences (see Appendix IVa). There are also a significant number (11) of environmental engineering programs (see Appendix IVb). However, the number of science-based Ph.D. degree programs in the environment is small (two in Environmental Biology – Appendix IVc; 1 in Environmental Health – Appendix IVd; three in Environmental Chemistry and Toxicology – Appendix IVe; and four in Environmental Science - Appendix IVf). The proposed program differs from those listed in Appendix IVf in two fundamental ways. First, the program has a core faculty based in one department, whereas programs at McGill and Memorial are cobbled together with researchers within a faculty but belonging to different departments. The department-centric nature of this program, while not excluding the important participation from others, will provide a greater sense of coherency for students in the program and the development of a dynamic cohort. Second, other programs are smaller niche programs such as Trent (Watersheds) and RMC (Remediation) whereas the full range of Environmental Science is covered by the proposed program. The relatively large course load compared to other Ph.D. programs in Environmental Science ensures that our students are provided a thorough foundation in the emerging discipline of Environmental Science, rather than a narrow aspect of it.

There is a clear need for a Ph.D. in Environmental Science to be offered at the University of Toronto, the most research intensive university in Canada.

1.1. Brief listing of programs

This proposal is for a new tri-campus graduate program to be housed in the Department of Physical & Environmental Sciences (DPES) at the University of Toronto Scarborough (UTSC) leading to a degree of Doctor of Philosophy (Ph.D.) in Environmental Science.3 The Department will assume graduate responsibilities and a graduate Chair will be appointed. The expected start date is September 2010. This program will build directly on the Department’s undergraduate program in Environmental Science and Master’s level programs. The Department’s extremely successful Master of Environmental Science Program (M.Env.Sc.) was established in 2005 and currently has enrolments of 54 full-time and 20 part-time students. A significant number of these students now wish to pursue doctoral research in a truly interdisciplinary mode, and it is appropriate that the University of Toronto provide these, and other like-minded students, from across Canada and abroad, the opportunity to further their education at a higher level.

DPES at UTSC will admit students typically to four or five years of research training leading to the degree of Ph.D. in Environmental Science. All students admitted will be offered the minimum annual funding package which consists of:

- Internal Fellowships;
- Teaching Assistantships;
- Research Assistantships; and
- External (NSERC, OGS) and Internal scholarships (other than university fellowships).

The existing M.Env.Sc. program at UTSC has generated a large body of students from all regions of Canada, as well as a significant number of international students. The Ph.D. program

---

3 The Department of Physical & Environmental Sciences at UTSC will assume graduate responsibilities, the first department to do so at UTSC.
will garner Master’s students from the same market base, but will also provide a higher level of research training for the best M.Env.Sc. students graduating from UTSC.

The University of Toronto (and now UTSC) has an impressive international reputation for research and training of highly qualified personnel in all the basic sciences. The introduction of a Ph.D. degree in Environmental Science at UTSC as a distinct and separate graduate program will enhance the profile both of UTSC and the university as a whole, and accords well with the tri-campus responsibilities of UTSC.

1.1.1 Existing graduate programs in the Environment at the University of Toronto

The University of Toronto is recognized internationally for its disciplinary graduate programs focusing on scientific environmental issues. In particular, Environmental Chemistry in the graduate Department of Chemistry, the Environmental Engineering Collaborative graduate program, Environmental Geosciences in the graduate Department of Geology, Physical Geography and Natural Systems in the graduate Department of Geography, and the Faculty of Forestry have all offered high quality Ph.D. programs in their disciplines for many years. In all likelihood, chemistry graduates wishing to pursue research in environmental interactions at the molecular level are expected to register in the graduate Department of Chemistry. Similarly, those students wishing to research the engineering needs and solutions to environmental problems (generally engineering graduates) will pursue their degrees through the Faculty of Applied Science and Engineering. Students focusing on environmental geosciences, including biogeochemistry, contaminant hydrogeology, oceanography and global climate change can still choose a Ph.D. program in Geology. Further, students pursuing graduate studies in forestry, forest-sciences and forest ecosystems are likely to enter the Faculty of Forestry. The proposed program will appeal to those students wishing to carry out research into environmental issues that involve an interdisciplinary approach, yet at a fundamental scientific level. Such students may have done an undergraduate degree in a subject area (e.g. Environmental Science) that may be deemed to have insufficient chemistry, engineering, geology or forestry content to be considered for admission to these other disciplines. Yet such students are well-suited to the interdisciplinary nature of the proposed program.

The Centre for Environment has been a major player in promoting cross-disciplinary collaborative programs particularly at the Masters’ degree level; indeed, the M.Env.Sc. program at UTSC currently reports through the Centre. However, while a number of collaborative graduate programs already exist through the centre, there is no Ph.D. program committed explicitly to the training of graduates at the interface between disciplines.4

1.1.2 Ph.D. and M.Env.Sc. programs in Environmental Science at UTSC

The M.Env.Sc. program was approved by OCGS in 2005 in the field of “Biophysical Interactions in Terrestrial and Aquatic Systems”. It has now been operating for four years with a 2009/2010 intake of 54 full-time and 20 part-time students; the student body draws on a pool of qualified applicants provincially, nationally and internationally. Upon graduation these students are eagerly sought after by employers, and, to date, every student graduated has either entered the environmental workplace successfully, or sought further research opportunities at the doctoral

4 Once the graduate Chair of the Department of Physcial & Environmental Sciences has been established, the Master of Environmental Science will be moved from the Centre for Environment to the Department of Physical & Environmental Sciences so as to align its administrative and operational homes.
level in environmental science or related fields. Unfortunately, opportunities for truly interdisciplinary work at the doctoral level are still limited in Canada (see Appendix IV), and many of our new M.Env.Sc. graduates experienced difficulty finding appropriate advanced programs as the requirements for entry into disciplinary programs do not fit their training profile, even though they are excellent students. The proposed Ph.D. program will be available to qualified master’s students (with a minimum B+ average), including our own M.Env.Sc. graduates, and will provide these, and other similarly trained students, with an opportunity to acquire advanced skills in environmental science by continuing their training at the interface between traditional disciplines.

1.2. Objectives of the program

Over the next several decades it is abundantly clear that the environment and its complexity will receive increasing attention locally, provincially, nationally and internationally. Many environmental problems are fundamental and cannot be solved using existing knowledge and methodologies. Furthermore, solutions to these problems may not necessarily be found within a single discipline; in fact, it is increasingly the norm that solutions are found at the interface between more traditional disciplines and interdisciplinary work. UTSC has been in the forefront of training students to work at this interface between disciplines ever since the formation of the undergraduate environmental science group in the early 1990s. Since then UTSC has grown dramatically, experiencing substantial expansion in its undergraduate, and more recently in its graduate, enrolment. Further expansion in graduate enrolment at UTSC in several science and other disciplines is expected, given the demand for highly qualified personnel by industry, government and academe.

A primary goal of the proposed doctoral program will be the production and publication of high quality, original research in environmental science. It will, as is normal at the University of Toronto, be presented for examination in thesis form, or as a series of collected published research papers. The research will be evaluated by a departmental committee of not less than four faculty members, chaired by the Graduate Chair or her/his designate. On acceptance of the quality of the research, this committee will recommend it be examined by the appropriate examination committee of the School of Graduate Studies at the University of Toronto, which includes a qualified expert external to the university.

UTSC is committed to the development of highly qualified doctoral candidates trained in environmental science, who can assume scientific leadership in industry, government and academe. UTSC is uniquely situated with respect to such a program as expertise in both research and training already exists in Environmental Science, and we have nationally and internationally recognized research facilities to which students have access. The addition of core faculty from other departments at UTSC, from other departments within the tri-campus system, as well as from the ranks of government scientists, will provide a program that will be unique. PhD course work, and research training, may be carried out anywhere within the tri-campus system, although the core course, Advanced Seminar in Environmental Science (ENV2200H), and the bulk of the other course offerings will be held at UTSC, and all students will have access to office space at UTSC; the latter are important considerations, since we believe commonality of office space and courses breeds commonality of purpose. However, courses and facilities at any campus within the system will be used where appropriate, through other departments and programs, with permission of the Graduate Chair.
It is expected that students will complete at least 50% of their course requirements in year 1. As stated above, ENV2200H will be mandatory for all doctoral students. At the end of year 1, i.e. in the fall semester one year after registration, students will be required to present a formal research proposal to her/his advisory committee. All Ph.D. program requirements must be completed within six years from first enrolment.

The objective of the proposed Ph.D. program in Environmental Science is to prepare students for careers in teaching and research within universities and colleges, and also in government laboratories or private organizations where fundamental research on the environment is carried out. Graduates from this program will be expected to have acquired autonomy in conducting research, and in the preparation of scholarly publications. The Ph.D. program is designed to provide both a broad knowledge of current environmental research issues, especially those that exist at the interface between traditional disciplines, and specific training in the most appropriate research methodologies to tackle these scientific problems in the environment.

We will follow a holistic approach to both teaching and research by integrating the physical, chemical and biological sciences with the geosciences in the study of natural and human environments. We believe this is a truly modern philosophy designed to meet worldwide concern with environmental quality in the new millennium. To partly meet this objective, in 2006, the Environmental Science group within DPES introduced the unique graduate program, M.Env.Sc. to take advantage of the synergies of interdisciplinary work being carried out at UTSC. In the four years since its introduction in January 2006 the program has expanded rapidly to a current (2009-10) enrolment of 54 full time and 20 part time students. Many of the students graduating from this program are now searching for further research training in environmental science, rather than in the more traditional discipline-oriented training. The Ph.D. program being proposed here will satisfy the needs of these and like-minded students from across Toronto, the Province, Canada and internationally, who wish to pursue interdisciplinary environmental research beyond the Master’s level. The number and the quality of our M.Env.Sc. graduates are a testament to the success of the interdisciplinary approach to environmental issues. It is worth noting that several of our best students have sought more advanced training, and a few, having failed to find a suitable program here, have gone abroad where the holistic approach is well-established.

Our aim is to train researchers in environmental science at the doctoral level, where students can develop theoretical and practical skills, and can be exposed to the very latest research technologies. Training will be achieved primarily through direct interaction between faculty and student, although each student will undertake course work as part of his/her program and one core course, ENV2200H, will be mandatory for all students. Each student entering the program will already have mutually agreed upon a supervisor for his/her research; this research will result in a thesis, which will be a required element for graduation. The primary supervisor will direct the research program, but final responsibility for the student’s progress will rest with a core advisory committee (supervisor plus at least two other faculty members with expertise in the research area) that will ensure the interdisciplinary nature of the Ph.D. program. However, the student’s primary supervisor will chair the core advisory committee, which will meet at least annually to oversee the student’s progress.
1.3. Method used for the self-study as well as the preparation of the brief, including faculty and student input and involvement

The decision to establish a Ph.D. program in Environmental Science in the Department of Physical & Environmental Sciences (DPES) developed as a natural response to the noteworthy success of the M.Env.Sc. program on the Scarborough campus. Extensive discussions were undertaken within the Department and at UTSC in a series of formal meetings from 2007 to 2009. Subsequent to this a detailed proposal for a Ph.D. in Environmental Science was prepared. This document evolved over several meetings of a large subset of faculty members within DPES and was widely circulated to interested individuals. These discussions produced a final document that was then forwarded to the Dean by the Chair of DPES. Coincident with all these discussions, the Director of the Centre for Environment was consulted and had been fully supportive of the curriculum and of the need to provide a doctoral program in Environmental Science to University of Toronto students.

Further discussions were held at the University decanal level and the proposal was considered in detail by the School of Graduate Studies. UTSC has established a new academic administrative position – of Vice-Dean, Graduate Education and Program Development – with the aim of establishing a formal office for focusing graduate training carried out at UTSC. Approval for the development of a full proposal was given at a meeting between the Vice-Dean, Graduate Education and Program Development at UTSC and the Dean and Vice-Dean Programs of the School of Graduate Studies. The Vice-Dean, Graduate Education and Program Development had discussions with the respective Deans or Chairs of all the relevant Faculties and Departments concerned with the environment at the University (the Faculty of Applied Science and Engineering – in particular the Departments of Chemical Engineering and Applied Chemistry and Civil Engineering; the Faculty of Arts and Science – in particular the Departments of Chemistry, Ecology and Evolutionary Biology, Geography, Geology; and the Faculty of Forestry). Members of many of these faculties/departments are part of the core faculty supporting this proposal.

In addition, extensive discussions with faculty in other departments at UTSC involved in environmental research, and with other faculty at the St. George and Mississauga campuses, were initiated in 2008 and have continued to the present. The proposal was widely circulated to all interested faculty, with an invitation for involvement; substantive comments were made and the document has evolved into the present proposal. A similar process was also followed for those research colleagues working in other local universities and in government research laboratories. Discussions with current graduate students, especially the graduating M.Env.Sc. students at UTSC, have shown them to be fully supportive of this initiative.

1.4. Fields in the programs

The areas of study that provide the primary focus for graduate training and research in the new program have emerged, in part, from the current M.Env.Sc. graduate program in the general field of “Biophysical Interactions in Aquatic and Terrestrial Systems” and are listed below:

- Contaminant flux through surface and subsurface environments and biogeochemical cycles;
- Urban geoscience;
- Remediation and restoration of degraded environmental systems;
- Great Lakes ecosystems;
• Climate change and the environment; and
• Environmental science in transitional economies.

It should be noted that UTSC has had a long-standing educational interest in “transitional economies”, with a well-established undergraduate program in International Development Studies. A doctoral degree focusing, in part, on the environment and development is therefore a natural fit.

A number of strong research and teaching foci within environmental science already exist at UTSC supported by the current graduate faculty at the University, and also by their research colleagues from other departments within the university, from other universities and from government agencies. It is this group of researchers that constitute the core faculty for this proposed Ph.D. program. At UTSC there is expertise in such diverse areas as geochemistry, biochemistry, hydrology, hydrogeology, aquatic ecology, atmospheric physics and chemistry, climatology, surface processes including atmospheric and lacustrine processes, sedimentology, soil science, stratigraphy, geophysics, geomorphology, etc. These fields are all essential building blocks for advanced graduate training in a truly interdisciplinary practice of environmental science. The foci of the graduate program will be strengthened by the addition of like-minded faculty from other campuses within the University of Toronto system, as well as researchers from other universities and government research laboratories.

The core faculty associated with each of the areas of focus listed above is given in Table 1. The individual faculty listed in Table 1, currently outside of DPES, have formally agreed to act as core faculty for the Ph.D. program in Environmental Science. These individuals are either outside of DPES or outside the UTSC campus (but within the University of Toronto), or outside the University of Toronto system in other universities or in local government research laboratories.

As noted earlier, the M.Env.Sc. program at UTSC has a field designated by OCGS as “Biophysical Interactions in Aquatic and Terrestrial Systems” and has focused on the first four fields listed above that have been proposed for the Ph.D. program. Therefore the department already has extensive experience in teaching in these areas. Indeed a large number of graduate courses are already available covering these fields as a result of the M.Env.Sc. program.

1.5. Review concerns expressed in previous appraisal and actions taken
Not applicable as this a proposal for a new program.

1.6. Special matters and innovative features
This is the first program at the University of Toronto built around researchers and teachers with a wide range of traditional disciplinary backgrounds, but who focus on the interface areas between the disciplines involved and on a number of specific program objectives. Members of the core faculty at UTSC are trained in a range of traditional disciplines (e.g. biology, chemistry, ecology, engineering, geography, geology, and physics) and have been brought together within a single department at UTSC (DPES). The synergies that produced this unique proposal came about because of the interactions between faculty within one department and the realization that many significant environmental science problems could not be resolved within a single
traditional discipline. The M.Env.Sc. program was started specifically to take advantage of these synergies and the proposed Ph.D. program is a logical progression in graduate training in environmental science at the University.

2. THE FACULTY

2.1 List of faculty by field

Table 1 lists the 43 core faculty members (and their major fields of study) that are to be involved in the supervision of students and/or teaching of graduate courses in the proposed Ph.D. graduate program in Environmental Science. Included are both faculty whose primary appointment is in the Department of Physical & Environmental Sciences (DPES) at the University of Toronto Scarborough (UTSC), and faculty from the other two campuses within the Toronto system (St. George & UTM). This proposed Ph.D. program is therefore a fully “tri-campus” program, but with a home base at UTSC. Drawing on the wealth of professional expertise in the field of environmental science, a number of individuals will be appointed as Adjunct Faculty members. Table 1 lists their qualifications, existing cross-appointments to other graduate departments and institutions and gender.

There are a total of 17 Full Professors, 7 Associate Professors, 9 Assistant Professors, 9 Adjunct Faculty members who are Research Scientists, and 1 Professor Emeritus associated with the program. It is also worth noting that the core faculty includes four Tier 1 Canada Research Chairs (Dr. J. Chen, Chair of Remote Sensing of Terrestrial Ecosystems; Dr. D. Holdway, Chair of Aquatic Toxicology; Dr. H. Kronzucker, Chair of Metabolic Bioengineering of Crop Plants; and Dr. B. Sherwood Lollar, Chair of Isotopes of the Earth and Environment).

Furthermore, many core faculty are either holders of endowed chairs, directors of important laboratory facilities, holders of important research administrative positions at the University, or holders of positions with important scientific organizations both nationally and internationally (Dr. B. Branfireun, Dr. D. Cormack, Dr. M. Diamond, Dr. J. Donaldson, Dr. G. Evans, Dr. W. Gough, Dr. A. Miall, Dr. B. Sherwood Lollar, Dr. A. Simpson). The core faculty also hold important scientific editorial positions in international scientific journals dealing with the environment. This is an impressive list of individual researchers, who have published extensively in international refereed journals, and who have significant experience in graduate training and research. The curriculum vitae in Volume II give further detail on the scholarly attributes and graduate teaching abilities of the core faculty.

The Environmental Science faculty in the Department of Physical & Environmental Sciences (DPES) at UTSC is in a strong position to lead this proposed Ph.D. program at the University of Toronto, as this group already offers both undergraduate and master’s programs in Environmental Science. Further, DPES faculty already support undergraduate and graduate teaching and research in the focus areas of the Ph.D. program, namely: contaminant flux through surface and subsurface environments and biogeochemical cycles; urban geoscience; remediation and restoration of degraded environmental systems; Great Lakes ecosystems; climate change and the environment; and environmental science in transitional economies. The foci of the graduate program will be strengthened by the addition of like-minded faculty from other campuses within the University of Toronto system, as well as researchers from other universities and government research laboratories.
The core faculty listed in Table 1 have coalesced over several years, through shared research interests, joint research programs, shared research facilities and co-supervision of students within existing disciplinary programs. For example, Dr. F. Wania has collaborated extensively over several years with Dr. D. Muir, Environment Canada, Dr. T. Harner, Meteorological Service of Canada and Dr. T. Bidleman, Environment Canada. More recently Dr. M. Wells has collaborated with Dr. S. Bailey (DFO) and Dr. G. Arhonditsis has collaborated with Dr. R. Yerubandi (Environment Canada). Dr. W. Gough hosts a node of the Adaptations and Impacts Group of Environment Canada in his UTSC based Climate Lab providing an intellectual home for two Environment Canada scientists (Dr. M. Mirza, Dr. A. Fenech). These cooperative research ventures are more clearly documented within the research programs and research funding documented in the individual curriculum vitae in Volume II, and they demonstrate the efficacy and success of cooperative university-government research in the environment. Such joint research is especially important for the graduate students who are involved with large government laboratories as part of their graduate training at UTSC. The opportunities for future careers in government research are clearly enhanced through this continued contact with government scientists at the graduate level.

The core faculty are closely linked to other important research centres both within the university (e.g. the Centre for Global Change – Dr. J. Abbatt, Dr. M. Diamond, Dr. J. Donaldson, Dr. W. Gough, Dr. F. Wania, Dr. M. Wells, etc.), locally at other universities (e.g. Watershed Ecosystem Program at Trent – Dr. F. Wania, etc.) and nationally (e.g., CRESTech at Waterloo; e.g. Dr. K. Howard, Dr. R. Fulthorpe, etc.). In addition, core faculty work closely with government research agencies such as the Federal Department of the Environment (e.g. Dr. G. Arhonditsis, Dr. W. Gough, Dr. F. Wania, etc.), the Federal Department of Fisheries and Oceans (e.g. Dr. M. Wells, etc.), and the Ontario Ministry of Natural Resources, the Ontario Ministry of the Environment (e.g. Dr. M. Diamond) and area municipalities (e.g. Dr. N. Eyles; Dr. W. Gough, Dr. K. Howard).

The adjunct appointments that have already occurred (e.g. Dr. A. Fenech, Dr. M. Mirza, Dr. D. Muir) and those that are proposed (Dr. S. Bailey, Dr. T. Bidleman, Dr. I. Droppo, Dr. T. Harner, Dr. H. Hung and Dr. R. Yerubandi) have all emerged as part of past research with core faculty.
### TABLE 1: Core faculty members designated by rank, gender, home unit, supervisory privileges and fields of focus

<table>
<thead>
<tr>
<th>Faculty Name &amp; Rank</th>
<th>M/F</th>
<th>Home Unit ¹</th>
<th>Supervisory Privileges ²</th>
<th>1³</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Category 3 ⁴</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arhonditsis, G</td>
<td>M</td>
<td>DPES - UTSC</td>
<td>Full</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assistant Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cormack, D</td>
<td>M</td>
<td>DPES - UTSC</td>
<td>Full</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full Professor &amp; Chair, Department of Physical &amp; Environmental Sciences</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dittrich, M</td>
<td>F</td>
<td>DPES - UTSC</td>
<td>Full</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assistant Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Donaldson, J</td>
<td>M</td>
<td>DPES – UTSC</td>
<td>Full</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full Professor &amp; Associate Chair, Graduate Studies (Chemistry)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eyles, N</td>
<td>M</td>
<td>DPES - UTSC</td>
<td>Full</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Full Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fulthorpe, R</td>
<td>F</td>
<td>DPES - UTSC</td>
<td>Full</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associate Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gough, W</td>
<td>M</td>
<td>DPES - UTSC</td>
<td>Full</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associate Professor &amp; Vice-Dean, Graduate Education &amp; Program Development, UTSC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Howard, K</td>
<td>M</td>
<td>DPES - UTSC</td>
<td>Full</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Full Professor &amp; Vice-President, International Association of Hydrogeologists</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isaac, ME</td>
<td>F</td>
<td>DPES - UTSC</td>
<td>Associate</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Assistant Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kerman, K</td>
<td>M</td>
<td>DPES - UTSC</td>
<td>Full</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assistant Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mitchell, C</td>
<td>M</td>
<td>DPES - UTSC</td>
<td>Full</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assistant Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simpson, A</td>
<td>M</td>
<td>DPES - UTSC</td>
<td>Full</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associate Professor &amp; Director, Environmental NMR Centre (UTSC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simpson, M</td>
<td>F</td>
<td>DPES - UTSC</td>
<td>Full</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associate Professor &amp; Associate Director, Environmental NMR Centre at UTSC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wania, F</td>
<td>M</td>
<td>DPES - UTSC</td>
<td>Full</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wells, ME</td>
<td>M</td>
<td>DPES - UTSC</td>
<td>Full</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assistant Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faculty Name &amp; Rank</td>
<td>M/F</td>
<td>Home Unit</td>
<td>Supervisory Privileges</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------------</td>
<td>-----</td>
<td>-----------</td>
<td>------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abbatt, JPD Full Professor &amp; Associate Director, Centre for Global Change Science</td>
<td>M</td>
<td>Chemistry</td>
<td>Full</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Berquist, B Assistant Professor</td>
<td>F</td>
<td>Geology</td>
<td>Full</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boonstra, R Full Professor</td>
<td>M</td>
<td>Biological Sciences - UTSC</td>
<td>Full</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Branfireun, B Associate Professor &amp; Director, UTM Programs in Environment</td>
<td>M</td>
<td>Geography - UTM</td>
<td>Full</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chen, JM Full Professor, Tier 1 Canada Research Chair</td>
<td>M</td>
<td>Geography</td>
<td>Full</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cowling, S Associate Professor</td>
<td>F</td>
<td>Geography</td>
<td>Full</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edwards, E Full Professor</td>
<td>F</td>
<td>Chemical Engineering &amp; Applied Chemistry</td>
<td>Full</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evans, G Full Professor &amp; Director, Southern Ontario Centre for Atmospheric Aerosol Research</td>
<td>M</td>
<td>Chemical Engineering &amp; Applied Chemistry</td>
<td>Full</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ferris, G Full Professor</td>
<td>M</td>
<td>Geology</td>
<td>Full</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>He, Y Assistant Professor</td>
<td>F</td>
<td>Geography - UTM</td>
<td>Associate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kronzucker, H Full Professor &amp; President, Tier 1 Canada Research Chair</td>
<td>M</td>
<td>Biological Sciences – UTSC</td>
<td>Full</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miall, A Full Professor &amp; President, Academy of Science, Royal Society of Canada</td>
<td>M</td>
<td>Geology</td>
<td>Full</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sherwood-Lollar, B Full Professor &amp; Director, Isotope Laboratory Tier 1 Canada Research Chair</td>
<td>F</td>
<td>Geology</td>
<td>Full</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Williams, D Full Professor &amp; Board of Directors, Toronto Zoo</td>
<td>M</td>
<td>Biological Sciences – UTSC</td>
<td>Full</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wortman, U Associate Professor</td>
<td>M</td>
<td>Geology</td>
<td>Full</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faculty Name &amp; Rank</td>
<td>M/F</td>
<td>Home Unit ¹</td>
<td>Supervisory Privileges ²</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>-------------</td>
<td>--------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Category 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bailey, S</td>
<td>F</td>
<td>Department of Fisheries &amp; Oceans</td>
<td>Associate</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research Scientist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjunct Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bidleman, TF</td>
<td>M</td>
<td>Environment Canada Centre for Atmospheric Research Experiments (CARE)</td>
<td>Associate</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senior Research Scientist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjunct Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Droppo, IG</td>
<td>M</td>
<td>Environment Canada</td>
<td>Associate</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research Scientist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjunct Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fenech, A</td>
<td>M</td>
<td>Environment Canada</td>
<td>Associate</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research Scientist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjunct Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greenwood, B</td>
<td>M</td>
<td>DPES - UTSC</td>
<td>Full</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professor Emeritus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harner, T</td>
<td>M</td>
<td>Environment Canada</td>
<td>Associate</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senior Research Scientist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjunct Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harner, T</td>
<td>M</td>
<td>Environment Canada</td>
<td>Associate</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senior Research Scientist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjunct Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holdway, D</td>
<td>M</td>
<td>Faculty of Science at UOIT</td>
<td>Associate</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full Professor, Tier 1 Canada Research Chair</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hung, H</td>
<td>F</td>
<td>Environment Canada</td>
<td>Associate</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research Scientist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjunct Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kirkwood, A</td>
<td>F</td>
<td>Faculty of Science at UOIT</td>
<td>Associate</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assistant Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mirza, M</td>
<td>M</td>
<td>Environment Canada</td>
<td>Associate</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research Scientist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjunct Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muir, D</td>
<td>M</td>
<td>Environment Canada</td>
<td>Associate</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senior Research Scientist &amp; Section Chief: Priority Substances Exposure Adjunct Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yerubandi, RR</td>
<td>M</td>
<td>Environment Canada</td>
<td>Associate</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research Scientist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjunct Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Notes:
1. The budget unit paying the salary of the faculty member. The Department of Physical & Environmental Sciences is the department in which the budgetary appointment for the first 15 faculty resides. Consistent with University policy, all U of T graduate faculty have appointments in tri-campus graduate departments.
2. Full supervisory privileges allow student supervision or co-supervision up to the Ph.D. level. Associate supervisory privileges allow supervision or co-supervision up to the M.Sc. level.
3. The field numbers refer to: 1 Contaminant flux; 2. Urban geoscience; 3. Remediation and restoration of degraded environmental systems; 4. The Great Lakes ecosystem; 5. Climate change and the environment; 6. Environmental science and transitional economies.
4. Category 3: these are tenured or tenure-track core faculty members who are involved in teaching and/or supervision in other graduate program(s) in addition to being a core member of the graduate program under review.
5. Category 5: other core faculty: this category includes emeritus professors with supervisory privileges and persons appointed from government laboratories as adjunct professors.

2.2 External operating research funding

Table 2 summarizes the pattern of research funding (operating) for the core faculty since 2002 and Table 2b summarizes separately the funding of major research equipment for the same period. It is evident that the core faculty are extremely well supported by both external and internal research funding. Each new faculty member hired in the Department of Physical & Environmental Sciences (DPES) receives significant start-up funds from the department, on the order of $100,000 to $200,000, and are promised a substantial matching component from both federal (CFI) and provincial (ORF) programs. They are also eligible to apply for a start-up grant and a matching grant from the Connaught Fund of the university. Depending on need, total start-up funding packages have been in the range of $400,000 to $700,000.

From the curricula vitae (Volume II) it will be clear that virtually all core faculty hold a Natural Science and Engineering Research Council Canada (NSERC) Discovery Grant, which is the core funding necessary to initiate and maintain a long term graduate training program. Grants from the science councils (principally NSERC, but also including other national councils such as NERC in the UK, NSF in the USA, etc., in conjunction with co-workers in these countries) have grown steadily from 2002-03 when the core faculty received $819,307 to 2008-09, when this source totalled $1,856,436. Funds from this source therefore more than doubled over the seven years. Funding from other peer reviewed sources totalled $1,936,357 in 2002-2003 and $2,815,250 in 2008-2009, and, on average, has remained stable over the last seven years.

The total granting council funding of the Category 3 core faculty over the last seven years has averaged over $328,000 per year; this is an annual average support of just under $47,000 per year, per faculty member. If funding from peer reviewed, but non-granting council sources (e.g., Canada Foundation for Innovation, Ontario Innovation Trust, Canada Foundation for Climate and Atmospheric Science, etc.) is included, the funding per core faculty member per year over the last seven years is over $111,000. It is clear therefore that the core faculty at UTSC and their associated core faculty within the University of Toronto have strong, well-funded research programs which already support an excellent cadre of research masters and doctoral graduate students, registered through disciplinary programs. The students to be admitted to the doctoral program proposed will therefore be well supported by external funding to their supervisors.
TABLE 2: Research funding (operating) by source and year

<table>
<thead>
<tr>
<th>Year</th>
<th>Granting Councils 2</th>
<th>Other Peer Adjudicated 3</th>
<th>Contracts 4</th>
<th>Others 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002-03</td>
<td>819,307</td>
<td>1,936,357</td>
<td>95,048</td>
<td>38,446</td>
</tr>
<tr>
<td>2003-04</td>
<td>932,732</td>
<td>1,193,192</td>
<td>105,048</td>
<td>344,500</td>
</tr>
<tr>
<td>2004-05</td>
<td>1,150,277</td>
<td>2,497,019</td>
<td>119,679</td>
<td>141,443</td>
</tr>
<tr>
<td>2005-06</td>
<td>1,262,320</td>
<td>1,946,835</td>
<td>96,679</td>
<td>120,000</td>
</tr>
<tr>
<td>2006-07</td>
<td>1,869,881</td>
<td>1,418,735</td>
<td>62,679</td>
<td>100,400</td>
</tr>
<tr>
<td>2007-08</td>
<td>1,939,076</td>
<td>1,695,283</td>
<td>85,530</td>
<td>17,500</td>
</tr>
<tr>
<td>2008-09</td>
<td>1,856,436</td>
<td>2,815,250</td>
<td>156659</td>
<td>50,000</td>
</tr>
<tr>
<td>Totals</td>
<td>9,830,029</td>
<td>13,502,671</td>
<td>721,322</td>
<td>812,289</td>
</tr>
</tbody>
</table>

Notes:
1. This refers to the university’s academic year.
2. Granting councils include not only the Natural Sciences and Engineering Research Council Canada and the Social Sciences and Humanities Research Council Canada, but also similar bodies from outside of Canada (e.g. the Natural Environment Research Council in the U.K.). In the latter instances grants are held jointly between core faculty members and their international co-workers and in this case and all other similar cases where there is more than one investigator supported by an award, funds have been divided equally unless otherwise awarded.
3. Other peer reviewed research support reported is funding from, e.g., the Canada Foundation for Innovation, the Ontario Innovation Trust, the Canadian Foundation for Climate and Atmospheric Sciences (CFCAS), etc.
4. Contracts include those from bodies such as the Ontario Ministry of the Environment, Environment Canada, etc.
5. Other research funds include internal university funding such as start up funds for new faculty, the Connaught Grants program, etc.
6. Equipment grants and conference and publication grants are excluded from the totals presented here; equipment grants are listed separately in Table 2b. Only core faculty in Category 3 have been included.
* These operating funds have been spread over a number of graduate units at the university (see Table 1).
### TABLE 2b: Research funding (equipment) by source and year

<table>
<thead>
<tr>
<th>Year</th>
<th>Granting Councils</th>
<th>Other Peer Adjudicated</th>
<th>Contracts</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002-03</td>
<td>89,229</td>
<td></td>
<td></td>
<td>170,000</td>
</tr>
<tr>
<td>2003-04</td>
<td>166,027</td>
<td>600,000</td>
<td></td>
<td>827,500</td>
</tr>
<tr>
<td>2004-05</td>
<td>176,764</td>
<td></td>
<td></td>
<td>42,500</td>
</tr>
<tr>
<td>2005-06</td>
<td>650,493</td>
<td>125,000</td>
<td></td>
<td>42,500</td>
</tr>
<tr>
<td>2006-07</td>
<td>202,895</td>
<td>1,405,515</td>
<td></td>
<td>42,500</td>
</tr>
<tr>
<td>2007-08</td>
<td>117,738</td>
<td>100,000</td>
<td></td>
<td>42,500</td>
</tr>
<tr>
<td>2008-09</td>
<td>377,173</td>
<td>200,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>1,666,755</td>
<td>2,430,515</td>
<td></td>
<td>1,125,000</td>
</tr>
</tbody>
</table>

**Notes:**
1. This refers to the university’s academic year.
2. Granting councils include not only the Natural Sciences and Engineering Research Council Canada and the Social Sciences and Humanities Research Council Canada, but also similar bodies from outside of Canada (e.g., the Natural Environment Research Council in the U.K., the National Science Foundation in the U.S.A., the Danish Natural Sciences Research Council, etc.). In the latter instances grants are held jointly between core faculty members and their international co-workers and in this case and all other similar cases where there is more than one investigator supported by an award, funds have been divided equally between the joint participants.
3. Other peer reviewed research support reported is funding from, e.g., the Canada Foundation for Innovation, the Ontario Innovation Trust, the Canadian Foundation for Climate and Atmospheric Sciences (CFCAS), etc.
4. Contracts include those from bodies such as the Ontario Ministry of the Environment, Environment Canada, etc.
5. Other research funds include internal university funding such as start up funds for new faculty, the Connaught Grants program, etc. Only core faculty in Category 3 have been included. However, it does not include the recent AIF Funds awarded by the university for the start up of the MEnvSc program as these are dealt with separately in Section 3.2.

### 2.3 Graduate supervision

Besides the graduate supervision carried out under the auspices of the M.Env.Sc. program at UTSC, faculty in DPES are also cross-appointed to one or more other graduate units within the university, including the Centre for Environment. This has allowed UTSC faculty to supervise research students up to the doctoral level in individual discipline-oriented departments. Indeed over the last several years, as the faculty has grown at UTSC, some DPES faculty have assumed prominent roles in these existing graduate programs (e.g. Dr. J. Donaldson, Associate Chair, Graduate Studies in Chemistry; W. Gough, Graduate Coordinator in Geography), and have also assumed prominent research administration roles at UTSC (e.g. Dr. R. Boonstra, Vice-Principal, Research, UTSC, 2003-2005; Dr. W. Gough, Vice-Dean, Graduate Education &
Program Development, 2009-2010; Dr. B. Greenwood, Associate Chair and Director, Master of Environmental Science program, 2005-2007).

Table 3 summarizes the current and past supervisory load of the core graduate faculty (Category 3 and Category 5) at UTSC. This table includes supervisions of those students in the research Masters and Ph.D. streams in other departments at the University of Toronto, as well as the supervisions of the M.Env.Sc. students in Programs I and II at UTSC. The graduate supervision load of the core faculty members outside of UTSC is given in Table 3b. It should be noted that several of the core faculty are recent appointments (both at UTSC and elsewhere in the university or at UOIT, e.g., Arhonditsis, Isaac, Dittrich, Kerman, Wells at UTSC; He at UTM; Kirkwood at UOIT) and have only just begun to build a graduate research group. Other core members are senior faculty with many years of experience of training graduate students (e.g. Boonstra, Eyles, Greenwood, Howard at UTSC; Chen, Evans, Ferris, Miall, Sherwood Lollar at St. George; Holdway at UOIT). Nevertheless, it is clear that the core faculty has extensive experience with graduate research and training; the UTSC faculty have graduated more than 150 masters and more than 50 Ph.D. students, while the rest of the core faculty have supervised more than 28 masters and more than 30 Ph.D. students in their careers.

**TABLE 3: Graduate supervisions listed by core faculty at UTSC**

<table>
<thead>
<tr>
<th>Member</th>
<th>Category 3</th>
<th>Completed</th>
<th>Current</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Arhonditsis, G</td>
<td>NIL</td>
<td>5</td>
<td>NIL</td>
<td>4.5</td>
</tr>
<tr>
<td>Boonstra, R,</td>
<td>NIL</td>
<td>15</td>
<td>3</td>
<td>2.5</td>
</tr>
<tr>
<td>Cormack, D,</td>
<td>NIL</td>
<td>21</td>
<td>10</td>
<td>NIL</td>
</tr>
<tr>
<td>Dittrich, M</td>
<td>NIL</td>
<td>7</td>
<td>2</td>
<td>NIL</td>
</tr>
<tr>
<td>Donaldson, D</td>
<td>NIL</td>
<td>6</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Eyles, N</td>
<td>NIL</td>
<td>18</td>
<td>3.5</td>
<td>1</td>
</tr>
<tr>
<td>Fulthorpe, R</td>
<td>NIL</td>
<td>3.5</td>
<td>2</td>
<td>NIL</td>
</tr>
<tr>
<td>Gough, W</td>
<td>NIL</td>
<td>16.5</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Howard, K</td>
<td>NIL</td>
<td>19</td>
<td>2.5</td>
<td>1</td>
</tr>
<tr>
<td>Isaac, M</td>
<td>NIL</td>
<td>NIL</td>
<td>NIL</td>
<td>NIL</td>
</tr>
<tr>
<td>Kerman, K</td>
<td>NIL</td>
<td>NIL</td>
<td>NIL</td>
<td>NIL</td>
</tr>
<tr>
<td>Kronzucker, H</td>
<td>NIL</td>
<td>1</td>
<td>1.5</td>
<td>1</td>
</tr>
<tr>
<td>Mitchell, C</td>
<td>NIL</td>
<td>1</td>
<td>NIL</td>
<td>1</td>
</tr>
<tr>
<td>Simpson, A</td>
<td>NIL</td>
<td>1</td>
<td>NIL</td>
<td>4.5</td>
</tr>
<tr>
<td>Simpson, M</td>
<td>NIL</td>
<td>4</td>
<td>1.5</td>
<td>1</td>
</tr>
<tr>
<td>Wania, F</td>
<td>NIL</td>
<td>4</td>
<td>5</td>
<td>7</td>
</tr>
</tbody>
</table>

The table includes the numbers of completed and current supervisions for each faculty member. The completed numbers are listed in the Completed column, and the current numbers are listed in the Current column. The categories are listed in the Category column, and the faculty members are listed in the Member column. The completed and current numbers of thesis supervisions are listed in the Completed and Current columns, respectively. The numbers are listed in increments of one, and the total number of completed and current supervisions is listed in the Completed and Current columns, respectively. The table is formatted in a table with columns for Member, Category, Completed, and Current.
### Completed and Current Numbers of Thesis\(^1\) Supervisions by Faculty Member

<table>
<thead>
<tr>
<th>Member</th>
<th>Completed</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Master’s</td>
<td>PhD</td>
</tr>
<tr>
<td>Category 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wells, M</td>
<td>1</td>
<td>NIL</td>
</tr>
<tr>
<td>Williams, D</td>
<td>15.5</td>
<td>7.5</td>
</tr>
<tr>
<td>Category 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greenwood, B</td>
<td>14</td>
<td>9</td>
</tr>
<tr>
<td>Mirza, M</td>
<td>NIL</td>
<td>NIL</td>
</tr>
</tbody>
</table>

**Notes:**
1. The value of 0.5 student indicates co-supervision.
2. The difference between current supervisions and past supervisions for individual faculty is simply a reflection of the age structure of the faculty.

### TABLE 3b: Graduate supervisions listed by core faculty based outside UTSC

<table>
<thead>
<tr>
<th>Member</th>
<th>Completed</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Master’s</td>
<td>PhD</td>
</tr>
<tr>
<td>Category 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abbatt, J</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Bergquist, B</td>
<td>NIL</td>
<td>NIL</td>
</tr>
<tr>
<td>Branfireun, B</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Chen, J</td>
<td>4.5</td>
<td>3</td>
</tr>
<tr>
<td>Cowling, S,</td>
<td>4.5</td>
<td>NIL</td>
</tr>
<tr>
<td>Diamond, M</td>
<td>31</td>
<td>8</td>
</tr>
<tr>
<td>Edwards, E</td>
<td>17</td>
<td>5</td>
</tr>
<tr>
<td>Evans, G</td>
<td>31</td>
<td>3</td>
</tr>
<tr>
<td>Ferris, G</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>He, Y</td>
<td>NIL</td>
<td>NIL</td>
</tr>
<tr>
<td>Miall, A</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Sherwood Lollar, B</td>
<td>10.5</td>
<td>5.5</td>
</tr>
<tr>
<td>Wortmann, U</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>
### Completed and Current Numbers of Thesis\(^1\) Supervisions by Faculty Member

<table>
<thead>
<tr>
<th>Member</th>
<th>Master’s</th>
<th>PhD</th>
<th>PDF</th>
<th>Master’s</th>
<th>PhD</th>
<th>PDF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holdway, D</td>
<td>3</td>
<td>13</td>
<td>4</td>
<td>4</td>
<td>NIL</td>
<td>1</td>
</tr>
<tr>
<td>Kirkwood, A</td>
<td>NIL</td>
<td>NIL</td>
<td>NIL</td>
<td>2</td>
<td>NIL</td>
<td>NIL</td>
</tr>
</tbody>
</table>

**Notes:**

1. The value of 0.5 student indicates co-supervision.
2. The difference between current supervisions and past supervisions for individual faculty is simply a reflection of the age structure of the faculty.

### 2.4 Current teaching assignments

The teaching assignments of the core faculty for the years 2006-07, 2007-08 and 2008-09 are documented in Tables 4a, 4b, and 4c respectively. The normal teaching load in DPES once a newly hired faculty member reaches the three year review process is 1.5 courses (three semester-long courses); this assignment generally consists of two undergraduate and one graduate half-courses, although there are frequent variations on this. In addition to the basic 1.5 half-courses, faculty also assume responsibility for those students in directed readings courses at both undergraduate (e.g. EESC24H, *Advanced Readings in Environmental Science*) and graduate (e.g. ENV1114 H, ENV1115H *Advanced Readings in Environmental Science*) levels, as well as supervision of undergraduate (e.g. EESD09H, EESD10Y *Research Project in Environmental Science*) and graduate research projects (e.g. ENV1101Y *Research Paper*). These latter commitments involve relatively small numbers of students at any one time (e.g. 1-2 in the readings courses, 1-2 in the research courses).

It should be noted from the tables that a considerable number of graduate courses are already offered at UTSC as the M.Env.Sc. program is based at UTSC; the M.Env.Sc. program started with 10 graduate courses in 2005-06 (the program started in January of that year), 18 in 2006-07 (the first full year) and 25 in 2008-09. These are primarily master’s level courses, for those students enrolled in the M.Env.Sc. program. However, many of the courses have been accepted by other departments across the university as fulfilling the course requirements for Ph.D. students. This is significant as many of these courses will be upgraded to full Ph.D. level for this proposed program. A significant number of these courses have been offered on an overload stipend teaching basis by the core faculty. This is gradually being phased out and should not impact the ability to mount the proposed Ph.D. program. UTSC has already appointed or is in the process of appointing a total of seven new faculty since the M.Env.Sc. was initiated. Course offerings in the proposed PhD program will be presented and discussed in Section 4.4. below.
### TABLE 4a: Teaching Assignments for core faculty in 2006-2007

<table>
<thead>
<tr>
<th>Faculty Member</th>
<th>Rank</th>
<th>Undergraduate</th>
<th>Graduate</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbatt, J</td>
<td>Professor</td>
<td>CHM415H</td>
<td>CHM1401H</td>
<td>Associate Director, Centre for Global Change</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ENV235Y</td>
<td>CHM1415H</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CHM310S</td>
<td>CHM1550H</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SCI199H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arhonditsis, G</td>
<td>Assistant Professor</td>
<td>EESA11H</td>
<td>ENV1114H</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>EESC24H</td>
<td>ENV1118H*</td>
<td></td>
</tr>
<tr>
<td>Bergquist, B</td>
<td>Assistant Professor</td>
<td>NIL</td>
<td>NIL</td>
<td>Hired 2008</td>
</tr>
<tr>
<td>Boonstra, R,</td>
<td>Full Professor</td>
<td>BGYC52H</td>
<td>NIL</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BGYC58H</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BGYC59H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Branfireun, B</td>
<td>Associate Professor</td>
<td>GGR117Y</td>
<td>GGR1392</td>
<td>Director, UTM Programs in Environment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GGR217H</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ENV232H</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>GGR309H</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>GGR315H</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ENV331H</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>GGR407H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chen, J</td>
<td>Full Professor</td>
<td>GGR337H</td>
<td>GGR1911H</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>GGR206H</td>
<td>GGR2149H</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>GGR413H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cowling, S</td>
<td>Associate Professor</td>
<td>ENV236Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>GGR303H</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>GGR403H</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>GGR493H</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PLN425Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>GGR1149H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cormack, D</td>
<td>Full Professor</td>
<td>NIL</td>
<td>ENV1100Y</td>
<td>Chair, DPES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ENV1116Y</td>
<td></td>
</tr>
<tr>
<td>Diamond, M</td>
<td>Full Professor</td>
<td>JEG221</td>
<td>JGE1212</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SCI199</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dittrich, M</td>
<td>Assistant Professor</td>
<td>NIL</td>
<td>NIL</td>
<td>Hired July 2009</td>
</tr>
<tr>
<td>Donaldson, D</td>
<td>Full Professor</td>
<td>CHMB20H</td>
<td>CHM1401H</td>
<td>Associate Chair, Graduate Studies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CHMB55H</td>
<td>CHM1550H</td>
<td>(Chemistry)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(25% for both)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edwards, E</td>
<td>Full Professor</td>
<td>NIL</td>
<td>CHE1134</td>
<td></td>
</tr>
<tr>
<td>Eyles, N</td>
<td>Full Professor</td>
<td>EESA06H</td>
<td>ENV1101Y</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>EESC16H</td>
<td>ENV1106H*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>EESD07H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ferris, G</td>
<td>Full Professor</td>
<td>GLG448H</td>
<td>GLG1000H</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>GLG351H</td>
<td>GLG2701H</td>
<td></td>
</tr>
<tr>
<td>Faculty Member</td>
<td>Rank</td>
<td>Undergraduate</td>
<td>Graduate</td>
<td>Comments</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------</td>
<td>---------------------</td>
<td>----------</td>
<td>-----------------------------------------</td>
</tr>
<tr>
<td><strong>Category 3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fulthorpe, R</td>
<td>Associate Professor</td>
<td>EESB16H, EESC30H, EESC16/D07, BGYD01Y</td>
<td>ENV1104H*, ENV1107H, ENV1108H, ENV1114H</td>
<td></td>
</tr>
<tr>
<td>Gough, W</td>
<td>Associate Professor</td>
<td>NIL</td>
<td>ENV1112H, ENV1117H*</td>
<td>On research leave, full year</td>
</tr>
<tr>
<td>Howard, K</td>
<td>Full Professor</td>
<td>EESA07H, EESC07H</td>
<td>ENV1101Y, ENV1108H, ENV1113H</td>
<td>On research leave, half-year</td>
</tr>
<tr>
<td>Isaac, M</td>
<td>Assistant Professor</td>
<td>NIL</td>
<td>NIL</td>
<td>Hired July 2009</td>
</tr>
<tr>
<td>Kerman, K</td>
<td>Assistant Professor</td>
<td>NIL</td>
<td>NIL</td>
<td>Hired July 2008</td>
</tr>
<tr>
<td>Kronzucker, H</td>
<td>Assistant Professor</td>
<td>BGYN50H, BGYC61H</td>
<td>NIL</td>
<td></td>
</tr>
<tr>
<td>Mitchell, C</td>
<td>Assistant Professor</td>
<td>GGR217H (UTM)</td>
<td>NIL</td>
<td>Hired, July 2008</td>
</tr>
<tr>
<td>Sherwood Lollar, B</td>
<td>Full Professor</td>
<td>NIL</td>
<td>NIL</td>
<td></td>
</tr>
<tr>
<td>Simpson, A</td>
<td>Associate Professor</td>
<td>CHEMC11H, CHEMC16H, CHEMD90/91Y</td>
<td>CHEM1401Y, CHEM1404H</td>
<td>Supervisor of Studies (Chemistry, UTSC) &amp; Director, UTSC Environmental NMR Centre</td>
</tr>
<tr>
<td>Simpson, M</td>
<td>Associate Professor</td>
<td>EESB05H, EESD32H</td>
<td>CHM1401Y, CHM1420H, ENV1105H</td>
<td>Associate Director, UTSC Environmental NMR Centre</td>
</tr>
<tr>
<td>Wania, F</td>
<td>Full Professor</td>
<td>NIL</td>
<td>ENV1101Y</td>
<td>On research leave, full year</td>
</tr>
<tr>
<td>Wells, M</td>
<td>Assistant Professor</td>
<td>EESC19H</td>
<td>NIL</td>
<td>Appointed March 2006</td>
</tr>
<tr>
<td>Williams, D</td>
<td>Full Professor</td>
<td>BGYC53S, BGYD01Y, BGYD51H</td>
<td>ENV1111H</td>
<td></td>
</tr>
<tr>
<td>Wortmann, U</td>
<td>Assistant Professor</td>
<td>ENV497, GLG216, GLG430, GIG340</td>
<td>GLG2303</td>
<td></td>
</tr>
<tr>
<td><strong>Category 5</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fenech, A</td>
<td>Associate Professor</td>
<td>NIL</td>
<td>NIL</td>
<td>Appointed adjunct at UTSC in 2009</td>
</tr>
<tr>
<td>Greenwood, B</td>
<td>Professor Emeritus</td>
<td>NIL</td>
<td>ENV1100H, ENV1101Y, ENV1114H, ENV1116Y</td>
<td></td>
</tr>
</tbody>
</table>
## Teaching Assignments for 2006/07

<table>
<thead>
<tr>
<th>Faculty Member</th>
<th>Faculty Member</th>
<th>Faculty Member</th>
<th>Faculty Member</th>
<th>Faculty Member</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Category 5</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holdway, D</td>
<td>Full Professor</td>
<td>Biology202H</td>
<td>Biology441Y</td>
<td>N/L</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Biology403H</td>
<td>Biology442Y</td>
<td></td>
</tr>
<tr>
<td>Kirkwood, A</td>
<td>Assistant</td>
<td>NIL</td>
<td>NIL</td>
<td>Newly hired in 2008</td>
</tr>
<tr>
<td></td>
<td>Professor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mirza, M</td>
<td>Associate</td>
<td>GGR367H</td>
<td>N/L</td>
<td>Appointed adjunct at UTSC in 2006</td>
</tr>
<tr>
<td></td>
<td>Professor</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Notes:

1. The courses asterisked are to form part of the Ph.D. course list selection; they will be upgraded to the 2000 level and will be open to both Ph.D. and M.Sc./M.Env.Sc. students but the course materials and the expectations will be greater for the Ph.D. program. There are at least five courses in the present M.Env.Sc. program which will not be open to Ph.D. students due to their “professional content”.

2. The “H” designation is generally for a semester-long course consisting of a minimum of 2 or 3 hours of lectures and/or seminars, plus laboratories and tutorials. It is worth one-half credit in the UTSC system. One exception to the norm is the graduate course ENV1100H, which is the mandatory core course for the M.Env.Sc. program; it is a half-credit course spread over 2 semesters. The “Y” designation is for a course lasting 2 full semesters and worth a full credit; some courses such as ENV1101Y is the Research Paper course, which may take longer than 2 semesters.

3. The normal course assignment for faculty at UTSC, who are not on research leave during the academic year is 1.5 full courses (or 3 half-courses); on top of this faculty may be expected to supervise Readings Courses (e.g. ENV1114H, ENV1115H) and students undertaking a masters Research Paper (ENV1101Y) or an undergraduate Research Paper (EESD09H/D10Y). The 1.5 half-courses may be a mix of undergraduate and graduate courses. It should be noted that the UTSC faculty did take on extra “over-load” teaching during the spin-up of the M.Env.Sc. program over the first three years.

4. Several courses in the M.Env.Sc. program are not represented in the Table as they are deemed “professional” and usually taught by practicing professionals, who are not core faculty; these courses will definitely not be open to the Ph.D. stream students.

5. ENV1101Y is the graduate Research Paper course of the M.Env.Sc. program; one faculty member is usually responsible for the course as a whole, while individual students are supervised by other faculty members.

6. EESC24H is an advanced readings course in the undergraduate program and EESD09H/D10Y are 4th year half or full credit undergraduate Project Courses as is BGYD01Y, CHMD90 and CHMD91.

7. ENV1105H is cross-listed with undergraduate course EESD32H.

8. CHM1401H is team taught with 6 other faculty members.

9. Those graduate course that at present form part of another graduate program are designated by the CHM, GLG, BOT, prefixes. Those with the prefix ENV are part of the M.Env.Sc. program at UTSC.
TABLE 4b: Teaching assignments for core faculty in 2007-2008

<table>
<thead>
<tr>
<th>Faculty Member 2</th>
<th>Rank</th>
<th>Undergraduate</th>
<th>Graduate 3</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbatt, J</td>
<td>Full Professor</td>
<td>CHM415H</td>
<td>CHM1401H</td>
<td>Associate Director, Centre for Global Change</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ENV235Y</td>
<td>CHM1415H</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CHM310S</td>
<td>CHM1550H</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SCI199H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arhonditsis, G</td>
<td>Assistant Professor</td>
<td>EESC24H</td>
<td>ENV1118H</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ENV1114H</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ENV1119H</td>
<td></td>
</tr>
<tr>
<td>Bergquist, B</td>
<td>Assistant Professor</td>
<td>NIL</td>
<td>NIL</td>
<td>Hired 2008</td>
</tr>
<tr>
<td>Boonstra, R,</td>
<td>Full Professor</td>
<td>BGYC52H</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BGYC58H</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BGYC59H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Branfireun,</td>
<td>Associate Professor</td>
<td>GGR117Y</td>
<td>GGR1392</td>
<td>Director, UTM Programs in Environment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GGR217H</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ENV232H</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>GGR309H</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>GGR315H</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ENV331H</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>GGR407H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chen, J</td>
<td>Full Professor</td>
<td>GGR337H</td>
<td>GGR1911H</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>GGR206H</td>
<td>GGR2149H</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>GGR413H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cormack, D</td>
<td>Full Professor</td>
<td>NIL</td>
<td>ENV1100H</td>
<td>Chair, DPES &amp; Director, MEnvSc Program</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ENV1116Y</td>
<td></td>
</tr>
<tr>
<td>Cowling, S</td>
<td>Associate Professor</td>
<td>ENV236Y</td>
<td>GLG3603H</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>GGR303H</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>GGR403H</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>FOR401H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diamond, M</td>
<td>Full Professor</td>
<td>JEG221</td>
<td>JEG1212</td>
<td></td>
</tr>
<tr>
<td>Dittrich, M</td>
<td>Assistant Professor</td>
<td>NIL</td>
<td>NIL</td>
<td>Newly Hired July, 2009</td>
</tr>
<tr>
<td>Donaldson, D</td>
<td>Full Professor</td>
<td>NIL</td>
<td>NIL</td>
<td>On research leave, full year</td>
</tr>
<tr>
<td>Edwards, E</td>
<td>Full Professor</td>
<td>JCC1313</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eyles, N</td>
<td>Full Professor</td>
<td>EESA05 (50%)</td>
<td>ENV1106H</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ENV1108H</td>
<td></td>
</tr>
<tr>
<td>Ferris, G</td>
<td>Full Professor</td>
<td>NIL</td>
<td>NIL</td>
<td></td>
</tr>
<tr>
<td>Faculty Member</td>
<td>Rank</td>
<td>Undergraduate</td>
<td>Graduate</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------</td>
<td>--------------</td>
<td>---------------</td>
<td>----------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Fulthorpe, R</td>
<td>Associate Professor</td>
<td>EESB16H, EESC30H</td>
<td>ENV1104H, ENV1114H</td>
<td></td>
</tr>
<tr>
<td>Gough, W</td>
<td>Associate Professor</td>
<td>EESD06H</td>
<td>ENV1117H</td>
<td>Associate Chair, DPES &amp; Graduate Coordinator, Geography, St. George</td>
</tr>
<tr>
<td>Howard, K</td>
<td>Full Professor</td>
<td>EESA07H, EESC16H, EESD02H</td>
<td>ENV1101Y, ENV1113H, GLG3601Y</td>
<td></td>
</tr>
<tr>
<td>Isaac, M</td>
<td>Assistant Professor</td>
<td>NIL</td>
<td>NIL</td>
<td>Newly hired, July 2009</td>
</tr>
<tr>
<td>Kerman, K</td>
<td>Assistant Professor</td>
<td>NIL</td>
<td>NIL</td>
<td>Newly hired, July 2008</td>
</tr>
<tr>
<td>Kronzucker, H</td>
<td>Full Professor</td>
<td>BGYC61H, BGYC65H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mitchell, C</td>
<td>Assistant Professor</td>
<td>EESB04H</td>
<td>NIL</td>
<td>Newly hired, July 2008</td>
</tr>
<tr>
<td>Sherwood Lollar, B</td>
<td>Full Professor</td>
<td>NIL</td>
<td>NIL</td>
<td></td>
</tr>
<tr>
<td>Simpson, A</td>
<td>Associate Professor</td>
<td>CHEMC11H, CHEMC16H, CHEMD90/91Y</td>
<td>CHEM1401Y (15%), CHEM1404H</td>
<td>Supervisor of Studies (Chemistry, UTSC) &amp; Director, UTSC Environmental NMR Centre</td>
</tr>
<tr>
<td>Simpson, M</td>
<td>Associate Professor</td>
<td>EESB05H, EESC15H, EESD32H</td>
<td>CHM1401Y (15%), CHM1420H, ENV1105H</td>
<td>Associate Director, UTSC Environmental NMR Centre</td>
</tr>
<tr>
<td>Wania, F</td>
<td>Full Professor</td>
<td>CHMB55H, CHMD59</td>
<td>CHM1401, CHM1425, ENV121H</td>
<td></td>
</tr>
<tr>
<td>Wells, M</td>
<td>Assistant Professor</td>
<td>ENV1101Y, ENV1120H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Williams, D</td>
<td>Full Professor</td>
<td>BGYC53H, BGYC57H, BGYC67H, BGYD51F</td>
<td>ENV1114H</td>
<td></td>
</tr>
<tr>
<td>Wortmann, U</td>
<td>Assistant Professor</td>
<td>GLG216, GIG340, GIG430</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Teaching Assignments for 2007/08¹

<table>
<thead>
<tr>
<th>Faculty Member²</th>
<th>Rank</th>
<th>Undergraduate</th>
<th>Graduate³</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fenech, A</td>
<td>Associate Professor</td>
<td>NIL</td>
<td>NIL</td>
<td>Appointed adjunct at UTSC in 2009</td>
</tr>
<tr>
<td>Greenwood, B</td>
<td>Professor Emeritus</td>
<td>ENV1101Y</td>
<td>ENV1114H</td>
<td>Retired in 2006</td>
</tr>
<tr>
<td>Holdway, D</td>
<td>Full Professor</td>
<td>Biology2020Y</td>
<td>Biology4410Y</td>
<td>APBS6010Y</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Biology4420Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kirkwood, A</td>
<td>Assistant Professor</td>
<td>Biology3070Y</td>
<td>Biology4030Y</td>
<td>NIL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Biology4010Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mirza, M</td>
<td>Adjunct Associate Professor</td>
<td>GGR367H</td>
<td>ENV1122H</td>
<td>Newly appointed adjunct at UTSC in 2006</td>
</tr>
</tbody>
</table>

**Notes:**

1. The courses asterisked are to form part of the Ph.D. course list selection; they will be upgraded to the 2000 level and will be open to both Ph.D. and M.Sc./M.Env.Sc. students but the course materials and the expectations will be greater for the Ph.D. program. There are at least five courses in the present M.Env.Sc. program which will not be open to Ph.D. students due to their “professional content”.

2. The “H” designation is generally for a semester-long course consisting of a minimum of 2 or 3 hours of lectures and/or seminars, plus laboratories and tutorials. It is worth one-half credit in the UTSC system. One exception to the norm is the graduate course ENV1100H, which is the mandatory core course for the M.Env.Sc. program; it is a half-credit course spread over 2 semesters. The “Y” designation is for a course lasting 2 full semesters and worth a full credit; some courses such as ENV1101Y is the Research Paper course, which may take longer than 2 semesters.

3. The normal course assignment for faculty at UTSC, who are not on research leave during the academic year is 1.5 full courses (or 3 half-courses); on top of this faculty may be expected to supervise Readings Courses (e.g. ENV1114H, ENV1115H) and students undertaking a masters Research Paper (ENV1101Y) or an undergraduate Research Paper (EESD09H/D10Y). The 1.5 half-courses may be a mix of undergraduate and graduate courses. It should be noted that the UTSC faculty did take on extra “over-load” teaching during the spin-up of the M.Env.Sc. program over the first three years.

4. Several courses in the M.Env.Sc. program are not represented in the Table as they are deemed “professional” and usually taught by practicing professionals, who are not core faculty; these courses will definitely not be open to the Ph.D. stream students.

5. ENV1101Y is the graduate Research Paper course of the M.Env.Sc. program; one faculty member is usually responsible for the course as a whole, while individual students are supervised by other faculty members.

6. EESC24H is an advanced readings course in the undergraduate program and EESD09H/D10Y are 4th year half or full credit undergraduate Project Courses as is BGYD01Y, CHMD90 and CHMD91

7. ENV1105H is cross-listed with undergraduate course EESD32H.

8. CHM1401H is team taught with 6 other faculty members.

9. Those graduate course that at present form part of another graduate program are designated by the CHM, GLG, BOT, prefixes. Those with the prefix ENV are part of the MEnvSc program at UTSC.
### TABLE 4c: Teaching assignments for core faculty in 2008-2009

<table>
<thead>
<tr>
<th>Faculty Member</th>
<th>Rank</th>
<th>Undergraduate</th>
<th>Graduate</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbatt, J</td>
<td>Full Professor</td>
<td>CHM415H</td>
<td>CHM1401H</td>
<td>Associate Director, Centre for Global Change at UofT</td>
</tr>
<tr>
<td>Arhonditsis, G</td>
<td>Assistant Professor</td>
<td>EESA11H</td>
<td>ENV1101Y</td>
<td></td>
</tr>
<tr>
<td>Bergquist, B</td>
<td>Assistant Professor</td>
<td>NIL</td>
<td>NIL</td>
<td>Hired 2008</td>
</tr>
<tr>
<td>Boonstra, R,</td>
<td>Full Professor</td>
<td>BGYC52H</td>
<td>NIL</td>
<td></td>
</tr>
<tr>
<td>Branfireun, B.</td>
<td>Associate Professor</td>
<td>GGR117Y</td>
<td>GGR1392</td>
<td>Director, UTM Programs in Environment</td>
</tr>
<tr>
<td>Chen, J</td>
<td>Full Professor</td>
<td>GGR337H</td>
<td>GGR1911H</td>
<td></td>
</tr>
<tr>
<td>Cowling, S,</td>
<td>Associate Professor</td>
<td>GGR403H</td>
<td>GGR1214H</td>
<td></td>
</tr>
<tr>
<td>Cormack, D,</td>
<td>Full Professor</td>
<td>NIL</td>
<td>ENV1100H</td>
<td></td>
</tr>
<tr>
<td>Diamond, M</td>
<td>Full Professor</td>
<td>ENV236</td>
<td>JGE1212</td>
<td></td>
</tr>
<tr>
<td>Dittrich, M</td>
<td>Assistant Professor</td>
<td>NIL</td>
<td>NIL</td>
<td>Newly hired, July 2009</td>
</tr>
<tr>
<td>Donaldson, D</td>
<td>Full Professor</td>
<td>CHMA11H</td>
<td>CHM1401H</td>
<td>Associate Chair Graduate Studies (Chemistry)</td>
</tr>
<tr>
<td>Edwards, E</td>
<td>Full Professor</td>
<td></td>
<td>CHE1134</td>
<td></td>
</tr>
<tr>
<td>Evans, G</td>
<td>Full Professor</td>
<td>EDC230H</td>
<td>CHE1134</td>
<td></td>
</tr>
<tr>
<td>Eyles, N</td>
<td>Full Professor</td>
<td>EESA05H</td>
<td>ENV1106H</td>
<td></td>
</tr>
<tr>
<td>Category 3</td>
<td>Faculty Member</td>
<td>Faculty Member 2</td>
<td>Faculty Member 3</td>
<td>Faculty Member 4</td>
</tr>
<tr>
<td>------------</td>
<td>----------------</td>
<td>------------------</td>
<td>------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Ferris, G</td>
<td>Full Professor</td>
<td>GLG351H</td>
<td>GLG1000H</td>
<td>GLG448H</td>
</tr>
<tr>
<td>Fulthorpe, R</td>
<td>Associate Professor</td>
<td>EESB16H</td>
<td>ENV1104H</td>
<td>EESC30H</td>
</tr>
<tr>
<td>Gough, W</td>
<td>Associate Professor</td>
<td>EESB03H</td>
<td>ENV1112H</td>
<td>GGR1200H</td>
</tr>
<tr>
<td>He, Y</td>
<td>Assistant Professor</td>
<td>NIL</td>
<td>NIL</td>
<td>NIL</td>
</tr>
<tr>
<td>Howard, K</td>
<td>Full Professor</td>
<td>EESA07H</td>
<td>ENV1101Y</td>
<td>EESC07H</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EESD02H</td>
<td>ENV1114H</td>
<td></td>
</tr>
<tr>
<td>Isaac, M</td>
<td>Assistant Professor</td>
<td>NIL</td>
<td>NIL</td>
<td>NIL</td>
</tr>
<tr>
<td>Kerman, K</td>
<td>Assistant Professor</td>
<td>CHMC41H</td>
<td>NIL</td>
<td>NIL</td>
</tr>
<tr>
<td>Kronzucker, H</td>
<td>Full Professor</td>
<td>BGYB50H</td>
<td>BOT1700H</td>
<td>BGYC61H</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BGYC65H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miall, A</td>
<td>Full Professor</td>
<td>GLG103H</td>
<td>ENV1114H</td>
<td>GLG430H</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GLG2605H</td>
<td></td>
<td>GLG2606H</td>
</tr>
<tr>
<td>Mitchell, C</td>
<td>Assistant Professor</td>
<td>EESB04H</td>
<td>ENV1101Y</td>
<td>ENV1114H</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ENV1114H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sherwood Lollar, B</td>
<td>Full Professor</td>
<td>NIL</td>
<td>NIL</td>
<td>NIL</td>
</tr>
<tr>
<td>Simpson, A</td>
<td>Associate Professor</td>
<td>CHMC11H</td>
<td>CHM1404H</td>
<td>CHMC16H</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CHMD90H</td>
<td></td>
<td>CHMD91Y</td>
</tr>
<tr>
<td>Simpson, M</td>
<td>Associate Professor</td>
<td>EES C15H</td>
<td>CHM 1420H</td>
<td>EES D32H</td>
</tr>
<tr>
<td>Wania, F</td>
<td>Full Professor</td>
<td>CHM A10H (50%)</td>
<td>ENV 1114H</td>
<td>CHM B55H (50%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wells, M</td>
<td>Assistant Professor</td>
<td>EES C19H</td>
<td>ENV 1101Y</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ENV 1114Y</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ENV 1120H</td>
<td></td>
</tr>
<tr>
<td>Williams, D</td>
<td>Full Professor</td>
<td>BGY C53H</td>
<td>ENV 1101Y</td>
<td></td>
</tr>
<tr>
<td>Wortmann, U</td>
<td>Assistant Professor</td>
<td>GIG 340</td>
<td>GLG 2303</td>
<td></td>
</tr>
</tbody>
</table>
# Teaching Assignments for 2008/09<br />

<table>
<thead>
<tr>
<th>Faculty Member</th>
<th>Rank</th>
<th>Undergraduate</th>
<th>Graduate</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fenech, A</td>
<td>Associate Professor</td>
<td>NIL</td>
<td></td>
<td>To be appointed as Adjunct in 2009</td>
</tr>
<tr>
<td>Greenwood, B</td>
<td>Professor Emeritus</td>
<td>NIL ENV1101Y</td>
<td>ENV1114H</td>
<td></td>
</tr>
<tr>
<td>Holdway, D</td>
<td>Full Professor</td>
<td>Biology202H</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Biology441Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Biology403H</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Biology442Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kirkwood, A</td>
<td>Assistant Professor</td>
<td>Biology1020Y</td>
<td></td>
<td>Newly hired at UOIT in 2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Biology3620Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Biology4010Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mirza, M</td>
<td>Associate Professor</td>
<td>EESB17H3</td>
<td>ENV1114H</td>
<td>Appointed adjunct at UTSC in 2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ENV1122H</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

1. The courses asterisked are to form part of the Ph.D. course list selection; they will be upgraded to the 2000 level and will be open to both Ph.D. and M.Sc./M.Env.Sc. students but the course materials and the expectations will be greater for the Ph.D. program. There are at least five courses in the present M.Env.Sc. program which will not be open to Ph.D. students due to their “professional content”.

2. The “H” designation is generally for a semester-long course consisting of a minimum of 2 or 3 hours of lectures and/or seminars, plus laboratories and tutorials. It is worth one-half credit in the UTSC system. One exception to the norm is the graduate course ENV1100H, which is the mandatory core course for the M.Env.Sc. program; it is a half-credit course spread over 2 semesters. The “Y” designation is for a course lasting 2 full semesters and worth a full credit; some courses such as ENV1101Y is the Research Paper course, which may take longer than 2 semesters.

3. The normal course assignment for faculty at UTSC, who are not on research leave during the academic year is 1.5 full courses (or 3 half-courses); on top of this faculty may be expected to supervise Readings Courses (e.g. ENV1114H, ENV1115H) and students undertaking a masters Research Paper (ENV1101Y) or an undergraduate Research Paper (EESD09H/D10Y). The 1.5 half-courses may be a mix of undergraduate and graduate courses. It should be noted that the UTSC faculty did take on extra “over-load” teaching during the spin-up of the M.Env.Sc. program over the first three years.

4. Several courses in the M.Env.Sc. program are not represented in the Table as they are deemed “professional” and usually taught by practicing professionals, who are not core faculty; these courses will definitely not be open to the Ph.D. stream students.

5. ENV1101Y is the graduate Research Paper course of the M.Env.Sc. program; one faculty member is usually responsible for the course as a whole, while individual students are supervised by other faculty members.

6. EESC24H is an advanced readings course in the undergraduate program and EESD09H/D10Y are 4th year half or full credit undergraduate Project Courses as is BGYD01Y, CHMD90 and CHMD91.

7. ENV1105H is cross-listed with undergraduate course EESD32H.

8. CHM1401H is team taught with 6 other faculty members.

9. Those graduate courses that at present form part of another graduate program are designated by the CHM, GLG, BOT, prefixes. Those with the prefix ENV are part of the M.Env.Sc. program at UTSC.
2.5 Commitment of faculty members from other graduate programs and/or from other institutions

In addition to the 15 core faculty from the Department of Physical & Environmental Sciences (DEPS), there are a significant number of faculty who have currently committed themselves to the Ph.D. program from:

- other departments at UTSC (three from the Department of Biological Sciences at UTSC);
- other departments, faculties and campuses across the university as a whole: eleven from the St. George Campus, including two members from the Department of Chemical Engineering & Applied Chemistry in the Faculty of Applied Science & Engineering, one from the Department of Chemistry, three from the Department of Geography and five from the Department of Geology all within the Faculty of Arts and Sciences, and finally two faculty members from the Department of Geography at UTM;
- faculties at nearby universities (two from the Faculty of Science at UOIT); and
- government agencies nearby (eight from Environment Canada and one from DFO);

Faculty members within the university but not in DPES, will be cross-appointed to the new graduate unit at UTSC through the University of Toronto School of Graduate Studies. Similarly, members outside of the university will be given adjunct status at UTSC and appointed to the graduate unit at UTSC through the School of Graduate Studies of the University.

As was noted in Section 2.4, all tenured and tenure-stream faculty in the Department of Physical & Environmental Sciences at UTSC, who are involved in the M.Env.Sc. program, are automatically cross-appointed to the Centre for Environment as the Centre is the unit through which the graduate program reported to the University’s School for Graduate Studies. Faculty are also cross-appointed to other departments within the university and already have full student supervisory privileges; they may also teach graduate courses in these departments (e.g. Ecology & Evolutionary Biology, Chemistry, Chemical Engineering & Applied Chemistry, Forestry, Geography, Geology, etc.) Some of these courses, those that fit this new program, will be included as courses which can be taken by doctoral students in the new program.

3. PHYSICAL AND FINANCIAL RESOURCES

3.1 Library resources

The University of Toronto Scarborough (UTSC) Library is just one part of a vast network of libraries within the University of Toronto Library System, to which the Ph.D. students will have automatic access. There are over 40 separate, but inter-linked, libraries and resource centers within the University of Toronto network, which is ranked fourth overall in total holdings for North American Libraries. The UTSC Library has already provided excellent support for an undergraduate program in Environmental Science (which has been running for over 15 years), and now provides similar support for the M.Env.Sc. The M.Env.Sc. program has been running successfully for over 4 years and now has an annual enrolment of 54 full-time students and 20 part-time students. It is clear that the existing library network, which already provides the necessary support for a very large number of other Ph.D. programs at the University of Toronto, will continue to provide the necessary facilities to support the proposed Ph.D. degree in Environmental Science. Nevertheless, some resources will need to be allocated to enable the
purchase of research monographs and new e-journals as they emerge in the rapidly expanding environmental science field. Appendix V provides a detailed statement from the Head Librarians at UTSC and at the University of Toronto outlining the university holdings pertinent to Environmental Science, the collection policy, and the library expenditures proposed for the mounting of the proposed Ph.D. program.

3.2 Laboratory facilities

All the core research faculty at UTSC and all other core members within university departments at the university have been able to equip their research laboratories with state-of-the-art equipment by means of equipment grants through the national granting councils (e.g. NSERC Canada and others) and other research granting agencies (e.g. the Canada Foundation for Innovation, Ontario Innovation Trust, etc.).

Furthermore, when the M.Env.Sc. program was initiated four years ago, the University of Toronto provided both laboratory and field equipment through the Academic Initiatives Fund (AIF). A total of $991,581 was awarded for equipment, to be spread over the budget years 2006-07, 2007-08, and 2008-09. As new courses came on-stream, money was used to fund the necessary equipment for the graduate and research laboratories. To date, these funds have allowed the purchase of major pieces of state-of-the-art equipment for individual courses. A further major purchase of analytical chemistry equipment will take place in the 2009-10 to upgrade the laboratories at UTSC (see Appendix VI); this will undoubtedly enhance the availability of state-of-the-art equipment to doctoral students.

Laboratory facilities and instrumentation

Researchers at UTSC also have access to the Environmental NMR Centre. This is a unique and cutting-edge facility solely dedicated to the molecular analysis of complex environmental samples. The facility, which opened in 2004, houses two, high field NMR spectrometers which are specially designed for the analysis of environmental samples. A third 500 MHz machine was installed in the fall of 2009 to serve the broad needs of teaching and research within the department. The Environmental NMR Centre’s capabilities include hyphenated (LC-SPE-NMR-MS), solution-state, solid-state, multiphase (solids, liquids and gels) and micro-imaging NMR applications. The Environmental NMR Centre is supported through funding from the University of Toronto, Canada Foundation for Innovation, and the Ontario Research Fund. Bruker BioSpin Ltd., who donated $1.57 million to the facility in 2004, currently serves as a research partner in the co-development of innovative methods for environmental science research. The Environmental NMR Centre is a unique facility in Canada and is under the direction of Dr. A. Simpson and Dr. M. Simpson. The Centre is run on a day-to-day basis by a full time Research Associate (Dr. David McNally). Although other nuclear magnetic resonance facilities exist within the university (e.g., in the Department of Chemistry at the St. George campus), the Environmental NMR Centre at UTSC is the only facility that is fully dedicated to Environmental Science research. Using specially designed NMR hardware and other innovative technology, research students are able to analyze and map the compounds found in natural organic matter, which lead to a vast range of environmental studies involving such as:

- molecular biogeochemistry;
- soil-contaminant interactions; and
- soil response to climate change; etc.
Graduate students engaged in Environmental NMR Centre research receive training in sophisticated and specialized molecular-level methods currently not available at other institutions across Canada.

Within the university at large, students will have access to other major facilities; one such facility of particular importance to the program proposed here is the Stable Isotope Laboratory within the Geology Department at the St. George Campus. Two of the founders of this laboratory, Dr. B. Sherwood Lollar and Dr. G. Ferris, are part of the core faculty supporting this program. The Laboratory has successfully developed and applied techniques for using compound specific stable carbon isotopes to investigate controls on the origin of low level dissolved priority pollutants and on their transport and fate in the subsurface. Results from the laboratory have provided an essential foundation for applying compound specific carbon isotope analysis (CSIA) in groundwater - characterizing the isotopic fractionation associated with dissolution, volatilization and adsorption of two groups of priority pollutants - chlorinated solvents and aromatic hydrocarbons. The laboratory also provided the first demonstration of the substantial fractionation associated with biodegradation of several important organic contaminants, and to demonstrate that biodegradation of organic contaminants is controlled by a Rayleigh distillation model. This reproducible and predictable behaviour is essential for the use of isotope fractionation as a means, not just to identify and monitor biodegradation, but to provide an alternative quantitative measure of the extent of biodegradation and a new basis for calculation of biodegradation rates.

The AIF funds mentioned earlier have already enhanced the laboratory equipment available for use in the graduate M.Env.Sc. courses at UTSC. Examples of the purchases of specific pieces of equipment for specific courses that have already been made are:

- **ENV1104H Methods for the Detection of Pathogens**
  - a real time PCR (polymerase chain reaction) unit from Applied BioSystems;
  - a high speed centrifuge;
  - a Micro-Array Scanner from Molecular devices, and a Microtek Systems computer to run the Micro-Array; and
  - a Gene Q Inc., Multi-gene Gradient Thermal Cycler

- **ENV1102H Analytical Chemistry for Geoscientists and ENV1105H Soil Contamination Chemistry**
  - a Bruker Optics ALPH-P FT-spectrophotometer with diamond ATR;
  - a Thermo Scientific NanoDrop UV-VI Spectrophotometer; and
  - a Bruker BioSpinAdvanced High Performance Digital NMR Spectrometer

There are still outstanding purchases to be made using the AIF Funds. However, in addition to the AIF funding, DPES is planning is to spend just over $2.5 million dollars over the next 3 years (2009-10, 2010-11, 2011-12) on upgrading the chemistry facilities at UTSC and providing the operating expenses that go with these purchases (for details see Appendix VII).

**Field equipment and facilities**

Again all the core faculty at UTSC have built up a large array of field instrumentation and the means of deployment over the last 10 years from various funding agencies. These facilities are accessible to graduate students either through their courses or their research projects carried out under direction of the core faculty. Furthermore, AIF funds have already enhanced the field equipment available for use in the graduate courses at UTSC that have a strong field
component. Examples of the purchases of specific pieces of equipment for specific courses that have already been made are:

- **ENV1106H Geology and Geophysics of the Shallow Subsurface**
  - a high resolution ground penetrating radar system (GPR)
- **ENV1110H Sediment and Contaminant Transport in Aquatic Systems** and **ENV1120H The Dynamics of Contaminant Dispersal in Fluids**
  - a Pulse Coherent Acoustic Doppler Profiler (PC-ADP);
  - a Seabird CTD;
  - several Optical Backscatter Sensors for turbidity measurements;
  - a YSI parameter Sonde; and
  - a RBR TR1060P Base Unit and a Single Channel: Temperature Recorder
- **ENV1113H Groundwater Hydrochemistry and Contaminant Transport**
  - a combined AP85 pH-conductivity meter;
  - a vacuum pump;
  - meter 30SCT SYS DIG with cable;
  - ACMT port AP63 Ph/MV/ION KT9V; and
  - A combined pH/EC Tester

The department at UTSC also has access to a number of boats ranging from a small zodiac inflatable up to a large solid hull motor vessel capable of handling relatively deep lake waters.

### 3.3 Computer facilities

UTSC has an excellent centralized computer system run by the Information and Instructional Technology Services (IITS), with fast internet links to other campuses within the university of Toronto system and to the outside world. IITS has a total of 52 individual servers, 116 server nodes in a High Performance Parallel Computing cluster, 58 wireless access points and 10 computer laboratories (one is currently regularly used for graduate courses in the M.Env.Sc. program) with a total of 528 workstations (including the Informatics Commons in the library) available to students. IITS itself consists of four groups responsible for:

- core server and networking infrastructure;
- application development;
- a helpdesk to support faculty, undergraduate and graduate students, and
- audio-visual support.

Specialized computer laboratories allow interactive teaching for the M.Env.Sc. courses (such as ENV1109H and ENV1118H) and will be available for the proposed Ph.D. courses once they come on stream. In addition, the M.Env.Sc. students are provided with sole access to eight computers and two printers in their dedicated workspace (the Corben Room); expansion of this space is planned as the M.Env.Sc. program has continued to expand and the Ph.D. program will require more dedicated study space. A common room is available for both faculty and graduate students including Ph.D. students in the Science Research Building (completed in 2008). Of course, doctoral and masters students have access to more specialized computational facilities in the laboratories of their supervisors; many sensitive analytical instruments are driven by computers, where analyses are carried out and results explored under computer control (e.g. the computers in the Environmental NMR Centre).

All faculty and graduate students are provided with an account on the centralized computer system, which gives them access to electronic mail facilities, the internet, statistical software
packages, scientific graphics, computer language compilers, a rich mathematical software library, etc. Faculty and students have access to over 520 Mac and PC workstations in 10 computing laboratories. Over 40 software packages, from office suites to statistical packages (e.g., Statistica™), to mathematical and multimedia applications are available on the computer laboratories for academic use. Statistica™, for example, is currently used extensively by Dr. G. Arhonditsis in his M.Env.Sc. graduate course, ENV1119H, Quantitative Environmental Analysis.

Computing kiosks are dispersed throughout the campus for easy access to both undergraduate and graduate students; wireless access to the Internet is available from a campus-wide wireless network. Computer users can print their output in all the IITS computer laboratories, using the laboratory computers or from their own laptop computers via wireless printing. UTSC faculty and graduate students also have access to a High Performance Computing (HPC) cluster that consists of 116 server nodes. HPC is the most efficient way to solve complex computational tasks in a wide variety of academic disciplines, including environmental science.

UTSC also offers two Learning Management Platforms and Communication Portals designed to help students with their studying and learning. Graduate students can download course materials, check their marks through ROSI (the centralized university student registration and course grades portal) and book appointments with support services. In addition to UTSC-specific services, UTSC faculty and students have access to a host of other IT services as members of the larger University of Toronto community.

3.4 Space

DPES is located partly in the Science Wing (SWing) of the Andrews Building and partly in the Science Research Building on the UTSC campus. At present there is a total of 2,000 m² assigned to research and research support activities, faculty and graduate student offices. Faculty members have access to private offices with telephone and computer lines to the UTSC servers. Graduate students participating in research (M.Env.Sc. Program I students and Ph.D. students) have access to shared office space dedicated to the research group to which they belong; some of this space may be within the supervisor’s research laboratory, wherever safety rules permit. Graduate students in the professional M.Env.Sc. program have access to shared office space in the Corben Room (in SWing). Office space totalling approximately 390 m² is allocated exclusively to the approximately 50 graduate students in the program. This combined laboratory/office space occupies approximately 1,335 m².

The space available for research and offices will increase dramatically over the next few years due to new construction currently under way, and further campus expansion that is at an advanced stage of planning. The first expansion will result when a new instructional building, recently funded through a $70 million infrastructure grant from the federal and provincial governments, is completed in the fall of 2011. Once this is accomplished, ~100 m² will be transferred to the Department of Physical & Environmental Sciences.

The second phase of campus expansion is expected to occur within five years. This will result in an opportunity to potentially triple DPES’s office, research and graduate student space. A secondary effect of campus expansion will be a major renovation of laboratories and offices in the SWing, bringing the space up to the same high standard as the Science Research Building and the other buildings under construction.
As noted above, the M.Env.Sc. students have access to dedicated study space in a combined lounge-workroom in the Corben Room. This will be expanded in 2009-10 to accommodate the increased enrolment projected for September 2009. As noted above, research space and study space for graduate students increased dramatically when the Science Research Building opened in 2008 – here, Ph.D. students have access to both study space and a common/seminar room. The new Environmental Science Ph.D. students will be housed in the Science Research Building.

3.5 Financial support of graduate students

Funding of graduate students, both at the master's and doctoral level is a major commitment made by the university, and may take a variety of forms depending upon the department and campus; a *University of Toronto Statement on Funding* is included as Appendix I.

The University of Toronto has a minimum level of funding for doctoral and doctoral-stream students (“funding commitment”). At present this funding stands at $21,914 per year for a maximum of 4 or 5 years (depending on the support provided for Master’s students). All students registered in the proposed Environmental Ph.D. program at UTSC will be funded at least at this minimum level; the funding package which will be included with the letter of offer, will be made up from a number of possible components:

- external scholarships (e.g. NSERC, OGS, etc.);
- departmental fellowships derived from BIU and tuition income;
- university scholarships;
- teaching assistantships; and
- research assistantships.

As the minimum level of funding for Ph.D. students is changed by the University over time, similar changes will occur in the proposed program at UTSC to maintain competitiveness and equality of opportunity for students across the university and compliance to the funding commitment.

The core faculty at UTSC receive substantial research funds annually from various granting councils and other organizations supporting research and have already agreed to fund Research Assistantships at $8,500 for each year of research assistance. Normally this is the summer semester, when the student is involved in his/her own research working towards the graduate degree and is not a hindrance to progress on her/his Ph.D. program.

It is worth noting that UTSC has expanded its undergraduate enrolment significantly over the last five years and funds available to graduate students through Teaching Assistantships outstrips the graduate students available to assume the workload, even with the large number of M.Env.Sc. students now on campus. Thus, the TA component of the doctoral funding package is assured at least for the immediate future.

With a core faculty spread over a three campus system, it is clear that students registered at UTSC may have their research laboratory anywhere within the three-campus system. Making the Teaching Assistantships at UTSC part of the guaranteed funding package might be perceived as a problem, but it should be noted that doctoral students have been based at the UTSC campus for many years (at least since the late 1960s), even though they have been
registered through departments on the St. George Campus and often carried out the teaching responsibilities there without any major issues emerging.

4. **PROGRAM REGULATIONS AND COURSES**

4.1 **The intellectual development and the educational experience of the student**

The core doctoral seminar course, *Advanced Seminar in Environmental Science* (ENV2200H), will be mandatory for all first-year Ph.D. students in the program. This course is designed to introduce doctoral students to the major issues in research in environmental science. It will also provide a forum for seminars delivered by core faculty and visiting scholars from other departments, other universities and research scientists from government agencies. All core faculty and students in the Ph.D. will be invited to attend these seminars. In the second semester each student enrolled in the course will be expected to offer a seminar on an area of research in which her/his research proposal is to be developed, to which all faculty and students in the program will be invited.

This seminar course provides a focal point for doctoral students in their first year. In addition to its primary educational role, it will enable the natural development of a distinct cohort among the first-year students, and it will also enhance the intellectual interactions of the entire community, establishing life long professional relationships in much the same way doctoral programs based on the St George campus currently do.

The University of Toronto already organizes a series of workshops on all three campuses to discuss such items as:

- research grant applications
- scholarship applications
- career planning, etc.

Students in the Ph.D. program will be expected to attend these workshops as part of their study program. UTSC organizes its own laboratory safety workshop, which is held several times a year; if it is appropriate for graduates to attend this workshop, they will be encouraged to do so.

There are several ways in which graduate students will interact with the wider community of scholars in environmental science:

- there are a significant number of individuals from other departments (e.g. Geology, Geography, Chemistry, Engineering, etc) , other universities (e.g UOIT) and government research laboratories (e.g. Environment Canada, Department of Fisheries and Oceans, etc.) who are already part of the core faculty and will be involved directly in co-supervision of thesis work but also as guest lecturers in specific courses; and
- all Ph.D. students will be encouraged from a very early stage to present their research ideas and results as posters or oral papers at local, national and late on in their program international conferences. Funding to assist students in travelling to these meetings will come primarily from student supervisors, but will include travel funds from the Department of Physical & Environmental Sciences (DPES) and are also available from the UTSC Vice-Principal Research.
4.2 Program regulations

Admission – Ph.D.

Students will be admitted by a committee consisting of the Program Director, the Graduate Program Assistant, and at least three members of the graduate faculty. The Program Director will ensure input from associated departments at all three campuses. Students admitted to the program will be required to have a strong background in the basic sciences (biology, chemistry, mathematics, physics), and a desire to do research at the interfaces between these disciplines. Students will be admitted with a completed M.Env.Sc. or M.Sc. in environmental sciences, or a related discipline; or a M.A.Sc. degree in environmental engineering, or a related discipline; or equivalent from a recognized university with a minimum of B+ average in all work completed in the master’s program.

In the case of exceptional students, admission by ‘direct entry’ to the Ph.D. program may be approved for applicants with an overall A- average and an appropriate University of Toronto bachelor’s degree, or its equivalent from a recognized university. During the admission process, the preparation of these ‘direct entry’ students will be assessed and additional courses may be required as part of their degree.

During admission, students’ preparedness will be assessed, and where it is deemed insufficient, students will be required to take additional courses. It is expected that graduates of the M.Env.Sc. research stream, or the other graduate programs listed above, normally will have sufficient background at the time of admission.

Degree requirements – Ph.D.

Degree Requirements:
The degree requirements consist of successful completion of: coursework, a thesis proposal, and a thesis. The degree program has been designed so that it can be completed within four years for students who have completed a related master’s degree.

- Students transferring from the master’s program are expected to complete the Ph.D. program within five years from the start of enrolment in the M.Sc. program.
- Direct-entry students from a bachelor’s program are expected to complete the Ph.D. program within five years.
- Students are required to prepare and defend a thesis as per the regulations of the School of Graduate Studies (see http://www.sgs.utoronto.ca/current/thesis/index.asp).
- All Ph.D. program requirements must be completed within six years from first enrolment.

Course requirements:

- To ensure students are aware of research in their own research field and in closely allied fields, and also to ensure the interdisciplinary nature of the program in Environmental Science, course ENV2200H, Advanced Seminar on Environmental Research, is mandatory.
- Each student must also successfully complete a minimum of 1.5 full-course equivalent (FCE) courses from an approved course list in the graduate program, bringing the full course load to 2.0 FCE. The courses are required to provide background relevant to the student’s research. Courses selected have to be approved by the Program Director.
- As stated above, during admission, students’ preparedness will be assessed, and where it is deemed insufficient, students will be required to take additional courses.
Research Proposal:
Program students are required to submit a detailed Research (Thesis) Proposal to their supervisory committee. The committee will advise the student on the acceptability of the proposal and will decide on any further steps to be taken in shaping the thesis research project. The Research Proposal should be presented at the beginning of the first term in Year II.

Thesis requirements:
The candidate shall present a thesis embodying the results of original investigation, conducted by the candidate, on the approved topic from the field of specialization. The thesis shall constitute a significant contribution to the knowledge of the field and must be based on research conducted while registered for the Ph.D. program.

A thesis should have a coherent topic with an introduction presenting the general theme of the research and a conclusion summarizing and integrating the major findings. Nonetheless, it may contain a collection of three or more papers where the candidate is the primary author. The collection of papers may be expanded or supplemented by unpublished material, scholarly notes, and necessary appendices.

The University of Toronto School of Graduate Studies (SGS) Calendar sets out criteria for “good academic standing” and “satisfactory academic progress”. The Program Director will apply these criteria in the evaluation of a student’s progress.

Progress through the Ph.D. Program for students admitted with a master’s degree:
- Year I: Complete course work
- Year II: Complete and defend thesis proposal/Start thesis research
- Year III: Research and thesis writing
- Year IV: Thesis writing and defense

Progress reports
Review meetings must be held in May of each year in the Ph.D. student’s program. The Review Committees (normally the Supervisory Committee) must consist of at least three faculty from the graduate Department. The Ph.D. student must be present at the meetings. For the Review Meetings in Years II, III, and IV, the Ph.D. student must submit a Progress Report of between two to five pages. The Progress Reports can be accompanied by materials such as draft questionnaires, initial tabulations and analysis results, or draft thesis chapters. (For further details see the SGS Calendar).

Thesis evaluation procedures
Students will participate in two thesis defenses. For the Departmental Thesis Defense, the examination committee will consist of at least four faculty members (normally including the members of the Supervisory Committee). One or more members can be from outside the Department. The committee will notify the Program Director that the thesis is ready to be forwarded to SGS for the final oral examination (FOE).

Language requirements
There will be no language requirements for the Ph.D. program other than those specified by the candidate’s Ph.D. Committee. The Committee may require proficiency in a language other than
English in cases where the thesis research is in a country where English is not the mother tongue.

**Distance delivery**

Not applicable to this program.

### 4.3 Part-time studies

Not applicable to this program.

### 4.4 Total graduate courses listed and level

**ENV1102H**  Analytical Chemistry for Geoscientists
This course will familiarize students with a working knowledge of analytical chemistry and modern instrumentation and the common laboratory methods used in the analysis of contaminants and ions in environmental media. Students will be introduced to a number of instruments and techniques and the methods used to analyze soils, air and water.

**ENV1103H**  Air and Water Quality Sampling and Monitoring
This course will focus on the measurement of atmospheric contaminant fluxes, including dry and wet atmospheric deposition rates and gas fluxes (e.g. NOX, CO2) to and from the surface. It will also consider the sampling of chemical storages and fluxes in the aqueous phase in soil, snow and snowmelt, stream flow and groundwater. Problems of sampling including spatial and temporal variability and process (pathway) uncertainty will be examined.

**ENV1104H**  Methods for the Detection of Pathogens
This course is focused on biological contaminants in the environment such as E. coli, Giardia, Cryptosporidium in public water supplies. Population pressure combined with a changing climate is increasing the range of Vibrio chlorae world wide, and the expansion of viruses such as West Nile. The ability to control these serious problems depends on our ability to detect these pathogens and to track their movements. This course will introduce students to the biology of the life history of these organisms, and will educate them in the state of the methods of high sensitivity detection.

**ENV1105H**  Soil Contamination Chemistry
This course will present fundamental chemical concepts and reactions that occur in soils with emphasis on contaminant behavior. The basics of soil chemistry will be introduced and the processes that relate to: quantities, attenuation, sequestration, and movement of ions, heavy metals, and organic molecules in terrestrial environments will be addressed in detail. Students will become familiar with geochemical computer models and these models will be used to predict the behavior of ions in soil. Soil chemical characteristics, which can be used to predict the fate of contaminants in terrestrial environments, will also be presented.

**ENV1106Y**  Geology and Geophysics of the Shallow Subsurface
This course provides an overview of the principal geophysical techniques; emphasis will be placed on their use in understanding site conditions in glaciated terrains such as in Canada. Contaminants move through subsurface and surface environments along pathways controlled
by geologic conditions and by surface processes. Identifying these complex pathways is fundamental to environmental assessments of contaminated sites and their remediation and in turn, is reliant on a good understanding of the local sedimentology and stratigraphy. In places, this can be gained by direct sampling or drilling but in most cases requires the application of geophysical techniques such as radar, on-land and marine seismic and down-hole logging.

**ENV1107H Remediaiton Methods**  
This course will examine the principal methods currently in use for remediating contaminated soils and waters. Emphasis will be placed on reviewing the advantages and limitations and site-specific applicability of remediation techniques and technologies.

**ENV1109H Advanced Techniques in Geographic Information Systems**  
This course covers an advanced set of techniques and applications of GIS, including a substantial practical component. Technical issues (including data format and conversion, georeferencing, spatial indexing and terrain analysis), application/spatial modeling (including watershed analysis, land use classification, soil erosion modeling, etc) as well as visualization and incorporation of spatial data and analysis into decision support systems will be examined. Underlying programming techniques will be reviewed and extended on a student-project basis.

**ENV1110H Sediment and Contaminant Transport in Aquatic Systems**  
This course examines contaminant transport in water bodies such as rivers and the Great Lakes using numerical modeling and other techniques. Physical methods for determining mass circulation in response to wind and water temperatures at different times of the year will be examined; case studies will be reviewed.

**ENV1111H Freshwater Ecology and Biomonitoring**  
Freshwater environments support diverse communities of plants and animals that are controlled by both biotic and abiotic factors. Organisms respond to changes in the habitat through detectable shifts in population abundances and the loss/gain of species. Monitoring such biological changes in freshwater communities is an established protocol for assessing the condition of rivers, lakes and ponds subject to human influence. This new course will have a large practical component in which students will have the opportunity to learn the skills necessary to evaluate the condition of aquatic environments variously affected by urbanization.

**ENV1112H Boundary Layer Climates and Contaminant Fate**  
This course examines the dynamics and radiation physics of the atmospheric planetary boundary layers. Topics include the formation of a planetary boundary layer, vertical stability, temperature inversions, diurnal and seasonal variations and impacts of local and regional scale circulation. With this foundation the dispersion of airborne pollutants will be studied. The course will conclude with modeling of airborne pollutants and case studies.

**ENV1113H Groundwater Hydrochemistry and Contaminant Transport**  
This course focuses on groundwater contamination and the various methods used to investigate, assess and evaluate the movement and behavior of contaminants in the subsurface. Emphasis will be on urban groundwater issues with case study examples taken from North America, Europe, central Asia and Africa.

**ENV1117H Climate Change Impact Assessment**  
The study and consideration of climate change is of increasing significance to society. This course will review the evidence for climate change over the past 150 years using both direct
measurements and proxy data. Projection of future climate change will also be considered by modeling. Students will complete a major case study and research paper.

**ENV1118H  Fundamentals of Ecological Modelling**
This course provides an introduction to the rapidly growing field of ecological and environmental modelling. Students will become familiar with most of the basic equations used to represent ecological processes. The course will also provide a comprehensive overview of the population and dynamic biogeochemical models; prey-predator, resource competition and eutrophication models will be used as illustrations. Emphasis will be placed on the rational model development, objective model evaluation and validation, extraction of the optimal complexity from complicated/intertwined ecological processes, explicit acknowledgment of the uncertainty in ecological forecasting and its implications for environmental management.

**ENV1119H  Quantitative Environmental Analysis**
This course provides an introduction to the field of ecological statistics. Students will become familiar with several methods of statistical analysis of categorical and multivariate environmental data. The course will provide a comprehensive presentation of the methods: analysis of variance, regression analysis, structural equation modeling, ordination (principal component & factor analysis) and classification (cluster & discriminant analysis) methods, and basic concepts of Bayesian analysis. Emphasis will be placed on how these methods can be used to identify significant cause-effect relationships, detect spatiotemporal trends, and assist environmental management by elucidating ecological patterns (e.g., classification of aquatic ecosystems based on their trophic status, assessment of climate variability signature on ecological time series, landscape analysis). The course will consist of 2 hr-lectures/tutorials where the students will be introduced to the basic concepts of the statistical methods and 2-hr lab exercises where the students will have the opportunity to get hands-on experience in statistical analysis of environmental data.

**ENV1120H  The Dynamics of Contaminant Dispersal in Fluids**
This course will introduce the mechanisms of contaminant transport in lakes and the coastal ocean. The emphasis will be on a practical understanding of different dispersion regimes from point and distributed pollution sources. Students will learn to use the basic equations that model these processes and understand how these equations are used in water quality models. Students will also be introduced to field measurement techniques and learn to compare field data with model data. Among the subjects to be discussed are the dispersion of pollutants in lakes, rivers and the coastal zone, mixing in stratified estuaries and the dynamics of the seasonal thermocline.

**ENV1121H  Modelling the Fate of Organic Chemicals in the Environment**
This course will give an introduction to quantitative approaches to describing the behaviour of organic chemicals in the environment. Building upon a quantitative treatment of equilibrium partitioning and kinetically controlled transfer processes of organic compounds between gaseous, liquid and solid phases of environmental significance, it will be shown how to build, use, and evaluate simulation models of organic chemical fate in the environment. The course will provide hands on experience with a variety of such models.

**ENV1122H  Global Environmental Security and Sustainable Development**
The major objectives of ENV 1122H are to: 1) discuss major environmental challenges the planet earth is now facing and 2) examine how human interventions are deteriorating global environment and that affecting sustainable development; 3) analyse major environmental
initiatives which include: the Stockholm Conference on Human Development, The Brundtland Commission Report, the Rio Earth Summit, the Johannesburg World Summit on Sustainable development, Montreal Protocol on Ozone Depletion, Kyoto Protocol and other global conventions, protocols and processes and their usefulness: 4) discuss extensive north-south cooperation in facilitating global environmental security and sustainable development.

ENV1126H (new) Environmental Tracers
This course focuses on the use of various isotope and chemical tracers for furthering our understanding of complex environmental problems, ranging from the characterization of freshwater resources to contaminant transport in aquatic systems. Particular focus will be placed on how chemical and isotope tracer studies can be coupled with physical measurements to understand complex problems in hydrology, biogeochemistry, and contaminant transport. This course will cover fundamentals of environmental tracer chemistry through to recent case studies, advanced models and applications.

ENV2200H (new) Advanced Seminar in Environmental Science
This course is designed to introduce doctoral students to the major issues in research in environmental science. It will also expose students to the diverse fields of research expertise within the UTSC Group. Students will be expected to contribute one seminar paper in their own field of interest. The class will meet weekly throughout the fall and winter and will act as a focus group for the PhD program. The course is restricted to those students enrolled in the PhD in Environmental Science program.

ENV2201H (new) Advanced Readings in Environmental Science
Students may follow a structured independent readings course in any sub-discipline of Environmental Science. A faculty member will supervise the student and a short description of the objectives, scope and procedures for evaluation for the course must be approved by both the faculty member and Program Director. Students need the approval of the Program Director of the PhD in Environmental Science to register in this course.

The 1000 series courses listed above are currently available for credit in the M.Env.Sc. program. The purely professional courses taught by specialists from outside the core faculty in Program II of the M.Env.Sc. program are not included in this list and will not be eligible for credit towards the Ph.D. degree.

There are also a number of Ph.D. level courses taught by core faculty both within the department and outside the Department of Physical & Environmental Sciences that can be considered for the Ph.D. degree. For example:

ENV1001H Environmental Decision Making
ENV1002H Environmental Policy
ENV1004H Urban Sustainability and Ecological Technology
ENV1703H Water Resources Management
ENV4002H Environment and Health of Vulnerable Populations
GGR1203H Coastal Hydrodynamics, Sediment Mechanics and Morphodynamics
GGR1214H Global Ecology and Biogeochemical Cycles
GLG1450H Contaminant Fate and Transport in Subsurface Environments
GLG2303H Earth System Evolution
GLG2704H Isotope Geochemistry
JGE1212H Fate of Contaminants in the Environment
Students may apply to take one of these half courses as part of their 1.5 FCE credits for the degree; however, all courses for Ph.D. degree credit must be approved by the Program Director.

Note: ENV stands for Centre for Environment; GGR stands for Geography; GLG stands for Geology.

4.5 Collateral and supporting departments, centres, institutes

It is clear from the listing of the core faculty in Table 2 that support for this new initiative, is university wide, and there is already a very significant interaction between UTSC faculty with other departments within the university, with other campuses both within the university and outside, as well as with appropriate government organizations.

All faculty in the Department of Physical & Environmental Sciences (DPES) at UTSC have cross-appointments to other graduate programs within the university (these cross-appointments are listed in Table 2). Similarly a large number of faculty in other departments within the university have expressed their interest in a cross-appointment to UTSC, once the new graduate department is in place. There are an extremely large number of cross-appointments, and naturally, significant support from these collateral and supporting departments both within UTSC (e.g. the Department of Biological Sciences is contributing two faculty in support of the program), but also across all three campuses of the university, i.e. UTSC, St. George, UTM. Of particular note is the support received from Chemistry, Chemical Engineering & Applied Chemistry, Geology and Geography at St. George (a total of 11 faculty have committed to the core from these departments). Two Geography faculty from UTM have also agreed to support the program as core faculty members. It is important to note that all of these core faculty already teach one or more graduate courses and have agreed to give access to UTSC Environmental Science Ph.D. students, provided of course that they have the required pre- and/or co-requisites. The doctoral program is also supported by two members of the Faculty of Science at the University of Ontario Institute of Technology (UOIT), UTSC’s nearest neighbour university in the Durham region.

Finally, it is important to stress that this proposal has the full support of the Director of the Centre for Environment, Dr. Ingrid Stefanovic. The Centre (and its predecessor, the Institute for Environmental Studies) has been an “umbrella” for a number of new initiatives in environmental education and Dr. Stefanovic was the Centre’s Director, when the M.Env.Sc. program was successfully launched at UTSC.

Perhaps of equal importance to the above is the collaboration with government agencies dealing with the environment (e.g. Environment Canada, DFO, etc.). One individual from Environment Canada (Dr. Monirul Mirza) is already already appointed as an adjunct professor in DPES at UTSC, and has already taught graduate courses in the M.Env.Sc. program. Eight other research scientists have agreed to become core faculty and accept associate graduate status. Much of the support from government scientists has arisen automatically as a result of previous joint research endeavours, research publications, and/or student co-supervision with faculty at UTSC through existing graduate departments. The list of research funding and publications of the core faculty given in their CVs (Volume II of this proposal) clearly demonstrates this interaction with government scientists.
The proposed Ph.D. program will further enhance the opportunity for government research scientists to do cooperative research, to serve on Ph.D. advisory and examining committees and to be involved to some degree in Ph.D. level courses (e.g. guest lectures, workshops, etc.). An important benefit from this interaction is that the Ph.D. students will be exposed to potential supervisors in the job market after the Ph.D. degree is completed.

5. OUTCOMES

The only graduate program currently offered at UTSC is the professional Master of Environmental Science (M.Env.Sc.), which reports through the Centre for Environment at the University of Toronto. This is therefore the only graduate program for which data are available.

5.1 Enrolment and graduations

M.Env.Sc. program

Table 8a lists the enrolments, withdrawals and graduation by year of admission, for the cohort of students in full time study. Table 8b provides similar data for students undertaking part time studies. Tables 9a and 9b provide flow through data for the same students, and the mean and median times to graduation for the M.Env.Sc. students are given in Tables 10a and 10b. The M.Env.Sc. program is a one-year program and has only been running since January 2006; the program has had a total of four student intakes over this period of 11 complete sessions.

TABLE 8a: Cohort data for Master of Environmental Science (Full-time)

<table>
<thead>
<tr>
<th>Year</th>
<th>New 2</th>
<th>Within 6 terms 11</th>
<th>Within 9 terms 11</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Trans PhD 3</td>
<td>Within 4</td>
</tr>
<tr>
<td>2002-03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003-04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2004-05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005-06</td>
<td>10</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2006-07</td>
<td>17</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2007-08</td>
<td>30</td>
<td>x</td>
<td>1</td>
</tr>
<tr>
<td>2008-09</td>
<td>38</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>
Notes:
1. Academic year starting September 1 with one entry point: (September). In the first year, the program was started with a January intake followed by a September intake.
2. Sum of intake for each entry point of a given academic year.
3. All students from that cohort who transferred to the Ph.D. within six terms of entry point.
4. All students from that cohort who had withdrawn within six terms of entry point (including lapses).
5. All students from that cohort who had completed the program within six terms of entry point.
6. All students from that cohort who were still in program or on approved leave after six terms of entry point.
7. All students from that cohort who transferred to the Ph.D. within nine terms of entry point.
8. All students from that cohort who had withdrawn within nine terms of entry point (including lapses).
9. All students from that cohort who had completed the program within nine terms of entry point.
10. All students from that cohort who were still in program or on approved leave after nine terms from entry point.
11. Even if 6 (or 9) terms have not elapsed for that cohort, results are indicated to date.

TABLE 8b: Cohort data for Master of Environmental Science (part-time)

<table>
<thead>
<tr>
<th>Year</th>
<th>New</th>
<th>Within 6 terms</th>
<th>Within 9 terms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Trans PhD</td>
<td>Withd</td>
</tr>
<tr>
<td>2002-03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003-04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2004-05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005-06</td>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2006-07</td>
<td>11</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2007-08</td>
<td>9</td>
<td>X</td>
<td>1</td>
</tr>
<tr>
<td>2008-09</td>
<td>9</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Notes:
1. Academic year starting September 1 with one entry point: (September). In the first year, the program was started with a January intake followed by a September intake.
2. Sum of intake for each entry point of a given academic year.
3. All students from that cohort who transferred to the Ph.D. within six terms of entry point.
4. All students from that cohort who had withdrawn within six terms of entry point (including lapses).
5. All students from that cohort who had completed the program within six terms of entry point.
6. All students from that cohort who were still in program or on approved leave after six terms of entry point.
7. All students from that cohort who transferred to the Ph.D. within nine terms of entry point.
8. All students from that cohort who had withdrawn within nine terms of entry point (including lapses).
9. All students from that cohort who had completed the program within nine terms of entry point.
10. All students from that cohort who were still in program or on approved leave after nine terms from entry point.
### TABLE 9a: Cohort flow-through data for Master of Environmental Science (full-time)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Enrolment</th>
<th># Female (%)</th>
<th># Visa (%)</th>
<th>Total Transfers</th>
<th>Total Withdrawals</th>
<th>Total Graduations</th>
<th>Total Continuing</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002-03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003-04</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2004-05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005-06</td>
<td>10</td>
<td>5 (50.0%)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2006-07</td>
<td>27</td>
<td>17 (63.0%)</td>
<td>4 (14.8%)</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>2007-08</td>
<td>33</td>
<td>18 (54.5%)</td>
<td>3 (9.1%)</td>
<td>0</td>
<td>1</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>2008-09</td>
<td>39</td>
<td>25 (64.1%)</td>
<td>2 (5.1%)</td>
<td>0</td>
<td>0</td>
<td>29</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

1. Academic year starting September 1 with one entry point: (September). In the first year, the program was started with a January intake followed by a September intake.
2. All students registered in the program in that academic year continuing and new (for continuing, use numbers reported November 1).
3. Number of female students and (%).
4. Number of visa students and (%).
5. All students who transferred to the Ph.D. within that year.
6. All students who withdrew within that year (excluding lapses).
7. All students who completed the program within that year.
8. This column is left blank. The University is not providing data on continuing students.
# TABLE 9b: Cohort flow-through data for Master of Environmental Science (part-time)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Enrolment</th>
<th># Female (%)</th>
<th># Visa (%)</th>
<th>Total Transfers</th>
<th>Total Withdrawals</th>
<th>Total Graduations</th>
<th>Total Continuing</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002-03</td>
<td>6</td>
<td>4 (66.7%)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2003-04</td>
<td>17</td>
<td>9 (52.9%)</td>
<td>1 (5.9%)</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2004-05</td>
<td>23</td>
<td>13 (56.5%)</td>
<td>1 (4.3%)</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>2005-06</td>
<td>26</td>
<td>15 (57.7%)</td>
<td>1 (3.8%)</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

1. Academic year starting September 1 with one entry point: (September). In the first year, the program was started with a January intake followed by a September intake.
2. All students registered in the program in that academic year continuing and new (for continuing, use numbers reported November 1).
3. Number of female students and (%).
4. Number of visa students and (%).
5. All students who transferred to the Ph.D. within that year.
6. All students who withdrew within that year.
7. All students who completed the program within that year.
8. This column is left blank. The University is not providing data on continuing students.

# TABLE 10: Mean and Median Times to Completion

<table>
<thead>
<tr>
<th>Field (#)</th>
<th>Mean (range)</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.Env.Sc., Full-time (n=54)</td>
<td>1.0 (1.0-1.3)</td>
<td>1.0</td>
</tr>
<tr>
<td>M.Env.Sc., Part-time (n=7)</td>
<td>1.8 (1.3-2.3)</td>
<td>1.7</td>
</tr>
</tbody>
</table>
Ph.D. program

This is a proposal for a Ph.D. program in Environmental Science at UTSC, therefore no data is provided and Tables 11-13 have been omitted.

5.2 Employment

As stated above, the environmental sector is one of the world’s fastest-growing industries - generating well over 120,000 new jobs in Canada. According to ECO Canada’s Environmental Labour Market (ELM) research, environmental employment will reach almost 600,000 by 2011 representing an 8% increase over 2006. The environmental sector is anticipated to expand by 23% in the same time period outpacing most sectors of the economy. Current financial concerns apart, the skills shortage is a severe constraint in many sectors of the resource-based Canadian economy. Remediation of contaminated sites in urban and non-urban areas is being slowed by inadequate practitioners (ECO Canada, 2008).

Unfortunately, a severe shortage of skilled people - exacerbated by the looming retirements of the “Baby Boom” generation – has meant that employers are experiencing increasing difficulties hiring people who are appropriately trained in the application of a wide variety of environmental sciences to manage and remediate environmental problems. These problems range from watershed protection, the delineation of surface and ground water resources, urbanization and its multifaceted environmental challenges, mining and the resource based sector, and remediation of contaminated sites in a wide variety of settings. There is also an additional need for highly qualified environmental scientists as a consequence of increased demand for suitably qualified instructors in colleges and universities. Our ability to cope with environmental challenges of the future is dependent on expanding the breadth of existing environmental science teaching and particularly research programs in universities and government and private sector laboratories. These will need individuals trained at the doctoral level.

5.3 Publications

Not applicable.

5.4 Projected graduate intake and enrolments

Table 14 illustrates the projected intake of students and the overall enrollments in the proposed Ph.D. program and the continuing M.Env.Sc. program at UTSC. As can be seen from the earlier Tables (please refer to Tables 8a and b, Table 9a and b, and Table 10), the Masters enrolments have increased at a very significant rate, far exceeding initial predictions for the first 4 cohorts of full and part time students. From 2005-06 until 2008-09, enrolment of full time students increased each year from 10 to 17, 17 to 30, and 30 to 38 respectively; of these, 9 students completed and graduated in 2006-07, 16 in 2007-08, and in 2008-09 this number increased to 29 completions. 34 full time students will graduate in November 2009. The plan

---


for the next seven years is to stabilize the M.Env.Sc. enrolment at 50 full time and 5 part time students for a total of 55 students; this will enable a clear focus on establishing the Ph.D. program in Environmental Science.

The proposal for enrolment in the proposed Ph.D. program is documented in Table 10 (which also documents the projected enrolments in the M.Env.Sc. program. The projected doctoral enrolment is that in the first year (2010-11) a total of 5 students will be enrolled. This rather modest number will ensure that only the very best students are admitted initially; it must also be remembered that all the core faculty currently have both masters and doctoral students through their cross-appointments to other units. However, as more faculty are hired, and as the core faculty accept more students in the Environmental Science program, the number of Ph.D. enrolments will increase. The projected enrolment at the end of the initial spin-up phase is an annual intake of 20-25 students. It is clearly important to assess the number and quality of graduating students and their careers, before further expansion is considered.

**TABLE 14**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>FULL-TIME</th>
<th>PART-TIME</th>
<th>TOTAL ENROLMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intake</td>
<td>Enrolments</td>
<td>Intake</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>M</td>
<td>D</td>
</tr>
<tr>
<td>2009-10</td>
<td>50</td>
<td>50</td>
<td>5</td>
</tr>
<tr>
<td>2010-11</td>
<td>50</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>2011-12</td>
<td>50</td>
<td>6</td>
<td>50</td>
</tr>
<tr>
<td>2012-13</td>
<td>50</td>
<td>7</td>
<td>50</td>
</tr>
<tr>
<td>2013-14</td>
<td>50</td>
<td>8</td>
<td>50</td>
</tr>
<tr>
<td>2014-15</td>
<td>50</td>
<td>9</td>
<td>50</td>
</tr>
<tr>
<td>2015-16</td>
<td>50</td>
<td>10</td>
<td>50</td>
</tr>
</tbody>
</table>
Appendix I – University of Toronto Statement on Funding
([http://www.sgs.utoronto.ca/informationfor/cal2008-09/financial.htm](http://www.sgs.utoronto.ca/informationfor/cal2008-09/financial.htm))

Financial Support

The University of Toronto gives high priority to the matter of graduate financial support. For many doctoral-stream students, programs commit to a minimum level of funding at the beginning of each year, for up to five years of study. For further information about the funding available from specific programs, see the Graduate Funding Structures (PDF) document. Although financial support cannot be guaranteed for all graduate students in all programs, we encourage you to inquire about financial assistance at your academic department or the Graduate Awards Office at the School of Graduate Studies.

Financial Aid

Internal Awards
The School of Graduate Studies offers a number of internal awards to meritorious graduate students such as the University of Toronto Fellowships (UTF), the Connaught Scholarship as well as other endowed awards.

External Awards
Canadians and landed-immigrants may also apply for external support in the form of scholarships and fellowships offered by the Natural Sciences and Engineering Research Council of Canada (www.nserc.ca), the Social Sciences and Humanities Research Council of Canada (www.sshrc.ca) and the Canadian Institutes of Health Research (www.cihr.ca). All three granting councils (NSERC, SSHRC, and CIHR) also offer Canadian Graduate Scholarships (CGS).

The Government of the Province of Ontario provides graduate scholarships tenable at Ontario universities. Ontario Graduate Scholarships, ([http://osap.gov.on.ca/eng/not_secure/Plan_Grants_full_sepapp_OGS_12345.htm](http://osap.gov.on.ca/eng/not_secure/Plan_Grants_full_sepapp_OGS_12345.htm)) are available for graduate studies in all disciplines. Sixty of these awards are available to visa students.

Ontario Graduate Scholarships in Science and Technology (OGSST) are designed to encourage excellence in graduate studies in science and technology; only available to Canadian citizens or permanent residents.

Ontario Student Assistance Program (OSAP)
The federal and provincial governments provide financial support to qualified students who are Canadian citizens or permanent residents of Ontario. The loan amount depends on your calculated financial need. Students can apply online at [http://osap.gov.on.ca/](http://osap.gov.on.ca/)

Awards for Non-Canadians
In addition to the internal funding normally available to all international students, a number of external funding sources can also be explored. For more information on awards for non-Canadians, please visit [www.sgs.utoronto.ca/informationfor/students/newcurrent/inter.htm](http://www.sgs.utoronto.ca/informationfor/students/newcurrent/inter.htm).
International students are encouraged to apply for all possible funding opportunities in their home country.

Other Funding Sources

Teaching Assistantships
Some graduate units hire teaching assistants who spend up to 10 hours a week conducting tutorials, grading undergraduate essays/exams, and acting as a resource for undergraduate students. For further information, write to the chair of your graduate unit, giving full particulars of your academic training and experience.

Research Assistantships
Research assistants normally work with a faculty member, assisting with research projects. Apply directly to the graduate unit chair concerned.

Financial Need

Emergency Grant Program
The Emergency Grant Program is designed to assist currently registered, full-time graduate students beyond their first year of studies who generally are not part of the funded cohort, and who encounter an unanticipated serious financial emergency. This is not considered to be a source of routine or long-term funding.

Emergency Loan Program
The Emergency Loan Program is designed to alleviate temporary cash flow problems for students who are expecting to receive a payment in the near future. The maximum loan amount is $500 and is interest free until the mutually agreed upon repayment date.

Financial Counselling
Financial counselling can relieve stress, resolve immediate financial problems, and help plan for the future. Financial Counsellors are trained to assist students in all aspects of financial management including budget planning and debt load management. Financial counselling sessions are confidential and available to graduate students free of charge. To schedule an appointment, contact the Graduate Awards Office by telephone (416) 946-0808 or by e-mail graduate.awards@utoronto.ca.

For further information

Contact
Graduate Awards Office
School of Graduate Studies
University of Toronto
63 St. George Street, Room 202
Toronto, Canada, M5S 2Z9
Tel: (416) 978-2379
Fax: (416) 978-4367
E-mail: graduate.awards@utoronto.ca or gradschool@utoronto.ca
Appendix II - Regulations of the School of Graduate Studies Concerning the Final Oral Examination

(Extract from the SGS Calendar, pages 38-40)

1 The candidate shall defend the thesis at a final oral examination organized by the graduate unit with the cooperation of SGS. The process of scheduling the examination, allowing time for professional appraisal, can be expected to take at least eight weeks at the best of times, and candidates should discuss the timing with the graduate administration of their unit. Candidates should also ascertain whether or not their unit imposes regulations over and above the minimal conditions required by SGS.

2 The graduate unit will notify SGS eight weeks prior to the examination when the thesis is ready to go forward for examination. In the absence of any particular local procedure, the candidate’s supervising committee will advise SGS that the thesis is ready to proceed. In rare cases, a thesis may proceed to examination without the approval of the supervising committee: candidates should contact the Vice-Dean of SGS.

3 The thesis will be sent to an appraiser external to the University of Toronto, appointed by SGS on the recommendation of the graduate unit. (The Supervisor of the thesis will propose a list of three or more names of possible external appraisers to the graduate coordinator or Chair, who will choose one and send the recommendation to SGS for approval. The graduate unit will certify that the external appraiser has an arm's-length relationship to the candidate and Supervisor.) The external appraiser should be a recognized expert on the subject of the thesis and should be external to the University as well as to its affiliated teaching hospitals and research institutes. Such an individual must be an associate or full professor at the home institution or, if the individual comes from outside the academic sector, must possess the qualifications to be appointed to an academic position at this level. Arrangements with external appraisers are the responsibility of the graduate unit. In particular, the graduate unit must allow the external appraiser sufficient time to act. The graduate unit must have a copy of the thesis delivered to the appraiser at least six weeks, and preferably longer, in advance of the examination date. Appraisals must be submitted to SGS at least two weeks in advance of the examination date; if they are not, the examination may have to be rescheduled. The graduate unit must also ensure that copies of the thesis are made available to all other voting members of the Examination Committee at least four weeks in advance of the examination date.

4 An Examination Committee, appointed by SGS on the recommendation of the graduate unit, will conduct the Final Oral Examination. The Examination Committee must include at least four, but no more than six, voting members: one to three of the voting members will have served on the candidate’s Supervisory Committee, and at least one voting member will not have been closely involved in the supervision of the thesis. Eligible for inclusion in the latter group are the external appraiser (in person or by audio connection), members of the graduate faculty of the candidate’s graduate unit, and members of the graduate faculty of other departments, centres, or institutes of the University. The Examination Committee may include, in addition, up to two non-voting members, who will be members of the graduate faculty of the candidate’s graduate unit or members of the graduate faculty of another graduate unit of the University. A quorum is four voting members. Graduate units must ascertain in advance the willingness of the persons named to act.

The Vice-Dean of SGS may modify the composition of the Examination Committee to fit exceptional circumstances.
5 SGS will appoint a non-voting Chair to the Examination Committee. The Chair will be a full member or member emeritus of the graduate faculty, holding no appointment to the graduate faculty of the candidate's graduate unit.

6 The graduate unit is responsible for scheduling the examination, booking a room, and making appropriate technical arrangements.

7 The graduate unit must submit to SGS a Certificate of Completion together with the nomination form confirming completion of all other academic requirements, such as language and field requirements; an abstract of the thesis not longer than 350 words; and a copy of the Examination Program.

8 The graduate unit will send a copy of the external appraisal of the thesis to SGS as soon as it is received. The graduate unit is responsible for the distribution of copies of the external appraisal to the candidate (two weeks before the examination) and members of the Examination Committee. To avoid prejudicing the result of the examination, the external appraisal is not to be discussed with the candidate by members of the Examination Committee until the examination takes place, nor should it be distributed beyond that group and the relevant administrative officers.

9 Members of the graduate faculty are entitled to attend the examination, and with the permission of the Chair, they may ask questions of the candidate, but they must withdraw before the Committee's discussion and vote. A qualified observer may attend, subject to the same restrictions, if the graduate unit has received approval for such attendance in writing beforehand from the Vice-Dean of SGS. Otherwise the examination is closed to the public. The vote at the examination takes into account both the thesis and the oral defence itself.

10 The Examination Committee represents the Council of the School of Graduate Studies and through it the University. It is therefore responsible for the standard of the Ph.D. degree in this University. Graduate unit examinations held immediately in advance of the final oral must not therefore interfere with attendance at, or thoroughness of, the final examination.

The Committee must evaluate the external appraisal of the thesis, which is to be considered only as an individual opinion to be employed as the committee sees fit. It must examine the candidate on the content and implications of the thesis. Where someone other than the candidate is a co-author of any portion of the thesis, the Examination Committee must be satisfied that the candidate's personal contribution to the thesis is sufficient to fulfil the requirements of the Ph.D. degree. In addition to determining the adequacy of the thesis, the committee must satisfy itself that the thesis document meets the proper standards of scholarship.

The committee possesses the full authority of the School with respect to the examination.

11 A quorum for the final examination is four voting members, plus the Examination Committee Chair who has no vote. Voting shall be by signed ballot, and the names of the examiners and their respective votes shall be read to the Examination Committee by the Chair. If a quorum is not present the Chair may delay the examination to obtain a quorum or may postpone the examination to another date.

12 The candidate passes on the first examination:

a. if the decision is unanimous, OR
b. if there is not more than one negative vote or abstention.

If there is more than one negative vote or abstention, adjournment is mandatory.

In the event of adjournment, the Examination Committee must provide the candidate, as soon as possible, with a written statement that indicates the reasons for adjournment and the committee's requirements for the reconvened oral examination. In addition, the Examination Committee must decide the approximate date of the reconvened examination. The time between the adjourned examination and the reconvened examination should be as short as circumstances will permit and in no case shall exceed one year.

At the reconvened examination, no new committee members shall be added, except for necessary replacements. It is the obligation of the examiners to attend the reconvened examination.

The candidate passes on the reconvened examination:

a. if the decision is unanimous, OR

b. if there is not more than one negative vote or abstention.

No further adjournment will be allowed.

If a candidate is not recommended for the degree by the committee in charge of the second examination, the candidate is ineligible for further Ph.D. candidacy at the University. The Examination Committee must provide the candidate, as soon as possible, with a written statement that explains clearly and directly why the examiners found the candidate's performance unsatisfactory on the written and/or oral components of the examination, as may be relevant.

13 If minor corrections in style are a condition of acceptance of the thesis, the candidate must complete the corrections within one month of the date of the examination, and the supervisor will inform the candidate of the necessary corrections. The supervisor must notify the School of Graduate Studies directly in writing that the required corrections have been made by the candidate, with a copy of the correspondence sent to the graduate coordinator of the graduate unit, before the candidate is recommended for the degree.

14 If minor modifications are a condition of acceptance of the thesis, the Chair of the Examination Committee will appoint a Subcommittee of the Examination Committee (to be approved by the Examination Committee) to supervise the proposed modifications. One member of the Subcommittee is designated by the Chair, with the approval of the Examination Committee, as the Convenor. The Convenor will be responsible for the preparation of a statement detailing the modifications required. Modifications must be completed within three months of the date of the oral examination. The members of the Subcommittee will report on the acceptability of the completed modifications to the Convenor. If all members of the Subcommittee approve the completed modification, the candidate will be passed without the necessity of reconvening the Examination Committee. The Convenor of the Subcommittee must certify in writing to the School of Graduate Studies, within three months of the original examination, that the modifications have or have not been satisfactorily completed. If one or more members of the Subcommittee do not approve the completed modifications, the final oral examination must be reconvened within a year of the date of the original examination.
The Examination Committee must decide the nature of minor modifications, but it is intended that minor modifications should be more than corrections in style and less than major changes in the thesis. A typical example of minor modifications might be clarification of textual material or qualification of research findings and conclusions. The option of acceptance with minor modifications does not apply to the reconvened examination.

If major changes are required, the examination must be adjourned and the Committee reconvened after the changes have been made.

15 The University Library authorization form and publication agreement must be signed by the candidate when the final thesis is submitted.

16 The School requires that every Ph.D. thesis be published substantially as it is accepted as follows:

a. After all the requirements for the degree have been met, the School will forward an original unbound copy of the thesis to University Microfilms Inc. (UMI), the National Library's microfilming agent, with the Non-exclusive Licence to Reproduce Theses Form, authorizing the National Library to reproduce, loan, distribute, or sell copies of the thesis in microform, paper, or electronic format. UMI will include the abstract in the listings of Dissertation Abstracts International. Titles published since 1997 are available in PDF digital format with 24-page previews. To offset the cost incurred by the National Library, UMI charges $39 per thesis, which is borne by the School.

b. All theses copies must include an abstract. Most importantly, the technical requirements outlined in the guidelines for preparation of the abstract, (copies available in graduate units and the Ph.D. Examinations Office) must be followed in order for the abstract in the unbound copy to be reproduced in Dissertation Abstracts International.

The abstract in the final unbound copy of the thesis must be no longer than 350 words.

The National Library's Non-exclusive Licence to Reproduce Form must be signed and submitted to the Ph.D. Examinations Office when the final thesis is submitted. The National Library is prepared to allow a student to revoke the permission he or she has accorded to reproduce, loan, distribute, and sell copies of the thesis in the following situation: if a commercial publishing opportunity arises whereby the commercial publisher objects to the non-exclusive licence granted by the student to the National Library. In this case the National Library will request that UMI, after official notification by the student, withdraw the thesis in question from possible future sale and distribution. However, the thesis in microform format will remain in the National Library's collection and will continue to be made available for on-site consultation and for interlibrary loan.

Publication in microfilm satisfies the School's publication requirement but does not preclude publication of the thesis or any part of it in a journal or as a monograph. In this case, acknowledgment should be made that the work is part of a thesis at the University of Toronto.

If a thesis includes material from other previously copyrighted works, such as offprints of journal articles, maps, published texts, etc., written authorization from the copyright holder is required in order that they may be filmed. This authorization can be included in the author's acknowledgements or at the top of the actual document (or first page of a document more than one page in length).
It is the intention of the University of Toronto that there be **no restriction** on the distribution and publication of theses. However, in exceptional cases, the author, in consultation with the thesis supervisor and with the approval of the chair of the graduate unit, shall have the right to postpone distribution and publication by microfilm for a period up to two years from the date of acceptance of the thesis. In exceptional circumstances and on written petition to the Dean of the School of Graduate Studies, the period might be extended, but in no case for more than five years from the date of acceptance of the thesis unless approved by the Council of the School of Graduate Studies.

Copies of the thesis shall bear the words "Thesis submitted in conformity with the requirements for the Degree of Doctor of Philosophy, Graduate Department of (name of department) in the University of Toronto." In a prominent place on the title page of the thesis the international copyright notice should appear, which consists of three elements in the same line:

a. the letter "C" enclosed in a circle

b. the name of the copyright owner, in this case the author

c. the year of convocation

For further details, students should consult the pamphlet, *Guidelines for the Preparation of Theses for Microfilming and Binding.*
Appendix III – Calendar Entry

Faculty Affiliation
University of Toronto Scarborough

Degree Program Offered
Environmental Science – Ph.D.

Fields
1. Contaminant flux through surface and subsurface environments and biogeochemical cycles
2. Urban geosciences
3. Remediation/restoration of degraded environmental systems
4. The Great Lakes ecosystem
5. Climate change and the environment
6. Environmental science and transitional economies

Overview
The graduate Department of Physical & Environmental Sciences offers opportunities for graduate research in Environmental Science leading to the degree Doctor of Philosophy (Ph.D.) in Environmental Science. Research and teaching within the department is focused on the interfaces between traditional disciplines in dealing with fundamental scientific issues.

The Department has a dynamic professorial staff with outstanding international reputations. Students with a strong background in the basic sciences and with interests in the any of the Fields above are encouraged to apply.

Contact and Address
Web: http://www.utsc.utoronto.ca/~physsci/
E-mail: menvsc@utsc.utoronto.ca
Telephone: (416) 416-287-7357
Fax: (416) 287-7204

Department of Physical & Environmental Sciences
University of Toronto Scarborough
1265 Military Trail
Toronto, Ontario, M1C 1A4
Canada

Degree Programs

Environmental Science
Doctor of Philosophy

Minimum Admission Requirements

Students may be accepted into the Ph.D. program through one of three routes:

1. Following completion of the M.Env.Sc. degree, the M.Sc. degree in environmental sciences, or a related discipline, or the M.A.Sc. degree in environmental engineering or a related discipline, or equivalent from a recognized university with a minimum of B+ average in all work completed in the master’s program;
2. By requesting transfer from a suitable master’s program (see above): students may reclassify from the master’s program after 12 months of full-time study;
3. In the case of exceptional students, by direct entry, that is, after completing an honours B.Sc. degree in a bachelor’s program in a related discipline with a minimum U of T average of A- or equivalent.

Program Requirements

Full Time
• The execution of an original piece of laboratory or field research in environmental science carried out under faculty supervision and presented in thesis form. The program requires successful defence of a thesis proposal, a departmental oral examination of the completed thesis, and a second oral examination carried out under the auspices of the School of Graduate Studies involving examination by an appropriate at-arms-length examiner.
• CA total of 2.0 full-course equivalents (FCE) as follows:
  - A mandatory 0.5 FCE- ENV 2200H Advanced Seminar on Environmental Research. 1.5 FCE from an approved course list in the graduate program. The courses are required to provide background for the student’s research. Courses selected must be approved by the departmental program committee.
• Students may apply to take a number of Ph.D.-level courses taught by the core faculty both within the Department of Physical & Environmental Sciences (DPES) and outside DPES that can be considered for the Ph.D. degree (see examples in the Course List section) as part of their 1.5 FCE credits for the degree; however, all courses for Ph.D. degree credit must be approved by the graduate coordinator/program director.
• During admission, if a student’s preparedness is assessed as being insufficient, the student will be required to take additional courses. It is expected that graduates of the M.Env.Sc. research stream, or other graduate programs listed above, normally will have sufficient background at the time of admission.

Program Length and Time Limit to Degree:

The degree requirements consist of successful completion of: coursework, a thesis proposal, and a thesis. The degree program has been designed so that it can be completed within four years for students who have completed a related master’s degree.
• Students transferring from the master’s program are expected to complete the Ph.D. program within five years from the start of enrolment in the M.Sc. program.
• Direct-entry students from a bachelor’s program are expected to complete the Ph.D. program within five years.

Progress through the Ph.D. program for students admitted with a master’s degree:
• Year I: Complete course work
• Year II: Complete and defend thesis proposal/Start thesis research
• Year III: Research and thesis writing
• Year IV: Thesis writing and defense
Course List

Core Course
ENV2200H Advanced Seminar in Environmental Science

Elective Courses
ENV1102H Analytical Chemistry for Geoscientists
ENV1103H Air and Water Quality Sampling and Monitoring
ENV1104H Methods for the Detection of Pathogens
ENV1105H Soil Contamination Chemistry
ENV1106H Geology and Geophysics of the Shallow Subsurface
ENV1107H Remediation Methods
ENV1109H Advanced Techniques in Geographic Information Systems
ENV1110H Sediment and Contaminant Transport in Aquatic Systems
ENV1111H Freshwater Ecology and Biomonitoring
ENV1112H Boundary Layer Climates and Contaminant Fate
ENV1113H Groundwater Hydrochemistry and Contaminant Transport
ENV1117H Climate Change Impact Assessment
ENV1118H Fundamentals of Ecological Modelling
ENV1119H Quantitative Environmental Analysis
ENV1120H The Dynamics of Contaminant Dispersal in Fluids
ENV1121H Modeling the Fate of Organic Chemicals in the Environment
ENV1122H Global Environmental Security and Sustainable Development
ENV1123H Advances in Agroecology
ENV1124H Social-ecological systems
ENV1126H Environmental Tracers
ENV2201H Advanced Readings in Environmental Science

Graduate Faculty
The following list may change during the year.

For current list, visit www.sgs.utoronto.ca/adminsupport/gradfac.htm.

Full Members
J. Abbatt, BSc, AM, PhD
G. Arhonditsis, BSc, MSc, PhD
B. Berquist, BSc, PhD
R. Boonstra, BSc, PhD
B. Branfireun, BA, MSc, PhD
J. Chen, BSc, PhD, FRSC
D. Cormack, BASc, MASc, PhD, PEng (Departmental and Graduate Chair, DPES)
S. Cowling, BSc, MSc, PhD
M. Diamond, BSc, MSc, Meng, PhD
M. Dittrich, BSc, MS, PhD, DSc
J. Donaldson, BSc, PhD
E. Edwards, BASc, MASc, PhD, PEng
G. Evans, BASc, MASc, PhD
N. Eyles, BSc, MSc, PhD, DSc
G. Ferris, BSc, PhD
R. Fulthorpe, BSc, MSc, PhD
W. Gough, BSc, MSc, PhD
K. Howard, BSc, MSc, PhD, PGeo
K. Kerman, BSc, PhD
H. Kronzucker, BA, BSc, MD, PhD
A. Miall, BSc, PhD, DSc, FRSC
C. Mitchell, BSc, MSc, PhD
B. Sherwood Lollar, BA, PhD, FRSC
A. Simpson, BSc, PhD
M. Simpson, BSc, PhD
F. Wania, BA, PhD
M. Wells, BSc, PhD
D. Williams, BSc, MSc, PhD, DSc
U. Wortmann, Dipl. Geol., Dr. rer. nat.

Members Emeriti
B. Greenwood, BSc, PhD, PhD (Honoris Causa)

Associate Members
S. Bailey, BSc, PhD
T. Bidleman, BSc, PhD
I. Droppo, BA, MSc, PhD
A. Fenech, BSc, PhD
T. Harner, BASc, MASc, PhD, PEng
Y. He, BSc, MSc, PhD
D. Holdway, BSc, PhD
H. Hung, BASc, MASc, PhD
M. Isaac, BSc, MSc, PhD
A. Kirkwood, BES, MSc, PhD
M. Mirza, BSc, PhD
D. Muir, BSc, PhD, FRSC
R. Yerubandi, BSc, M Tech, PhD
Appendix IV – Canadian Graduate Programs in the Environment

Appendix IVa: Canadian Graduate Programs in Environmental Studies, Geography and Natural Resources  (Note: University of Toronto programs are given in bold)

Carleton University - Geography and Environmental Studies
Concordia University - Environmental Impact Assessment
Dalhousie University - Resource and Environmental Studies
Lakehead University - Master of Environmental Studies in Nature-Based Recreation & Tourism
Royal Roads University - Graduate Certificate in Environmental Education and Communication
Royal Roads University - Graduate Diploma in Environmental Education and Communication
Royal Roads University – Environment and Management (M.A., M.Sc.)
Royal Roads University - Environmental Education and Communication (M.A.)
Ryerson University - Environmental Applied Science and Management
Simon Fraser University - Resource and Environmental Management
University of British Columbia - Resource Management and Environmental Studies
University of British Columbia - Occupational and Environmental Hygiene
University of Calgary - Energy and the Environment
University of Calgary - Environmental Design (M.A., Ph.D.)
University of Guelph - Resource and Environmental Economics (Ph.D.)
University of New Brunswick - Faculty of Forestry and Environmental Management
University of Northern British Columbia - International Studies (M.A. - Regional Relations, International Development, Global Environmental Policy)
University of Northern British Columbia - Natural Resources and Environmental Studies, M.A. (Geography, Environmental Studies, Tourism)
University of Northern British Columbia - Natural Resources and Environmental Studies (Ph.D. & MNRES)

University of Toronto - Environmental Geography and Resource Management (M.A., Ph.D.)
University of Toronto - Environmental Planning (M.A.)
University of Toronto - Environmental Studies (M.A., Ph.D.)
University of Waterloo - Environment and Resource Studies
University of Western Ontario – Environment and Sustainability (M.Sc., Ph.D.)
York University - Business and the Environment
York University - Graduate Diplomas in Environmental/Sustainability Education
York University - Graduate Diplomas in Environmental/Sustainability Education
York University - Environmental Studies (M.Sc., Ph.D.)

Appendix IVb: Canadian Graduate Programs in Environmental Engineering
(Note: University of Toronto programs are given in bold)
Carleton University - Ottawa-Carleton Institute for Environmental Engineering
Concordia University - Environmental Engineering
Dalhousie University - Graduate Studies in Environmental Engineering
Memorial University of Newfoundland - Environmental Engineering and Applied Science (M.A.Sc.)
Royal Military College of Canada - Environmental Engineering
University of Calgary - The Centre for Environmental Engineering, Research and Education

University of Toronto - Environmental Engineering
University of Toronto - Environmental Science and Engineering
University of Ottawa - Environmental Engineering (Ph.D./?)
University of Saskatchewan - Environmental Engineering
University of Windsor - Environmental Engineering (MASc/MEng/PhD)

**Appendix IVc: Canadian Graduate Programs in Environmental Biology**
(Note: University of Toronto programs are given in bold)
Simon Fraser University - Environmental Biology
University of Guelph - Environmental Biology (M.Sc./Ph.D.)

**Appendix IVd: Canadian Graduate Programs in Environmental Health**
(Note: University of Toronto programs are given in bold)
**University of Toronto** - Occupational and Environmental Health (M.H.Sc./M.Sc.)

**Appendix IVe: Canadian Graduate Programs in Environmental Chemistry & Toxicology**
(Note: University of Toronto programs are given in bold)
Carleton University - Ottawa-Carleton Collaborative Program in Chemical and Environmental Toxicology
**University of Toronto** - Environmental Chemistry (M.Sc., Ph.D.)
University of Ottawa - Chemical and Environmental Toxicology (Ph.D.)

**Appendix IVf: Canadian Graduate Programs in Environmental Science**
(Note: University of Toronto programs are given in bold)
McGill University – School of Environment (M.A., M.Sc., Ph.D.)
Memorial University of Newfoundland – Faculty of Science (Ph.D. & Master of Environmental Science/Master of Science)
Royal Military College of Canada - Environmental Science
Trent University - Watershed Ecosystems (M.Sc., Ph.D.)
University of Northern British Columbia (M.Sc., Ph.D.)
University of Northern British Columbia - Natural Resources and Environmental Studies, M.Sc. (Biology, Environmental Science, Forestry, Geography, Recreational Resource Management)
**University of Toronto Scarborough** - Environmental Science (M.Env.Sc.)
University of Windsor – Great Lakes Institute for Environmental Research (M.Sc., Ph.D.)
Appendix V – Statement from the Head Librarian

Background
The University of Toronto Scarborough Library is well positioned to provide the necessary scholarly resources and services required for a graduate program at the doctoral level in Environmental Science. Together with other libraries in the University of Toronto Library (UTL) system, the collection supports research in a full range of both traditional subjects of geology, geography, biology, ecology, chemistry, geophysics, engineering and the interdisciplinary subject of environmental sciences. Researchers in this program will draw on literature that is diverse in its coverage, from basic field and laboratory techniques to an examination of real world environmental problems.

All libraries are challenged by financial constraints in an environment characterized by an 'information explosion' of print and electronic resources. Accordingly, libraries are necessarily selective in materials that are purchased for their particular institution. The University of Toronto Library's holdings have been developed in a systematic way by U of T Scarborough and UTL selectors and through faculty requests to ensure that all commercially produced current imprints of books are received by the Library.

At U of T Scarborough, the best scholarly resources are purchased to support courses, programs and research activities at the campus. At the same time, U of T Scarborough enjoys the benefits of having access to the resources of all the other libraries in the UTL system. Access to the collection is provided through an integrated online catalogue of UTL records, searched by author, title, subject, or keyword. Using features of the online catalog, materials from any U of T library can be delivered to U of T Scarborough within 1-5 days through the InterCampus Delivery service. As such, irrespective of library affiliation, all users have access to the same UTL resources. Similarly, through Interlibrary Loan services, access to materials from academic institutions around the world can be requested in the library’s online environment.

Currency is of utmost importance in all science disciplines. Continuous improvements in the Library’s processing of materials ensure that newly acquired resources are made available to the University community as quickly as possible.

Description of Collection

Monographs
The University of Toronto Library is ranked fourth over-all in holdings for North American libraries7.

It is the policy of UTL to acquire a single copy of all science books published in English that are considered to be of research value. These include print and/or electronic proceedings of conferences and symposia, professional society publications, review literature, technical handbooks, research monographs and reference books in the forms of handbooks, encyclopedias, dictionaries and biographies.

Given the interdisciplinary nature of environmental studies, environmental resources are distributed throughout the UTL system. In addition to holdings at U of T Scarborough, students and faculty in the proposed program will find substantial resources in many other U of T libraries, such as Noranda Earth Sciences, Engineering and Computer Science, Robarts, Law, and the Gerstein Science Information Centre.

Serials
Periodical publications are the primary means by which information is made known to scientists and the U of T libraries have extensive journal holdings. However, like all North American libraries, UTL is experiencing great difficulty in keeping up with the rising cost of serial subscriptions. This situation has improved significantly in the recent past due to the Library's commitment to purchase an ever-increasing number of electronic journals. At the present time a total of 61,448 electronic journals, 1,053 electronic journal indexes and 4,195 electronic news services are available to students and faculty at the university. Many of these have full text availability.

A search of the ISI journal citation reports for the subject area "Environmental Studies" shows the Library system holding a print or full text electronic version of 157 of the 163 top ranked journals.

Electronic Resources
The electronic information services at the University of Toronto Library have been evolving since 1987, when the first online catalogue was mounted. Within a year, the online catalogue was available in all the campus libraries, and dial-in access was introduced with a small number of lines. Abstracts and indexes had been computerized since the early 1970’s and through the 1980’s, searched by trained intermediaries. Beginning in the late 1980’s CD-ROMs and networked databases widened the access of electronic databases to the end-user to perform his or her own searches. Today most electronic resources are accessed through a web interface, and the U of T Library is a world leader in the provision of resources in this manner.

In support of Environmental Studies, the Library subscribes to major abstracting and indexing online services such as Science Citation Index, Scopus, Environmental Sciences and Pollution Management, Environment Abstracts and Geobase. Major organizations and agencies such as Environment Canada, the Environmental Protection Agency, and the United Nations are well represented in both electronic and print formats.

Staff and Services
Currently U of T Scarborough Library staff consists of 7.92 FTE librarians and 15.87 FTE library technicians. The Library is open 168 hours per week from September to May and 71.25 hours per week from May to August, which includes weekend hours of service. The library also provides 24/7 library services from mid-October to December and from February to early May.

Environmental science is complex and interdisciplinary in nature. Information research in today’s environment is also complex with increasingly important reliance on electronic databases, the Internet and the vast quantity of resources available in all formats at the University of Toronto and beyond. Service is the key to ensuring that the most relevant resources are found for research purposes. It is the support through U of T Scarborough Library’s Reference, Research and Instruction, Circulation and Media services which facilitates this efficiency in research. The Library has an information literacy specialist and librarians offer one-on-one instruction sessions to identify and optimize the use of scholarly resources.
The following are examples of the types of support available through the University or Toronto Library: connections to local, national and international scientific information networks, verification of citations, teaching and orientation in the use of the Library’s collection, electronic indexes, networked databases, the Internet and more. During the Fall/Winter term, service in person, by telephone, email or chat is available in the U of T Scarborough Library until 10:30 p.m. (Fall) and 12 midnight (Winter) and in the Summer term, until 10:30 p.m.

Approximately 94 computers in the U of T Scarborough Library’s Informatics Commons are available, in addition to the 476 computers on campus, to provide access to the Library catalogue and other online resources. All electronic resources are also available from desktops in offices or from home. Together with the increasing online support services such as email and chat reference and online help guides, the complex world of information research is easily accessible to faculty and students beyond the limits of a physical library building.

Supporting Collections

While no one library can own every title that is published, we understand the importance of developing and maintaining efficient networks for quick and easy access to other libraries’ resources. As already mentioned, U of T Scarborough Library’s services enables users to obtain materials from other U of T libraries and from those outside of the University. U of T Scarborough places high priority in seeking ways to further expedite the process between when an item is ordered to when it arrives in the Library.

With a TCard, users have direct access and full privileges to all of U of T libraries. In addition, by presenting the card at any Canadian University, the holder may apply for direct borrowing privileges at that institution with no cost to the user.

Budget and Long-Term Commitments

The strength of the Library’s financial commitment to purchasing material over the next five to seven years depends upon University policy and government funding. To date it has been the University of Toronto's stated policy to protect, as far as possible, the Library’s acquisition budget from rising costs and maintain this protected status. This present financial policy allows the Library to maintain its current purchasing levels for publications relevant to Environmental Science and ensures continued support for the program. It is expected that upon establishment the program will attract $22,000 initially and thereafter $10,000 per year will be added to base.

Prepared by: Cristina Sewerin
Physical & Applied Sciences Book Selector

Victoria Owen
Head Librarian, University of Toronto Scarborough

Submitted by: Carole Moore
Chief Librarian
University of Toronto Libraries

July 9, 2009
Appendix VI Planned Laboratory Equipment Purchases 2009-2012

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Year 1 Purchases</th>
<th>Year 2 Purchases</th>
<th>Year 3 Purchases</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPLC</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GC-MS</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FTIR (2 instruments)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UV-VIS</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Atomic Absorption (AA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Software</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>ESI-ion Trap</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teaching Grade NMR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research Grade NMR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ion Chromatograph</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Gas Chromatograph</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Real Time CPR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accurate Mass Multiphase (pure compounds)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>LC-MS (Accurate Mass Mixtures)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Element Analyzer</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>X-ray Diffraction small molecules - bench top</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>x-ray fluorescence analyzer (environmental)</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Raman Spectrophotometer</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Circular Dichroism Spec.</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>ICP-MS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluorometer</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Nitrogen Generator</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas Generator * 3</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>UPS (Uninterruptible Power Supply)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Renovations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Once only start-up cost</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
Ph.D. in Environmental Science

Calendar Entry

Faculty Affiliation
University of Toronto Scarborough

Degree Program Offered
Environmental Science – PhD

Fields
1. Contaminant flux through surface and subsurface environments and biogeochemical cycles
2. Urban geosciences
3. Remediation/restoration of degraded environmental systems
4. The Great Lakes ecosystem
5. Climate change and the environment
6. Environmental science and transitional economies

Overview
The graduate Department of Physical and Environmental Sciences offers opportunities for graduate research in Environmental Science leading to the degree Doctor of Philosophy (PhD) in Environmental Science. Research and teaching within the department is focused on the interfaces between traditional disciplines in dealing with fundamental scientific issues.

The Department has a dynamic professorial staff with outstanding international reputations. Students with a strong background in the basic sciences and with interests in any of the Fields above are encouraged to apply.

Contact and Address
Web: http://www.utsc.utoronto.ca/~physsci/
E-mail: menvsc@utsc.utoronto.ca
Telephone: (416) 416-287-7357
Fax: (416) 287-7204

Department of Physical & Environmental Sciences
University of Toronto Scarborough
1265 Military Trail
Toronto, Ontario, M1C 1A4
Canada

Degree Programs

Environmental Science
Doctor of Philosophy

Minimum Admission Requirements

Students may be accepted into the PhD program through one of three routes:
1. Following completion of the MEnvSc degree, the MSc degree in environmental sciences, or a related discipline, or the MASc degree in environmental engineering or a related discipline, or equivalent from a recognized university with a minimum of B+ average in all work completed in the master's program;
2. By requesting transfer from a suitable master's program (see above): students may reclassify from the master's program after 12 months of full-time study;
3. In the case of exceptional students, by direct entry, that is, after completing an honours BSc degree in a bachelor’s program in a related discipline with a minimum U of T average of A- or equivalent.
Ph.D. in Environmental Science

Program Requirements

Full Time
- The execution of an original piece of laboratory or field research in environmental science carried out under faculty supervision and presented in thesis form. The program requires successful defence of a thesis proposal, a departmental oral examination of the completed thesis, and a second oral examination carried out under the auspices of the School of Graduate Studies involving examination by an appropriate at-arms-length examiner.
- CA total of 2.0 full-course equivalents (FCE) as follows:
  - A mandatory 0.5 FCE- ENV 2200H Advanced Seminar on Environmental Research.
  - 1.5 FCE from an approved course list in the graduate program. The courses are required to provide background for the student's research. Courses selected must be approved by the departmental program committee.
- Students may apply to take a number of PhD-level courses taught by the core faculty both within the Department of Physical & Environmental Sciences (DPES) and outside DPES that can be considered for the PhD degree (see examples in the Course List section) as part of their 1.5 FCE credits for the degree; however, all courses for PhD degree credit must be approved by the graduate coordinator/program director.
- During admission, if a student’s preparedness is assessed as being insufficient, the student will be required to take additional courses. It is expected that graduates of the MEnvSc research stream, or other graduate programs listed above, normally will have sufficient background at the time of admission.

Program Length and Time Limit to Degree:

The degree requirements consist of successful completion of: coursework, a thesis proposal, and a thesis. The degree program has been designed so that it can be completed within four years for students who have completed a related master’s degree.
- Students transferring from the master’s program are expected to complete the Ph.D. program within five years from the start of enrolment in the M.Sc. program.
- Direct-entry students from a bachelor’s program are expected to complete the Ph.D. program within five years.

Progress through the PhD program for students admitted with a master's degree:
- Year I: Complete course work
- Year II: Complete and defend thesis proposal/Start thesis research
- Year III: Research and thesis writing
- Year IV: Thesis writing and defense

Course List

Core Course
ENV2200H Advanced Seminar in Environmental Science

Elective Courses
ENV1102H Analytical Chemistry for Geoscientists
ENV1103H Air and Water Quality Sampling and Monitoring
ENV1104H Methods for the Detection of Pathogens
ENV1105H Soil Contamination Chemistry
ENV1106H Geology and Geophysics of the Shallow Subsurface
ENV1107H Remediation Methods
ENV1109H Advanced Techniques in Geographic Information Systems
ENV1110H Sediment and Contaminant Transport in Aquatic Systems
Ph.D. in Environmental Science

ENV1111H Freshwater Ecology and Biomonitoring
ENV1112H Boundary Layer Climates and Contaminant Fate
ENV1113H Groundwater Hydrochemistry and Contaminant Transport
ENV1117H Climate Change Impact Assessment
ENV1118H Fundamentals of Ecological Modelling
ENV1119H Quantitative Environmental Analysis
ENV1120H The Dynamics of Contaminant Dispersal in Fluids
ENV1121H Modeling the Fate of Organic Chemicals in the Environment
ENV1122H Global Environmental Security and Sustainable Development
ENV1123H Advances in Agroecology
ENV 1124H Social-ecological systems
ENV 1126H Environmental Tracers
ENV 2201H Advanced Readings in Environmental Science

Graduate Faculty

The following list may change during the year.

For current list, visit www.sgs.utoronto.ca/adminsupport/gradfac.htm.

Full Members

J. Abbatt, BSc, AM, PhD
G. Arhonditsis, BSc, MSc, PhD
B. Berquist, Bsc, PhD
R. Boonstra, BSc, PhD
B. Branfireun, BA, MSc, PhD
J. Chen, BSc, PhD, FRSC
D. Cormack, BASc, MASc, PhD, PEng (Departmental and Graduate Chair, DPES)
S. Cowling, BSc, MSc, PhD
M. Diamond, BSc, MSc, Meng, PhD
M. Dittrich, BSc, MS, PhD, DSc
J. Donaldson, BSc, PhD
E. Edwards, BASc, MASc, Phd, PEng
G. Evans, BASc, MASc, PhD
N. Eyles, BSc, MSc, PhD, DSc
G. Ferris, BSc, PhD
R. Fulthorpe, BSc, MSc, PhD
W. Gough, BSc, MSc, PhD
K. Howard, BSc, MSc, PhD, PGeo
K. Kerman, BSc, PhD
H. Kronzucker, BA, BSc, MD, PhD
A. Miall, BSc, PhD, DSc, FRSC
C. Mitchell, BSc, MSc, PhD
B. Sherwood Lollar, BA, PhD, FRSC
A. Simpson, BSc, PhD
M. Simpson, BSc, PhD
F. Wania, BA, PhD
M. Wells, BSc, PhD
D. Williams, BSc, MSc, PhD, DSc
U. Wortmann, Dipl. Geol., Dr. rer. nat.
Members Emeritii
B. Greenwood, BSc, PhD, PhD (Honoris Causa)

Associate Members
S. Bailey, BSc, PhD
T. Bidleman, BSc, PhD
I. Droppo, BA, MSc, PhD
A. Fenech, BSc, PhD
T. Harner, BASc, MASc, PhD, PEng
Y. He, BSc, MSc, PhD
D. Holdway, BSc, PhD
H. Hung, BASc, MASc, PhD
M. Isaac, BSc, MSc, PhD
A. Kirkwood, BES, MSc, PhD
M. Mirza, BSc, PhD
D. Muir, BSc, PhD, FRSC
R. Yerubandi, BSc, MTech, PhD
MOTION

Graduate Education Council
Tuesday, January 19, 2010

ITEM 7.1

Proposal to add the master’s level to an existing doctoral-level Collaborative Program: Collaborative master’s program in Developmental Biology
Lead Faculty: Faculty of Medicine

MOTION
THAT Graduate Education Council approve the proposal of the Faculty of Medicine to add the master’s level to the existing Collaborative doctoral program in Developmental Biology, housed within SGS Division IV for administrative purposes, and with the Faculty of Medicine as the program’s lead Faculty, effective May 2010.

See attached documents:
- Governance Form E
- U of T Proposal Document
- OCGS Brief
- Calendar Entry

Prior Approvals and Discussion

The proposal was approved by the Faculty of Medicine Graduate Curriculum Committee on December 10 2009. At the meeting, the following points arose:

- When would it be expected that master’s students be admitted into this Collaborative Program and would this parallel the experience of students in the doctoral level Collaborative Program which already exists? It was clarified that master’s students are only in their programs for two years, so it is expected that they would be admitted and participating in their first year.

- A clarification around students’ program requirements was requested. It was made clear that the core course is identical to one of the doctoral-level Collaborative Program courses and it includes a speaker series and attendance at an annual scientific retreat. Students must also present a poster which will usually be done at the end of the second year.

Further Governance

GEC approval is the final University of Toronto approval. It will be sent for information to the Academic Policy and Programs Committee of Academic Board in SGS’s annual report. The proposal will be submitted to OCGS for appraisal and approval.
Governance Form E: New Program
2009-2010

Name of Proposed Graduate Program:
Collaborative Program in Development Biology (adding the MSC)

Faculty Affiliation:
Medicine

Name of Graduate Unit involved, if any:
NA

Brief Summary of Proposal:
Please see attached Executive Summary.

Prior Approvals/Actions and Comments:
Collaborative Program in Developmental Biology Program Committee (6 February, 2009)
Faculty of Medicine Graduate Curriculum Committee (10 December 2009)
SGS Graduate Education Council (19 January 2010)

Proposed Effective Date:
May 2010

Chair/Director Name and Contact Information:
Helen McNeill
Director, Collaborative Program in Developmental Biology

Faculty Dean Name and Contact Information:
Andrea Sass-Kortsak
Vice Dean, Graduate Affairs

Date:
November 16, 2009
Executive Summary

Academic

The Collaborative Program in Developmental Biology (PhD-level) proposes to add the Master of Science degree level to its existing program. Developmental biology represents a strong and diverse area of research in many departments at the university. This Collaborative Program was established in 1995 to facilitate cross-disciplinary interactions and further strengthen research and teaching in developmental biology. Currently, the program accepts only PhD students. However, many MSc students participate in program activities such as the monthly meetings, the Annual Scientific Retreat and the Distinguished Lecture series. Adding master’s students to this program will: a) provide a venue for developmental biology research at the master’s level, b) integrate and formalize connections between graduate students in both MSc and PhD degree programs, c) strengthen the collaborative program through expansion and d) formally acknowledge the participation by master’s students.

Currently there are six participating graduate departments at the doctoral level and all six will allow eligible master’s students to participate in the program.

- Department of Biochemistry
- Department of Cell and Systems Biology
- Department of Immunology
- Department of Laboratory Medicine and Pathobiology
- Department of Molecular Genetics
- Department of Physiology

The Graduate Departments of Dentistry and Medical Biophysics did participate in the doctoral collaborative program prior to this review but no longer have faculty members within this field, therefore, these departments will not continue their participate at the doctoral level or join at the masters level at this time.

Planning and Budget

The existing budget allocation will be sufficient to cover the very minimal increased costs, given that Master’s students have been informally included for some time.

Space and Facilities

No additional space is required. Students enrolled in this program are provided with space and facilities through their home departments. The director and part-time administrative assistant will continue to provide administrative support. The administrative office is currently located at the Samuel Lunenfeld Research Institute, Mount Sinai Hospital.

Students

Students enrolled in the collaborative program receive non-academic student support from their home departments.
UNIVERSITY OF TORONTO

Proposal for

Adding M.Sc. Level

To The Existing

Collaborative PhD Program in Developmental Biology

November 3, 2009
# TABLE OF CONTENTS

**Page**

1 Executive Summary ................................................................................................................ 3

2 Academic ................................................................................................................................. 4
   2.1 Description and rationale for the proposal ................................................................. 4
      2.1.1 Description of proposed program .............................................................. 4
      2.1.2 Rationale for proposal ....................................................................... 4
   2.2 Pedagogical and other academic objectives, including expected benefits of the proposed program ................................................................. 4
   2.3 Projected student demand ..................................................................................... 4
   2.4 Impact on the Department's and Division's program of study, including impact on other divisions, if any .................................................................................. 5
   2.5 Evidence of consultation with other affected divisions ........................................... 5
   2.6 Appropriateness of the name and designation of the new program ................. 5
   2.7 Program description and requirements, course titles/numbers, faculty members ........................................................................... 5
      2.7.1 Program description and requirements ..................................................... 5
      2.7.2 Course titles/numbers ........................................................................ 5
      2.7.3 Faculty members ................................................................................. 6

3 Planning and Budget .............................................................................................................. 6
   3.1 Resource implications ............................................................................................ 6
      3.1.1 Staffing .................................................................................................. 6
      3.1.2 Space .................................................................................................. 6
      3.1.3 Libraries ................................................................................................... 6
      3.1.4 Computing facilities ........................................................................... 6
      3.1.5 Enrolment/admissions ...................................................................... 6
      3.1.6 Revenues/costs .................................................................................. 6
      3.1.7 Financial Aid ....................................................................................... 6

4 Space and Facility ................................................................................................................... 7
   4.1 Requirements for physical facilities ................................................................. 7
   4.2 Capital projects for approvals ........................................................................ 7

5 Students ................................................................................................................................... 7
   5.1 Student affairs and services ............................................................................... 7
   5.2 Student conduct and discipline ........................................................................ 7
   5.3 Financial Support .............................................................................................. 7
   5.4 Student registration and information systems ............................................. 7
1 Executive Summary

Academic

The Collaborative Program in Developmental Biology (PhD-level) proposes to add the Master of Science degree to its existing program. Developmental biology represents a strong and diverse area of research in many departments at the university. This Collaborative Program was established in 1995 to facilitate cross-disciplinary interactions and further strengthen research and teaching in developmental biology. Currently, the program accepts only PhD students. However, many MSc students participate in program activities such as the monthly meetings, the Annual Scientific Retreat and the Distinguished Lecture series. Adding master’s students to this program will: a) provide a venue for developmental biology research at the master’s level, b) integrate and formalize connections between graduate students in both MSc and PhD degree programs, c) strengthen the collaborative program through expansion and d) formally acknowledge the participation by master’s students.

Currently there are six participating graduate departments at the doctoral level and all six will allow eligible master’s students to participant in the program.

Department of Biochemistry
Department of Cell and Systems Biology
Department of Immunology
Department of Laboratory Medicine and Pathobiology
Department of Molecular Genetics
Department of Physiology

The Graduate Departments of Dentistry and Medical Biophysics did participate in the doctoral collaborative program prior to this review but no longer have faculty members within this field, therefore, these departments will not continue their participate at the doctoral level or join at the masters level at this time.

Planning and Budget

The existing budget allocation will be sufficient to cover the very minimal increased costs, given that Master’s students have been informally included for some time.

Space and Facilities

No additional space is required. Students enrolled in this program are provided with space and facilities through their home departments. The director and part-time administrative assistant will continue to provide administrative support. The administrative office is currently located at the Samuel Lunenfeld Research Institute, Mount Sinai Hospital.

Students

Students enrolled in the collaborative program receive non-academic student support from their home departments.
2  Academic

2.1  Description and rationale for the proposal

2.1.1  Description of proposed program

The Collaborative Program in Developmental Biology (PhD level) proposes to add the Master of Science degree to its program. All of the current participating departments (listed below) agree to allow eligible masters students to enroll.

- Department of Biochemistry
- Department of Cell and Systems Biology
- Department of Immunology
- Department of Laboratory Medicine and Pathobiology
- Department of Molecular Genetics
- Department of Physiology

2.1.2  Rationale for proposal

Currently, the program accepts only PhD students. However, many MSc students participate in program activities such as the monthly meetings, the Annual Scientific Retreat and the Distinguished Lecture Series. The interest of MSc students in our program is substantial as evidenced, for example, by the fact that approximately 45 percent of the posters at the past scientific retreat were presented by MSc students (18 posters).

2.2  Pedagogical and other academic issues, including expected benefits of the proposed program

There is a clear demand to open the collaborative program to masters’ level students. The addition of master’s students will enrich the existing doctoral program.

2.3  Projected student demand

Based on discussions with participating departments, a steady-state student enrollment of 24 is expected by 2013-14.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Molecular Genetics</td>
<td>(6)</td>
<td>7(3)</td>
<td>8(5)</td>
<td>7(3)</td>
<td>8(2)</td>
<td>9(3)</td>
<td>9(2)</td>
<td>55</td>
</tr>
<tr>
<td>Immunology</td>
<td>(2)</td>
<td>2(1)</td>
<td>3(1)</td>
<td>3(0)</td>
<td>3(1)</td>
<td>3(0)</td>
<td>4(1)</td>
<td>20</td>
</tr>
<tr>
<td>CSB</td>
<td>(5)</td>
<td>4(1)</td>
<td>5(2)</td>
<td>8(2)</td>
<td>8(0)</td>
<td>8(1)</td>
<td>8(2)</td>
<td>46</td>
</tr>
<tr>
<td>Laboratory Medicine and Pathobiology</td>
<td>(1)</td>
<td>1(0)</td>
<td>2(1)</td>
<td>2(0)</td>
<td>2(0)</td>
<td>2(0)</td>
<td>2(1)</td>
<td>12</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>(1)</td>
<td>1(0)</td>
<td>1(0)</td>
<td>1(1)</td>
<td>2(1)</td>
<td>1(1)</td>
<td>1(1)</td>
<td>7</td>
</tr>
<tr>
<td>Physiology</td>
<td>(1)</td>
<td>1(1)</td>
<td>1(0)</td>
<td>1(0)</td>
<td>1(0)</td>
<td>1(0)</td>
<td>1(1)</td>
<td>7</td>
</tr>
<tr>
<td>Total:</td>
<td>(16)</td>
<td>16</td>
<td>20</td>
<td>22</td>
<td>24</td>
<td>24</td>
<td>25</td>
<td>147</td>
</tr>
</tbody>
</table>
2.4 Impact on the Department’s and Division’s program of study, including impact on other divisions

The addition of the master’s level students will create a shared community of scholars in this area and integrate MSc and PhD students. In addition, cross-disciplinary interactions will be facilitated at both student and faculty levels. This will further strengthen research and teaching in developmental biology at the University of Toronto.

2.5 Evidence of consultation with other affected divisions

Consultation has taken place with all participating graduate departments and all current departments agree to open the program to eligible master’s students.

2.6 Appropriateness of the name and designation of the new program

This program exists at the doctoral level.

2.7 Program description and requirements, course titles/numbers, and faculty members

2.7.1 Program description and requirements

○ Admission requirements

Students who wish to enter the Program must first be registered in the MSc program in one of the host departments, and be pursuing a developmental biology project under the supervision of a member of the collaborative program. We expect that students will apply early in their first year of study.

○ Program requirements

All master’s students will be enrolled in the new course Topics in Developmental Biology (JDB1024Y) for the duration of their stay in the program. Course requirements for JDB1024Y will be that students attend the monthly meetings of the Collaborative Program in Developmental Biology, the Distinguished Lecturers in Developmental Biology Series, and will present one poster at the Annual Scientific Retreat, which will be evaluated by program faculty. MSc students must complete a thesis in the topic area of developmental biology and the student’s supervisory committee should include at least one member of the Collaborative Developmental Biology Program.

2.7.2 Course titles/numbers

Students will enroll in the new course JDB1024Y for the duration of their program. This course will also be the forum for the students’ common learning experience.
<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>JDB1024Y</td>
<td>Topics in Developmental Biology</td>
</tr>
</tbody>
</table>

Synopsis: MSc students must attend the monthly meetings of the program and the distinguished lecturers in developmental biology series. In addition, students present one poster at the Annual Scientific Retreats of the Collaborative Program in Developmental Biology. The poster is evaluated by program faculty.

2.7.3 Faculty members

Please see attached Appendix A.

3 Planning and Budget

3.1 Resource implications

The existing budget allocation will be sufficient to cover the very minimal increased costs, given that Master’s students have been informally included for some time.

3.1.1 Staffing

Staff will be the same as the existing program. Administration of the program is carried out by the Director and part-time administrative assistant.

3.1.2 Space

Space will remain the same as for the existing program.

3.1.3 Libraries

Library resources will be the same as for the existing program.

3.1.4 Computing facilities

Students use facilities in their home departments.

3.1.5 Enrolment/admissions

Based on discussions with participating departments, the initial enrolment is expected to be 16 MSc students (2010-11) with a steady-state enrollment of 24-25 students by 2013-14.

3.1.6 Revenues/costs

The budget of the collaborative program is expected to remain the same.

3.1.7 Financial aid

None, students receive financial aid through their home departments.
4 Space and Facilities

4.1 Requirements for physical facilities

Home departments will provide graduate students with workspace within their home department. No additional space is required.

4.2 Capital projects for approvals

No capital projects.

5 Students

5.1 Student affairs and services

All the standard facilities and services will be available to students.

5.2 Student conduct and discipline

Students are subject to regulations through their home departments.

5.3 Financial Support

Financial support is the responsibility of the student’s home department.

5.4 Student registration and information systems

Student registration and enrollment will follow current SGS practices for collaborative programs.
APPENDIX I

COLLABORATIVE PHD PROGRAM IN
DEVELOPMENTAL BIOLOGY

CORE FACULTY RESEARCH SYNOPSISES

The following is a list of the collaborative program's core faculty:

Molecular Genetics

Gabrielle Boulianne

My laboratory has been using powerful genetic techniques available in Drosophila, to study the development and the function of the nervous system. More recently, we have exploited the knowledge and tools obtained during the course of these studies to develop models of aging and human neurodegenerative diseases, such as Amyotrophic Lateral Sclerosis (ALS) and Alzheimer's Disease (AD).


Julie Brill

Phosphatidylinositol phosphates (PIPs) are critical regulators of cell polarity, growth and proliferation. We are studying the roles of these important membrane phospholipids in the differentiation of specialized cells during development of multicellular organisms. Using the fruit fly Drosophila melanogaster as a model system, we have identified roles for PIPs in cytokinesis, oogenesis, polarization of developing sperm and epithelial cells, secretory granule formation and eye pigmentation. Our current research focuses on studying the enzymes that control PIP formation, identifying target proteins that are regulated by PIPs and PIP regulatory enzymes, and defining the molecular mechanisms by which PIPs regulate these proteins during differentiation.


Brian Ciruna

We are interested in understanding the molecular and genetic mechanisms that regulate early development, with specific emphasis on the planar cell polarity (PCP) signalling pathway and its role in embryonic morphogenesis.

Correct polarity is essential for normal cellular function. The characteristic apical-basolateral polarity of epithelial cells, for example, is required for directional ion transport and deposition of the basal lamina. In addition, polarity may also exist across the plane of an epithelium or field of cells. In vertebrates, this planar cell polarity (or PCP) instructs polarized cell rearrangements and morphogenetic processes that structure and shape the developing embryo. At neurulation, defects in PCP signalling are thought to cause spina bifida and anencephaly - neural tube closure defects that affect one in every 1000 human births. PCP signalling has also been implicated in skin development, polarization of the inner ear sensory epithelium, cardiac development and cancer. However, little is known about how PCP signals ultimately regulate these important cellular and physiological processes. We are using the zebrafish as a model organism to investigate the fundamental mechanisms by which cell polarity is established, maintained and interpreted in the course of vertebrate embryonic development. By combining powerful live microscopic imaging capabilities with the genetic and embryological techniques afforded by zebrafish research, we are examining the dynamic regulation of PCP signalling at a sub-cellular level. Furthermore, we are employing forward genetic and candidate gene approaches to screen for novel regulators and modifiers of PCP signalling. We hope to gain insight into how
regulation of cell polarity functions in normal development, and how aberrations in PCP signalling contribute to congenital malformations and disease.


**Sabine Cordes**

Dr. Cordes’s laboratory is using molecular techniques and analysis of pre-existing and newly generated mouse mutations to understand early neural development, especially that of the vertebrate hindbrain segmentation and serotonergic neuron. To investigate neurotonal specification, Dr. Cordes's lab is using chemical mutagenesis and a series of streamlined assays to generate and identify novel mouse mutations which affect serotonergic neuron specification, differentiation, and neurotransmission.


**Joseph Culotti**

Dr. Culotti’s laboratory is using the simple nematode Caenorhabditis elegans to identify and characterize the function of gene products that are responsible for neurogenesis and for guiding the migration of growing axons. Other projects in the laboratory involve identifying mutations in homologues of genes known to affect axon guidance in vertebrates.


**Sean Egan**

The Notch family receptors have been implicated in development of most tissues in complex animals. We are interested in how Notch receptor activation and signaling control normal mammary development and breast cancer. To this end we identified mammalian Fringe proteins (Lunatic, Manic and Radical Fringe), which control Notch activation in response to Delta and Jagged family ligands. We have recently shown that Fringe proteins can function as tumor suppressors in mammary epithelium. Furthermore, we are using mouse mutants and reporter lines to define which Notch receptors control mammary stem and progenitor cell division, differentiation and survival. We have recently determined that while some Notch proteins control mammary cell survival, others regulate proliferation and differentiation of mammary alveoli during pregnancy.


**CC Hui**

The Hedgehog signaling pathway plays a major role in the development of both invertebrates and vertebrates. In vertebrates, Hedgehog signaling controls embryonic patterning and the development of multiple organ systems. In humans, aberrations in the Hedgehog signaling pathway lead to congenital malformations and cancer. My laboratory is interested in understanding the molecular mechanisms underlying Hedgehog signal transduction in mammalian cells and how Hedgehog signaling affects both normal and abnormal developmental processes.


**Henry Krause**

Our lab is using genome scale approaches to understand processes of development. There are two main projects in the lab. The first involves the nuclear hormone receptor family of ligand activated transcription factors, while the second project focuses on the process of transcript localization within cells and how this localization affects the functions of encoded proteins.


**Howard Lipshitz**

We are interested in understanding how embryonic cells are instructed to adopt distinct developmental fates, ultimately specifying a complex, three-dimensional organism. Our research program is sub-divided into two projects that utilize Drosophila as a molecular genetic model. One focus is on how certain classes of mRNAs are localized within the cytoplasm of cells, with an emphasis on the egg and early embryo. Intra-cellular transcript localization is a fundamental mechanism by which informational asymmetries are established in cells. Several years ago we discovered a novel transcript localization mechanism that converts a generally distributed transcript into a localized one by a combination of generalized degradation and localized protection of the RNA. We are currently taking a combined genetic and biochemical approach to defining the cis-acting elements, trans-acting factors and genetic pathways that control this localization process. In addition we are carrying out genome-wide gene expression profiling analyses aimed at identifying all stable versus unstable maternal RNAs in the early embryo, including which of the latter are localized. Our second research project studies the genetic control of morphogenesis. In particular, we have studied the coordinate cell shape changes and cell rearrangements that convert two-dimensional sheets of cells into three-dimensional structures during embryogenesis. Our analyses have led to insights into how spatial control of particular signal transduction pathways (e.g. the Jun kinase pathway) may be used to regulate the initiation and termination of cell movements. Our studies have also begun to elucidate a novel genetic pathway that controls tissue integrity as cells within epithelia are reorganized. Genetic screens and live imaging of subcellular structures during cell movements are being used to understand the cellular and molecular mechanisms of morphogenesis. These have led to elucidation of the role of cell surface molecules (e.g., integrins, basigin) in promoting morphogenesis and preventing a process known as anoikis (epithelial disintegration and death upon loss of contact with extracellular matrix). These findings are relevant, not only to normal development, but also to understanding the mechanisms of wound healing and cancer.


**Helen McNeill**

A central problem in cell and developmental biology is understanding how cells and groups of cells become organized to form organs and tissues. One form of higher organization that is currently under intense investigation is planar cell polarity. Planar cell polarity is the coordinate organization of cells within the plane of a single layered sheet of cells. Planar polarity is essential for tissue functioning: the planar polarity of the vertebrate inner ear is essential to proper hearing and balance; similarly, planar polarity of the fly eye is essential for accurate vision. We are using the fruit fly, Drosophila melanogaster, as a genetically tractable organism to investigate the genetic and molecular mechanisms underlying planar polarity.


Andras Nagy

The Nagy laboratory is interested in using mouse genetics to study mammalian development and to apply this knowledge to human disease. Dr. Nagy is also developing new, powerful tools for genetic approaches and phenotype analysis for these ongoing studies. Another main activity of the Nagy lab is connected to mammalian genomic imprinting.


Janet Rossant

Our lab is interested in understanding early lineage development in the mouse embryo. Some of the topics lab members are currently investigating include axial patterning, specification of stem cell lineages, and vasculogenesis


Peter Roy

We are working towards understanding how whole animals resist the effects of small bioactive molecules (a.k.a. xenobiotics or drugs), as animals likely have additional organism-wide xenobiotic defense mechanisms in addition to those conferred by individual cells. We are also exploiting these defense mechanisms to develop new small molecule tools for biological analysis. Finally, we are working to better understand how cell extensions like axons reach their target destinations during normal animal development using a previously unexploited model system in *C. elegans*, a tiny nematode worm.


Ian Scott

My lab uses the zebrafish model organism to study vertebrate embryonic heart development. In a forward genetic screen I have isolated several novel mutations that affect diverse steps of cardiac development. Analysis of the *grinch* mutant has revealed a role for the G-protein coupled receptor Agtr1lb in the specification of the myocardial lineage. We are currently using transgenic and embryological approaches to determine the mechanism through which Agtr1lb regulates the earliest events of heart formation. Furthermore, other organ systems affected in agtr1la, agtr1lb and agtr1la/b mutants are also being examined. In a related project, we have recently uncovered a combination of transcription factors that can reprogram embryonic cells to form cardiomyocytes at a high frequency in vivo. Interestingly, these cells appear to migrate to the heart forming region of the embryo, even if placed in ectopic locations, including the CNS/forebrain. We are currently examining how these factors can induce this procardiac behaviour.

Genes affected by a second class of mutations, that cause defects in the later morphogenesis of the heart tube, are also being studied. The *logelei* mutant affects morphogenesis of a number of epithelial organs. We have resolved the *logelei* critical region, and found it to affect a member of the mediator complex. Positional cloning of additional heart mutants has also been initiated. It is hoped that by combining genetic and cell imaging approaches we will gain a deeper understanding of the developmental processes that regulate heart development. As dysfunction of these processes in humans lead to congenital heart defects, these studies should help inform future curative approaches to this significant constellation of diseases. To this end, the usefulness of a chemical genetic approach to zebrafish congenital heart disease models is currently being evaluated in the lab.


Andrew Spence

Sex determination and sexual differentiation in *Caenorhabditis elegans*: We are interested in how genes direct animal development. We study the small, genetically tractable nematode worm, *Caenorhabditis elegans*, to address the questions of how cells acquire different fates, and how they form functional organs, in a developing animal. Much of our work focuses on mechanisms involved in sex determination and sexual differentiation in *C. elegans*.


Derek van der Kooy

Our work on neural development & stem cell biology research focuses on the lineage steps in the development of the mammalian brain from totipotent embryonic stem (blastocyst) cells to neural stem cells to more restricted neural progenitor cells that make neurons and glia. Of particular interest are the earliest steps in the production of self-renewing neural stem cells from mouse embryonic stem cells, in terms of discovering novel and testing candidate neural determination genes.


Mei Zhen

Dr. Zhen’s laboratory investigates how neurons establish synaptic connectivities during development. The focus is on dissecting the molecular components of syd-2 and sad-1 signaling pathways using *C. elegans* as a model system. The lab has developed a number of fluorescent GFP/YFP/CFP markers which allows direct visualization of different synaptic structures in live *C. elegans*.


Immunology

Michele Anderson

Our research is aimed at understanding the role of transcription factors in T cell development. T cells develop from hematopoietic stem cells, which initially can become any of the eight major blood cell types. As this process begins, new genes are expressed, and the expression of these genes is directed by transcription factors. We are focusing on two families of transcription factors that are involved in these processes, the Ets and basic helix-loop-helix families. We have identified several members of these families that are active during early T cell development. To study the roles these factors play, we are disrupting or enhancing their activities in hematopoietic stem cells using retroviral gene transfer. We then monitor the effects of these perturbations on fate choice, differentiation, cell growth and cell death as the stem cells develop into T cells. We have found that one transcription factor, HEB, can be expressed in different forms that in turn have different effects on cell growth. We believe that the ratios of these factors in developing T cells could be critical in determining if T cells are programmed with the necessary growth control responses that protect them from overgrowth and that could result in cancerous transformation, but that permit proliferation in response to infection. Studies are underway to understand the molecular interactions among these transcription factors, their target genes and the other cellular machinery that controls the normal and aberrant development of T cells. Ultimately, it is in these networks of interactions that the answers will be found to provide an understanding of the genetic programs that are installed during T cell development and that allow their unique and essential immune functions to be deployed while avoiding malfunctions that can lead to leukemia, lymphoma or autoimmune disease.


**Cynthia Guidos**

While at Stanford Dr. Guidos identified several novel precursor-progeny relationships during murine intrathymic T cell development. These studies provided the impetus for establishing her independent research program, which is focused on elucidating molecular mechanisms that regulate survival, proliferation, and lineage commitment during lymphocyte development. Defects in this process are known to cause lymphoblastic leukemia and immune deficiency.

Dr. Guidos' current research is focused on two broad goals:

1. To elucidate essential functions of the Notch signaling pathway in T and B cell development
2. To elucidate mechanisms of T and B cell leukemogenesis, by identifying pathways that allow T and B cell progenitors to escape death, proliferate and self-renew aberrantly


**Juan Carlos Zuniga-Pflucker**

The process of differentiation allows a small population of continuously self-renewing stem cells to generate a remarkably diverse range of mature progeny. Understanding how molecular signals in developing tissues induce commitment and differentiation of stem cells is a fundamental question of developmental biology. In the context of blood cells, this question also has therapeutic implications in the treatment of leukemia, which arises from dysregulated differentiation.

In the context of the immune system, the thymus provides a model system to study the mechanisms controlling tissue-specific differentiation events and lineage commitment pathways. Hematopoietic progenitor cells from the bone marrow migrate to the thymus where they receive the necessary signals that mediate their commitment and differentiation into T lymphocytes. The absolute requirement for the thymus in the generation of T cells from hematopoietic progenitors has been recognized for over 40 years.

However, until recently, the precise molecular interactions responsible for this thymic requirement remained elusive. We contributed to the identification of these molecular interactions by demonstrating that a bone marrow-derived stromal cell line (OP9) ectopically expressing Delta-like-1 (OP9-DL1), a Notch receptor ligand, gains the ability to induce the full differentiation of T cells from hematopoietic stem cells (HSC). Interestingly, expression of Delta-like-1 by OP9 cells results in a complete switch in lymphocyte lineage commitment, as control OP9 cells allow for robust B cell differentiation, while OP9-DL1 cells support only T cell differentiation from HSCs. These findings have recently been extended to totipotent embryonic stem cells (ESCs), which can also be induced to differentiate into functional T cells in vitro by coculture on OP9-DL1 cells. Thus, our findings show that Delta-like-1/Notch interactions occurring within the thymus underpin its unique ability to induce the lineage commitment and differentiation of T cells. With this in mind, our current focus involves identifying the molecular mechanisms that govern progenitor lymphocyte lineage commitment, T cell development, and Delta-like-1 expression by thymic stromal cells, and the development of a stromal cell-free system for the induction of T cell differentiation from defined sources of stem cells. We are also developing strategies to adapt our current model system for the induction of T cell differentiation from defined sources of human stem cells.


Cell and Systems Biology

Thomas Berleth

Molecular developmental genetics and genomics; Plant embryo and vascular development. Projects focus on the molecular genetic analysis of signaling pathways involved in embryonic root initiation and vascular tissue formation in the model plant Arabidopsis thaliana and in trees. The strategy is based on the identification of genes by mutation in Arabidopsis, which are subsequently isolated and analyzed at the molecular level. The strategy involves the generation of genomic resources in Arabidopsis, such as transgenic enhancer-trap and activation-tag collections and the transfer of knowledge obtained in Arabidopsis to biotechnological applications in trees.


Ashley Bruce

The goal of my research program is to answer the question of how cell movements are coordinated during embryonic development. Transformation of a simple cleavage stage embryo into a complex adult relies upon an exquisite series of carefully orchestrated cell movements. In all animals, dramatic cellular rearrangements generate the multilayered body plan by a process termed gastrulation. Although modes of gastrulation vary widely in the animal kingdom, they all draw upon a set of relatively simple cell behaviors, different combinations of which generate the array of different gastrulation patterns observed in nature. By examining cell behaviors in the experimentally tractable zebrafish system, we will learn about general cellular properties and mechanisms of cell movements that are likely to be widely used throughout animal development. This knowledge should also be useful in understanding disease states resulting from abnormal cell movements, such as congenital birth defects.


Malcolm Campbell

Despite the incredible diversity in plant forms, the molecular mechanisms that control plant architecture are highly conserved across diverse genera. It is thought that the timing and localization of these mechanisms, in response to environmental and developmental cues, determine the overall structure of the plant body. My research team tests hypotheses aimed at understanding the molecular mechanisms that control plant architecture. Much of my group's work has focused on the regulation of aspects of plant growth and development that are critical in architectural design. This work has largely centered on an exploration of the molecular mechanisms that underpin the timing and localization of lignin biosynthesis. Lignins are complex three-dimensional polymers that reinforce specific plant cell walls and thereby impart strength that is important in supporting the plant body against gravity. The control of the timing and localization of lignin biosynthesis is important in establishing the architectural design of the plant body.

My group focuses on the role of members of the MYB family of transcription factors in controlling the timing and localization lignin biosynthesis. As a complement to this work, my team has also been characterizing mutant plants that accumulate lignins in tissues where they would not normally be found, in order to understand the mechanisms controlling the localization of this important building material. Other work in my lab is aimed at understanding how members of the MYB family of transcription factors affect plant architecture beyond their role in the control of lignin biosynthesis.


Dorothea Godt

Cells come in different shapes. They can be round, columnar, spindle shaped, they come with or without protrusions, and they can change their shape rapidly during development. Interactions between cells allow them to build highly organized tissue structures. What are the molecules that control cell shape and movements? To find and analyze the factors that are involved in morphogenesis my laboratory uses a genetic approach. We study the development of the ovary of Drosophila melanogaster that consists of a regular array of tubes in which the eggs mature, and gene mutations, which disturb the formation of the egg tubes cause sterility. With the help of such mutations we isolate and characterize genes that regulate morphogenetic processes in ovarian development on the molecular, cellular and genetic level. Our current work focuses on the function of several morphogenetic regulators, such as adhesion molecules of the cadherin family.


Tony Harris

We are using confocal and time-lapse microscopy in combination with Drosophila genetics, molecular biology and proteomics to study how epithelial cell polarity is established. Epithelia are sheets of adherent cells that form boundaries between our body compartments. Each side of an epithelial sheet has distinct molecular properties. This epithelial polarity is critical for guiding embryo development and directing adult functions (e.g. nutrient uptake in the gut), and its loss is associated with cancer. We are focusing on the polarity-organizing machinery operating in each epithelial cell. We are identifying the proteins making up this machinery, and determining how they function together to establish and maintain epithelial polarity in the Drosophila embryo. By using cutting edge microscopy in combination with Drosophila genetics, we can literally see how identified proteins interact to control epithelial polarity and structure. It is really exciting to see how cells and tissues are built, and it is important for understanding cancer and developing regenerative medicine.


Ellen Larsen

We explore the relationship between the mechanisms by which genes control morphogenesis during development and the evolution of form. An overall goal is to gain insight into what has to be genetically encoded and what is the outcome of self-organized behaviour of cellular systems involved in morphogenesis. Two projects in the lab address this problem, one is based on the development and evolution of sex combs in male fruit flies and the other is to produce a laboratory model lichen system. Lichens are composed of a fungal and photobiont component, (algae and/ or cyanobacteria), neither of which, when grown separately, can make the three dimensional structures of the lichen.


Peter McCourt

In plants, hormones influence many diverse developmental processes ranging from seed germination to root, shoot and flower formation. I have chosen to study the plant hormones abscisic acid (ABA) and gibberellin (GA) in Arabidopsis thaliana as a model genetic system to understanding hormone signaling in plants. The program involves the identification of mutants with altered hormonal responses and the cloning of the subsequent genes that have been identified through these genetic screens.

Maurice Riguette

The physiochemical properties and specialized functions of tissues are dependent on dynamic interactions and communication between cells and their extracellular matrix (ECM) environment. In addition to forming elaborate three-dimensional frameworks that establish tissue patterns and boundaries, ECM macromolecules play a critical role in regulating the biological activities of cells. Consequently, a dynamic reciprocal dialogue is established whereby cell secretions and their organization into a matrix in turn influences the activity of secreting cells, promoting a permissive environment for further growth and development. My research program is focused using molecular biology techniques to examine the expression and morphogenic contributions of two structurally related ECM glycoproteins, SPARC (Secreted Protein, Acidic, Rich in Cysteine) and SC1, on early embryonic development. Using the South African clawed frog Xenopus laevis as an experimental organism, our data indicate that SPARC and SC1 have pleiotropic effects on the development of muscular and neural tissues, e.g., somitic myotomes, neural tube and brain development. Their complex transient expression patterns indicate they make overlapping but distinct contributions to the development of these tissues. Since SPARC is associated with tissue remodeling and repair, we are also examining changes in its expression at different stages of tumour progression in humans. Our preliminary data indicate that SPARC plays a permissive role in the invasion of tumour cells in the stroma of human ovarian tumors. The lessons learned should serve as a stepping stone towards a better understanding of abnormal development and the design of novel therapeutic strategies in the treatment of human diseases.


Ulrich Tepass

Cell Biology of Animal Development: Finding out how cells adopt specific shapes and organize themselves into tissues and organs in multicellular organisms is one of the most exciting questions in modern biology with profound implications for human health. Our work focuses on epithelial cells, the basic building blocks of all animals and humans that are major components of many organs such as skin, gut, liver, kidney or the retina. These cells form two-dimensional sheets that separate different compartments of the body. Cell polarity is a key feature of simple and more complex epithelial cells such as photoreceptor cells. The polar organization of these cells is fundamental to their anatomy and physiology and an area of intense research in current cell biology. Our aim is to better understand both the cellular and molecular mechanisms that control the polarity of epithelial cells and the cell adhesion between epithelial cells that binds cells into tissues. Some of the main questions that we pursue are:

How do epithelial cell establish and maintain their polar organization during development?
How do epithelial tissues adopt specific shapes such as tubes?
How do epithelial cells adhere to each other and move along each other without compromising epithelial tissue integrity?
How do photoreceptor cells establish different, functionally and structurally distinct plasma membrane region?
Abnormalities of epithelial cells including defects in cell polarity and cell adhesion cause many diseases. Our research currently explores genetic models for cancer and blindness. In fact, more than 80% of all human cancer cases are caused by the abnormal behaviour of epithelial cells. Blindness results often from death of the retina that is caused by defects in the polarity and adhesion of the epithelial cells that compose the retina including the light sensing photoreceptor cells.


Vincent Tropepe

The production of nerve cells in the brain (neurogenesis) is regionally specialized for the formation of distinct functional domains in the vertebrate brain. Moreover, neurogenesis in the adult brain may contribute to the structural changes that underlie neural plasticity, which is crucial for sensory processing, learning and memory. My lab investigates the fundamental questions of how the development of neural tissue is initiated in the early embryo, and how neurogenesis contributes to the generation and maintenance of regional nerve cell diversity throughout life. We use mouse and zebrafish as complementary vertebrate model systems and employ a variety of technical approaches that range from histological and cell culture techniques to molecular biology and genetics in order to identify and characterize the molecular mechanisms that govern vertebrate neurogenesis.


**Susan Varmuza**

Research in Dr. Varmuza's lab is focused on two aspects of mammalian reproductive biology - spermatogenesis and genomic imprinting. Spermatogenesis is being pursued through analysis of a targeted mutation in the protein phosphatase 1c (PP1) gene made in the Varmuza lab that causes male sterility by disrupting spermiogenesis. The phenotype of the PP1 knockout closely resembles male infertility in humans. Experiments are in progress to determine the precise mechanism by which loss of this vital enzyme impedes cytodifferentiation in the testis. Human male infertility is also being studied through high throughput SNP discovery studies. Preliminary evidence revealed that a cluster of de novo substitutions in the SBF1 gene associates with human male infertility.

Genomic imprinting is an epigenetic mechanism that silences one parental allele of a small number of genes, many of which are involved in development and function of the placenta. Microarray analysis of uniparental embryos revealed the paternally expressed *Sfmbt2* gene in mice, which was subsequently shown to be expressed at high levels in placenta and yolk sac. The *Sfmbt2* gene encodes both a PcG protein (SFMBT2) and a large number of miRNAs from a block of pre-mi-RNAs within one of the introns in the primary transcript, suggesting that this locus may play multiple roles during mouse development.


**Rudolf Winklbauer**

We study the molecular and cellular basis of several morphogenetic (“shape-generating”) processes that contribute to gastrulation in the amphibian, Xenopus laevis. In particular, we examine how cell migration and fibronectin matrix formation in the gastrula are controlled by paired-class genes, we analyze the control and mechanisms of embryonic cell sorting and convergent extension, and we study new gastrulation processes like vegetal rotation and active mesoderm involution.


**Biochemistry**

**Craig Smibert**

Specification of various cell and tissue types relies on differential patterns of gene expression which are often controlled at the level of transcription. Regulation, however, does not cease once transcripts are made. Instead, a variety of post-transcriptional control events, including translational controls, may also contribute to proper expression patterns. For example, recent studies have shown that selective translational controls operate in such diverse processes as red blood cell development and spermatogenesis in mammals, sex determination in *C. elegans*, and dosage compensation in *Drosophila*. Although these results highlight the fact that translational controls are likely to function in a wide range of developmental processes, little is known about the molecular mechanisms that underlie selective translational regulation.

Several of the most prominent examples of translational controls have been revealed by studying the expression of mRNAs that direct early *Drosophila* development. For example, *nos* protein, which directs posterior body patterning in *Drosophila*, is localized to the posterior of the embryo through the coordinate action of systems that regulate the translation, localization, and stability of nos mRNA.
Our long-term goals are to identify factors that regulate and coordinate post-transcriptional control of nos expression. We employ a combination of genetic and biochemical approaches to pursue these investigations. The ability to apply both genetics and biochemistry to a problem is one of the advantages of the Drosophila system. In addition, the use of Drosophila allows one to readily explore the biological significance of processes in a complex multicellular organism.


Physiology

Norm Rosenblum

The overall goal of my research is to identify molecular mechanisms that control normal and abnormal kidney development. Renal malformation is a general clinical category which contains two major sets of renal disorders: (i) renal dysplasia, defined as malformation of tissue elements, and (ii) renal hypoplasia, defined as a kidney with normal architecture but a low number of nephrons. Renal dysplasia and severe hypoplasia are major causes of childhood renal failure. Less severe forms of renal hypoplasia characterized by nephron number at the lower end of the population distribution is considered to be an antecedent to adult-onset high blood pressure and kidney disease. We have developed novel genetic mouse models for both renal dysplasia and renal hypoplasia. In so doing, we are generating new insights into the functions members of the bone morphogenetic protein (BMP) family, Sonic Hedgehog and beta-catenin in distinct epithelial and mesenchymal lineages of the kidney.


Laboratory Medicine and Pathobiology

Benjamin Alman

Our laboratory studies the molecular mechanisms responsible for the deregulation of cellular growth control in aggressive fibromatosis (desmoid tumour) and cartilage neoplasms (e.g. chondrosarcomas). We identified developmental signaling pathways that are inappropriately activated in both types of lesions. Our current work focuses on determining somatic mutations that may be responsible for the activation, identifying novel mediators in the signaling pathways, and determining if a pharmacologic approach can be used to modulate the pathway activation. The long-term goal of this work is to develop novel pharmacologic therapies for these otherwise difficult to treat lesions. Some of the information learned from our work on tumours can be applied to repair processes and bone growth. We are currently working to determine how these signaling pathways regulate normal bone growth and wound healing.


UNIVERSITY OF TORONTO

Brief for the Standard Appraisal

of the

MSc-level to be added to the existing PhD-level

Collaborative Program

in

Developmental Biology

Submitted to the
Ontario Council on Graduate Studies
January 2010
TABLE OF CONTENTS

1. Introduction and Rationale ................................................................. 3
2. Objectives and Added Value .............................................................. 4
3. Admission Requirements ................................................................. 5
4. Program Requirements and Common Learning Experience ............... 5
5. Participation of Home Graduate Units ................................................. 7
6. Administration .................................................................................. 8
7. Resource Issues ............................................................................... 9
8. Registration Information/Enrolment Projections ................................. 9

APPENDIX I: Relationship Between Collaborative Program Requirements and Degree Program Requirements for Participating Programs ........................................ 12

APPENDIX II: Core Faculty Research Synopses ...................................... 15

APPENDIX III: Calendar Entry ............................................................... 27

APPENDIX IV: Proposal for a New Course ............................................ 29
1. Introduction and Rationale

Developmental biology transcends both species and traditional research boundaries. To fully understand the development of any particular organism requires input from different research disciplines including: molecular biology, cell biology, anatomy, histology, genetics, biochemistry, physiology, genomics and systems biology. Developmental biology represents a strong area of research in many departments and the Collaborative Graduate Program in Developmental Biology (CGPDB) was established to facilitate cross-disciplinary interactions and further strengthen research and teaching in developmental biology at the University of Toronto.

Historical Overview: The proposal for establishment of a PhD-level collaborative program in developmental biology was presented to SGS Council by Professor Janet Rossant, of the Department of Molecular and Medical Genetics, (currently Molecular Genetics), and was accepted on October 27, 1994. The memorandum of agreement, approved at the same Council meeting, was signed by Chairs of all collaborating departments on December 9, 1994. The program was approved by Ontario Council on Graduate Studies (OCGS) on April 21, 1995 and began officially in September of that year with Professor Rossant as Director/Coordinator. The following four graduate departments participated in the collaborative Ph.D. program in developmental biology: Anatomy and Cell Biology, Botany, Molecular and Medical Genetics, and Zoology. The number of departments increased in subsequent years to include Immunology, Biochemistry, Laboratory Medicine and Pathobiology and Physiology. The Department of Anatomy and Cell Biology was closed and its faculty members absorbed into other departments within the Faculty of Medicine. Most recently, The Departments of Zoology and Botany were closed and all faculty of these departments who are members of this collaborative program are now with the Department of Cell and Systems Biology.

Participating Graduate Departments:
- Department of Biochemistry; Biochemistry Program - MSc, PhD
- Department of Cell and Systems Biology; Cell and Systems Biology Program – MSc, PhD
- Department of Immunology; Immunology Program – MSc, PhD
- Department of Laboratory Medicine and Pathobiology; Laboratory Medicine and Pathobiology Program - MSc, PhD
- Department of Molecular Genetics; Molecular Genetics Program – MSc, PhD
- Department of Physiology; Physiology Program – MSc, PhD

Rationale for Upcoming Integration of MSc Students: Currently, the program accepts only PhD students. However, many MSc students participate in program activities such as the monthly meetings, annual retreat and the distinguished lecture series. The interest of MSc students in our program is substantial as evidenced, for example, by the fact that approximately 45 percent of the posters at the most recent Annual Scientific Retreat were presented by MSc students (18 posters). We therefore have submitted a proposal to the School of Graduate Studies to expand the Collaborative Program in Developmental
Biology to the MSc students throughout the participating departments and programs listed above.

2. Objectives and Added Value

The field of developmental biology represents one of the most exciting areas of modern biological research. The combination of molecular biology, cell biology, genetics and experimental embryology has brought about a revolution in our understanding of the basic developmental processes in organisms as diverse as plants, fruit flies (*Drosophila*), nematode worms (*C. elegans*), fish, frogs, mice and humans. In the past, developmental biologists tended to work on a particular organism to the exclusion of all others and, although common rules of development were clearly apparent across species, cross-talk between researchers was limited. The isolationism ended in the 1980s when it became apparent that not only were the cellular and tissue mechanism of development conserved across evolution, but that these mechanisms were often governed by conserved genes that play similar roles in different organisms ranging from plants and fungi to insects and humans. The recognition that development is regulated by a conserved set of genes has invigorated the study of the material basis of evolution. Moreover, the integrative nature of developmental biology was further emphasized by the use of complementary model systems for a careful cell biological and functional genomic analysis of developmental processes. Thus, developmental biology now transcends both species and traditional research boundaries. To understand fully the development of any particular organism requires input from different research disciplines, including molecular biology, cell biology, anatomy, histology, genetics, biochemistry, physiology, and genomics and systems biology.

The objectives of the Collaborative Program in Developmental Biology:

- Promote and foster excellence in developmental biology research in Toronto
- Provide opportunities for graduate students to be exposed to a broad range of issues and approaches in modern development biology
- Provide a comprehensive graduate course in developmental biology
- Provide a forum for interaction among investigators studying development biology in different university departments

The Collaborative Program in Developmental Biology achieves its objectives for both students and faculty through a number of activities, including: monthly research meetings, annual scientific retreat, distinguished lecturer series, and two graduate courses in Developmental Biology. All of these events are described in detail in the following section “Program Requirements and Common Learning Experience”. Information about the program is disseminated by means of emails, monthly electronic newsletter, poster notices of seminars and events and a web site [http://www.utoronto.ca/devbiol/].
3. Admission Requirements

Students who wish to enter the Program must first be registered in the PhD or MSc academic program in one of the host departments, and be pursuing a developmental biology project under the supervision of a member of the collaborative program. We expect that students will apply early in their first year of study.

4. Program Requirements and Common Learning Experience

Master’s program requirements:

Master’s students will be enrolled in a new course (JDB1024Y) for the duration of their enrollment in the program as MSc students (see Appendix IV). MSc students must complete a thesis in the topic area of developmental biology.

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>JDB1024Y</td>
<td>Topics in Developmental Biology</td>
</tr>
</tbody>
</table>

*Synopsis:* MSc students must attend the monthly meetings of the program and the distinguished lecturers in developmental biology series. In addition, students present one poster at the Annual Scientific Retreats of the Collaborative Program in Developmental Biology. The poster is evaluated by program faculty.

Doctoral program requirements:

Graduate students are enrolled through one of the participating academic programs/departments and are required to fulfill the PhD course requirements of the home program/department, with the exception that one of the elective course requirements for the host academic program/department is replaced with a new 12-week graduate course, JDB 1025H, “Developmental Biology”. This course counts as an external elective in departments where this is required.

All PhD students registered in the Collaborative Graduate Program in Developmental Biology (CGPDB) are also enrolled in JDB 1026Y for the duration of their enrollment in the program. The student’s supervisory committee should include at least one member of the Developmental Biology Program other than his/her supervisor.

All doctoral students in the CGPDB program take the following two core courses:

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>JDB1025H</td>
<td>Developmental Biology</td>
</tr>
</tbody>
</table>

*Synopsis:* A team of 3 or 4 faculty members of CGPDB teach this course, with the
participation of other faculty members as “guest experts.” The course uses the primary and review literature to illustrate concepts and mechanisms in development with examples drawn from a variety of experimental models. Students gain skill in critically reading literature, familiarity with important concepts in developmental biology, and an appreciation of current understanding of developmental mechanisms. Completion of the course requires submission of a written research proposal on some aspect of development. Preparation of the proposal, with appropriate feedback from the instructors, educates the student in identifying tractable biological problems, conducting a literature review, formulating hypotheses and designing experimental tests.

<table>
<thead>
<tr>
<th>JDB1026Y</th>
<th>Seminars in Developmental Biology</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Synopsis:</strong></td>
<td>PhD students present a poster and a seminar at two different Scientific Annual Retreats of the CGPDB, which are evaluated by program faculty. In addition, students attend the Monthly Research Meetings of the CGPDB and the Distinguished Lecturer Series in Developmental Biology.</td>
</tr>
</tbody>
</table>

**Common Learning Experience:**

The common learning experience for all students in the collaborative program, are:

- **DEVBIO Monthly Research Meetings:** Members of the program and others with an interest in developmental biology meet once each month during the academic year to discuss recent scientific progress. The meetings commonly take one of two formats: members of one of the local developmental biology research groups may present their recent results for discussion. Alternatively, one or more program members may lead a discussion on an aspect of development with the goal of exploring the relevance of ideas and approaches developed.

- **Distinguished Lecturer Series in Developmental Biology:** The program organizes a series of lectures by leading researchers who have made major contributions to our current understanding of development in various organisms. Each lecture is co-sponsored by the program and one of its host departments or participating hospital research institutes. This series brings prominent developmental biologists to the University of Toronto. These lectures are well attended by the entire Toronto DEVBIO community. Approximately six lecturers are invited each year.

- **Annual Scientific Retreat:** The Annual Scientific Retreat is held each year at which members of the program, as well as anyone interested in developmental biology are invited to attend. The event allows current scientific developments to be presented by both faculty and students through numerous oral presentations. In addition, a poster session allows trainees to obtain feedback on their scientific project by presenting their work to date. The retreat also broadens students’
scientific experience by exposing them to the wide range of developmental biology research conducted at the University of Toronto.

Completion of program requirements

All students enrolled in the collaborative program must complete the requirements of the collaborative program, in addition to those requirements for the degree program in their home graduate unit. The collaborative program Director/Coordinator is responsible for certifying the completion of the collaborative program requirements. The home graduate unit is solely responsible for the approval of the student’s home degree requirements.

5. Participation of Home Graduate Programs

The collaborative program’s core faculty members are available to students in the home program as advisors or supervisors. It is expected that a core faculty member in the student’s home department will be involved in thesis supervision. A student’s supervisory committee should include at least one member of the Developmental Biology Program other than his/her supervisor. Core faculty members contribute to the collaborative program through teaching of the core courses and participating in the delivery of the DEVBIO Monthly Research Meetings and Distinguished Lecturer Series in Developmental Biology. Faculty also participate by presenting at the Annual Scientific Retreat and serving as judges for student presentation and posters. Not all faculty members participate each year and, in many cases, simply may remain available to interested students. Some faculty may teach courses in the subject area of the collaborative program in the home program. The list of the collaborative program’s core faculty members is available in Appendix II. Each participating degree program contributes to the collaborative program through student enrolments, although not necessarily every year.
6. Administration

The Developmental Biology Collaborative Program has an approved Director. It also has a Program/Steering Committee composed of a faculty representative from a minimum of three participating graduate units. The Program Committee initiates and recommends the appointment of a new Director to the Dean of SGS, after consultation with chairs/directors of participating graduate units and with the current collaborative program director. The Dean of the School of Graduate Studies approves appointments of directors of collaborative programs. The initial term normally is three years, with subsequent terms normally up to five years. An appointment is renewable upon recommendation of the Program Committee in consultation with the chairs/directors of participating graduate units, and approval of the Dean of SGS.

The Director and the Program Committee are responsible for the approval of admissions to the collaborative program, and are responsible for approving the completion of collaborative program requirements, including the granting of the collaborative program designation. The Committee and Director also recommend changes to the program, as required, approve advertising, etc. For the SGS Calendar entry see Appendix III.

Director

Dr. Helen McNeill, Department of Molecular Genetics (Jan 2008-Jan 2011)

Current Program Committee Members

Dr, Helen McNeill, PhD, Molecular Genetics (Director)
Dr. Julie Brill, PhD, Molecular Genetics
Ms. Nicole Forgione, PhD candidate, Cell & Systems Biology (Student Representative)
Dr. Peter Roy, PhD, Molecular Genetics
Dr. Tony Harris, PhD, Cell & Systems Biology
Dr. Mei Zhen, PhD, Molecular Genetics
Dr. Juan Carlos Zuniga-Pflucker, PhD, Immunology
7. Resource Issues

The majority of the program’s activities are funded by a yearly budget allocation (May 1 – April 30) from the Academic Priorities Fund to the Department of Molecular Genetics. The host departments help to support the Distinguished Lecturer Series in Developmental Biology by sharing the costs of travel and accommodation of the speakers. The program’s budget includes support for a part-time administrative assistant. The existing budget allocation will be sufficient to cover the very minimal increased costs, given that Master’s students have been informally included for some time.

8A. Registration Information

<table>
<thead>
<tr>
<th>PhD Students</th>
<th>REGISTRATIONS in Participating Programs for Past Seven Years</th>
<th>(New registration numbers in brackets)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molecular Genetics</td>
<td>14(7)</td>
<td>17(5)</td>
</tr>
<tr>
<td>Immunology</td>
<td>2(2)</td>
<td>3(1)</td>
</tr>
<tr>
<td>CSB</td>
<td>10(5)</td>
<td>8(0)</td>
</tr>
<tr>
<td>Laboratory Medicine and Pathobiology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biochemistry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physiology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total:</td>
<td>26</td>
<td>28</td>
</tr>
</tbody>
</table>

Note: graduates and ‘incomplete’/drop out included

<table>
<thead>
<tr>
<th>PhD Students</th>
<th>COMPLETIONS in Participating Programs for Past Seven Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molecular Genetics</td>
<td>2</td>
</tr>
<tr>
<td>Immunology</td>
<td></td>
</tr>
<tr>
<td>CSB</td>
<td>1</td>
</tr>
<tr>
<td>Laboratory Medicine and Pathobiology</td>
<td></td>
</tr>
<tr>
<td>Biochemistry</td>
<td></td>
</tr>
<tr>
<td>Physiology</td>
<td></td>
</tr>
<tr>
<td>Total:</td>
<td>3</td>
</tr>
</tbody>
</table>

Note: Estimate for 2002-2004, data not available
8B. Enrolment Projections

### PhD Students

**PROJECTED REGISTRATIONS in Participating Programs for next Seven Years**  
(new registration numbers in brackets)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Molecular Genetics</td>
<td>23(4)</td>
<td>20(5)</td>
<td>19(2)</td>
<td>20(3)</td>
<td>20(2)</td>
<td>19(4)</td>
<td>20(4)</td>
<td>141</td>
</tr>
<tr>
<td>Immunology</td>
<td>8(2)</td>
<td>10(2)</td>
<td>10(2)</td>
<td>9(1)</td>
<td>8(1)</td>
<td>10(2)</td>
<td>10(0)</td>
<td>65</td>
</tr>
<tr>
<td>CSB</td>
<td>11(2)</td>
<td>10(1)</td>
<td>10(2)</td>
<td>10(2)</td>
<td>10(1)</td>
<td>10(1)</td>
<td>9(1)</td>
<td>70</td>
</tr>
<tr>
<td>Laboratory Medicine and Pathobiology</td>
<td>1(1)</td>
<td>1(1)</td>
<td>1(0)</td>
<td>1(0)</td>
<td>1(0)</td>
<td>1(0)</td>
<td>1(1)</td>
<td>7</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>1(0)</td>
<td>1(1)</td>
<td>1(0)</td>
<td>1(0)</td>
<td>1(0)</td>
<td>1(0)</td>
<td>1(1)</td>
<td>7</td>
</tr>
<tr>
<td>Physiology</td>
<td>0(0)</td>
<td>1(1)</td>
<td>1(0)</td>
<td>1(0)</td>
<td>1(0)</td>
<td>1(0)</td>
<td>1(1)</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>44</strong></td>
<td><strong>43</strong></td>
<td><strong>42</strong></td>
<td><strong>42</strong></td>
<td><strong>41</strong></td>
<td><strong>42</strong></td>
<td><strong>42</strong></td>
<td><strong>295</strong></td>
</tr>
</tbody>
</table>

### MSc Students

**PROJECTED REGISTRATIONS in Participating Programs for next Seven Years**  
(new registration numbers in brackets)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Molecular Genetics</td>
<td>6(6)</td>
<td>7(3)</td>
<td>8(5)</td>
<td>7(3)</td>
<td>8(2)</td>
<td>9(3)</td>
<td>9(2)</td>
<td>55</td>
</tr>
<tr>
<td>Immunology</td>
<td>2(2)</td>
<td>2(1)</td>
<td>3(1)</td>
<td>3(0)</td>
<td>3(1)</td>
<td>3(0)</td>
<td>4(1)</td>
<td>20</td>
</tr>
<tr>
<td>CSB</td>
<td>5(5)</td>
<td>4(1)</td>
<td>5(2)</td>
<td>8(2)</td>
<td>8(0)</td>
<td>8(1)</td>
<td>8(2)</td>
<td>46</td>
</tr>
<tr>
<td>Laboratory Medicine and Pathobiology</td>
<td>1(1)</td>
<td>1(0)</td>
<td>2(1)</td>
<td>2(0)</td>
<td>2(0)</td>
<td>2(0)</td>
<td>2(1)</td>
<td>12</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>1(1)</td>
<td>1(0)</td>
<td>1(0)</td>
<td>1(1)</td>
<td>2(1)</td>
<td>1(1)</td>
<td>1(1)</td>
<td>7</td>
</tr>
<tr>
<td>Physiology</td>
<td>1(1)</td>
<td>1(1)</td>
<td>1(0)</td>
<td>1(0)</td>
<td>1(0)</td>
<td>1(0)</td>
<td>1(1)</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16</strong></td>
<td><strong>16</strong></td>
<td><strong>20</strong></td>
<td><strong>22</strong></td>
<td><strong>24</strong></td>
<td><strong>24</strong></td>
<td><strong>25</strong></td>
<td><strong>147</strong></td>
</tr>
</tbody>
</table>
APPENDIX I

COLLABORATIVE PHD PROGRAM IN DEVELOPMENTAL BIOLOGY

RELATIONSHIP BETWEEN COLLABORATIVE PROGRAM REQUIREMENTS AND DEGREE PROGRAM REQUIREMENTS FOR PARTICIPATING PROGRAMS

DEPARTMENT OF MOLECULAR GENETICS

- PhD in Molecular Genetics
  
  **PhD Requirements:**
  
  - MMG1012H Topics in Molecular Genetics I
  - MMG1015Y Seminars in Molecular Genetics
  - MMG1016H Topics in Molecular Genetics II
  - MMG 1017H Topics in Molecular Genetics III

  JDB1026Y required for collaborative program
  JDB1025H required for the collaborative program fulfills the course topic requirements for MMG1016H
  The thesis topic should be in the area of developmental biology

- MSc in Molecular Genetics
  
  **MSc Requirements:**
  
  - MMG1012H Topics in Molecular Genetics I
  - MMG1015Y Seminars in Molecular Genetics

  JDB1024Y required for the collaborative program
  The thesis topic should be in the area of developmental biology

DEPARTMENT OF IMMUNOLOGY

- PhD in Immunology
  
  **PhD Requirements:**
  
  - IMM1016H Basic Immunology I
  - IMM1017H Basic Immunology II
  - IMM1100H Seminars in Immunology
  - IMM2100H Special Topics in Immunology II
  - 0.5 FCE elective

  JDB1025H required for the collaborative program may be counted as 0.5 FCE elective
  The thesis topic should be in the area of developmental biology
  JDB1026Y required for collaborative program

- MSc in Immunology
  
  **MSc Requirements:**
  
  - IMM1016H Basic Immunology I
  - IMM 1019H Masters Seminar Course
  - IMM 2021H Special Topics in Immunology I

  JDB1024Y required for collaborative program
  The thesis topic should be in the area of developmental biology
DEPARTMENT OF CELL AND SYSTEMS BIOLOGY

• **PhD in Cell and Systems Biology**

  **PhD Requirements:** 1.0 FCE required courses
  - CSB1010Y Cell and Systems Biology Seminars
  - JDB1025H required for the collaborative program may be counted as elective 0.5 FCE
  - JDB1026Y required for collaborative program
  The thesis topic should be in the area of developmental biology

• **MSc in Cell and Systems Biology**

  **MSc Requirements:** 0.5 FCE required CSB course
  - CSB1010Y Cell and Systems Biology Seminars
  - JDB1024Y required for collaborative program
  The thesis topic should be in the area of developmental biology

DEPARTMENT OF PHYSIOLOGY

• **PhD in Physiology**

  **PhD Requirements:** 2.0 FCEs required courses
  - PSL 1066H Grant Proposal
  - PSL Seminars in Physiology
  - JDB1025H required for the collaborative program may be counted as elective 0.5 FCE
  The thesis topic should be in the area of developmental biology
  - JDB1026Y required for collaborative program

• **MSc in Physiology**

  **MSc Requirements:** 1.0 FCEs required courses
  - PSL Seminars in Physiology
  The thesis topic should be in the area of developmental biology
  - JDB1024Y required for collaborative program
  - JDB1025H may be counted as 0.5 elective FCE

DEPARTMENT OF BIOCHEMISTRY

• **PhD in Biochemistry**

  **PhD Requirements:** BCH 2021H Selected Topics in Biochemistry
  - BCY 2020 Y Seminars in Biochemistry
  - 1.0 FCE elective
  - JDB1025H required for the collaborative program may be counted as 0.5 elective FCE
  - JDB1026Y required for collaborative program
  The thesis topic should be in the area of developmental biology
- **MSc in Biochemistry**

  **MSc Requirements:**
  - BCH 2021H Selected Topics in Biochemistry
  - BCY 2020 Y Seminars in Biochemistry
  - JDB1024Y required for collaborative program
  - The thesis topic should be in the area of developmental biology

**DEPARTMENT OF LABORATORY MEDICINE AND PATHOBIOLOGY**

- **PhD in Laboratory Medicine and Pathobiology**

  **PhD Requirements:**
  - LMP1401H Mechanisms of Disease
  - 1.0 FCE elective
  - LMP 1001Y Seminars
  - JDB1025H required for the collaborative program may be counted as elective 0.5 FCE
  - The thesis topic should be in the area of developmental biology
  - JDB1026Y required for collaborative program

- **MSc in Laboratory Medicine and Pathobiology**

  **MSc Requirements:**
  - LMP1401H Mechanisms of Disease
  - LMP 1001Y Seminars
  - The thesis topic should be in the area of developmental biology
  - JDB1024Y required for collaborative program
APPENDIX II

COLLABORATIVE PHD PROGRAM IN
DEVELOPMENTAL BIOLOGY

CORE FACULTY RESEARCH SYNOPSISES

The following is a list of the collaborative program’s core faculty:

**Molecular Genetics**

**Gabrielle Boulianne**

My laboratory has been using powerful genetic techniques available in Drosophila, to study the development and the function of the nervous system. More recently, we have exploited the knowledge and tools obtained during the course of these studies to develop models of aging and human neurodegenerative diseases, such as Amyotrophic Lateral Sclerosis (ALS) and Alzheimer's Disease (AD).


**Julie Brill**

Phosphatidylinositol phosphates (PIPs) are critical regulators of cell polarity, growth and proliferation. We are studying the roles of these important membrane phospholipids in the differentiation of specialized cells during development of multicellular organisms. Using the fruit fly Drosophila melanogaster as a model system, we have identified roles for PIPs in cytokinesis, oogenesis, polarization of developing sperm and epithelial cells, secretory granule formation and eye pigmentation. Our current research focuses on studying the enzymes that control PIP formation, identifying target proteins that are regulated by PIPs and PIP regulatory enzymes, and defining the molecular mechanisms by which PIPs regulate these proteins during differentiation.


**Brian Ciruna**

We are interested in understanding the molecular and genetic mechanisms that regulate early development, with specific emphasis on the planar cell polarity (PCP) signalling pathway and its role in embryonic morphogenesis. Correct polarity is essential for normal cellular function. The characteristic apical-basolateral polarity of epithelial cells, for example, is required for directional ion transport and deposition of the basal lamina. In addition, polarity may also exist across the plane of an epithelium or field of cells. In vertebrates, this planar cell polarity (or PCP) instructs polarized cell rearrangements and morphogenetic processes that structure and shape the developing embryo. At neurulation, defects in PCP signalling are thought to cause spina bifida and anencephaly - neural tube closure defects that affect one in every 1000 human births. PCP signalling has also been implicated in skin development, polarization of the inner ear sensory epithelium, cardiac development and cancer. However, little is known about how PCP signals ultimately regulate these important cellular and physiological processes. We are using the zebrafish as a model organism to investigate the fundamental mechanisms by which cell polarity is established, maintained and interpreted in the course of vertebrate embryonic development. By combining powerful live microscopic imaging capabilities with...
the genetic and embryological techniques afforded by zebrafish research, we are examining the dynamic regulation of PCP signalling at a sub-cellular level. Furthermore, we are employing forward genetic and candidate gene approaches to screen for novel regulators and modifiers of PCP signalling. We hope to gain insight into how regulation of cell polarity functions in normal development, and how aberrations in PCP signalling contribute to congenital malformations and disease.


Sabine Cordes

Dr. Cordes’s laboratory is using molecular techniques and analysis of pre-existing and newly generated mouse mutations to understand early neural development, especially that of the vertebrate hindbrain segmentation and serotonergic neuron. To investigate neurotonal specification, Dr. Cordes’s lab is using chemical mutagenesis and a series of streamlined assays to generate and identify novel mouse mutations which affect serotonergic neuron specification, differentiation, and neurotransmission.


Joseph Culotti

Dr. Culotti’s laboratory is using the simple nematode Caenorhabditis elegans to identify and characterize the function of gene products that are responsible for neurogenesis and for guiding the migration of growing axons. Other projects in the laboratory involve identifying mutations in homologues of genes known to affect axon guidance in vertebrates.


Sean Egan

The Notch family receptors have been implicated in development of most tissues in complex animals. We are interested in how Notch receptor activation and signaling control normal mammary development and breast cancer. To this end we identified mammalian Fringe proteins (Lunatic, Manic and Radical Fringe), which control Notch activation in response to Delta and Jagged family ligands. We have recently shown that Fringe proteins can function as tumor suppressors in mammary epithelium. Furthermore, we are using mouse mutants and reporter lines to define which Notch receptors control mammary stem and progenitor cell division, differentiation and survival. We have recently determined that while some Notch proteins control mammary cell survival, others regulate proliferation and differentiation of mammary alveoli during pregnancy.


CC Hui

The Hedgehog signaling pathway plays a major role in the development of both invertebrates and vertebrates. In vertebrates, Hedgehog signaling controls embryonic patterning and the development of multiple organ systems. In humans, aberrations in the Hedgehog signaling pathway lead to congenital malformations and cancer. My laboratory is interested in understanding the molecular mechanisms underlying Hedgehog signal transduction in mammalian cells and how Hedgehog signaling affects both normal and abnormal developmental processes.


Henry Krause

Our lab is using genome scale approaches to understand processes of development. There are two main projects in the lab. The first involves the nuclear hormone receptor family of ligand activated transcription factors, while the second project focuses on the process of transcript localization within cells and how this localization affects the functions of encoded proteins.


Howard Lipshitz

We are interested in understanding how embryonic cells are instructed to adopt distinct developmental fates, ultimately specifying a complex, three-dimensional organism. Our research program is sub-divided into two projects that utilize Drosophila as a molecular genetic model.

One focus is on how certain classes of mRNAs are localized within the cytoplasm of cells, with an emphasis on the egg and early embryo. Intra-cellular transcript localization is a fundamental mechanism by which informational asymmetries are established in cells. Several years ago we discovered a novel transcript localization mechanism that converts a generally distributed transcript into a localized one by a combination of generalized degradation and localized protection of the RNA. We are currently taking a combined genetic and biochemical approach to defining the cis-acting elements, trans-acting factors and genetic pathways that control this localization process. In addition we are carrying out genome-wide gene expression profiling analyses aimed at identifying all stable versus unstable maternal RNAs in the early embryo, including which of the latter are localized.

Our second research project studies the genetic control of morphogenesis. In particular, we have studied the coordinate cell shape changes and cell rearrangements that convert two-dimensional sheets of cells into three-dimensional structures during embryogenesis. Our analyses have led to insights into how spatial control of particular signal transduction pathways (e.g. the Jun kinase pathway) may be used to regulate the initiation and termination of cell movements. Our studies have also begun to elucidate a novel genetic pathway that controls tissue integrity as cells within epithelia are reorganized. Genetic screens and live imaging of subcellular structures during cell movements are being used to understand the cellular and molecular mechanisms of morphogenesis. These have led to elucidation of the role of cell surface molecules (e.g., integrins, basigin) in promoting morphogenesis and preventing a process known as anoikis (epithelial disintegration and death upon loss of contact with extracellular matrix). These findings are relevant, not only to normal development, but also to understanding the mechanisms of wound healing and cancer.


Helen McNeill

A central problem in cell and developmental biology is understanding how cells and groups of cells become organized to form organs and tissues. One form of higher organization that is currently under intense investigation is planar cell polarity. Planar cell polarity is the coordinate organization of cells within the plane of a single layered sheet of cells. Planar polarity is essential for tissue functioning: the planar polarity of the vertebrate inner ear is essential to proper hearing and balance; similarly, planar polarity of the fly eye is essential for accurate vision. We are using the fruit fly, Drosophila melanogaster, as a genetically tractable organism to investigate the genetic and molecular mechanisms underlying planar polarity.


Andras Nagy

The Nagy laboratory is interested in using mouse genetics to study mammalian development and to apply this knowledge to human disease. Dr. Nagy is also developing new, powerful tools for genetic approaches and phenotype analysis for these ongoing studies. Another main activity of the Nagy lab is connected to mammalian genomic imprinting.


Janet Rossant

Our lab is interested in understanding early lineage development in the mouse embryo. Some of the topics lab members are currently investigating include axial patterning, specification of stem cell lineages, and vasculogenesis


Peter Roy

We are working towards understanding how whole animals resist the effects of small bioactive molecules (a.k.a. xenobiotics or drugs), as animals likely have additional organism-wide xenobiotic defense mechanisms in addition to those conferred by individual cells. We are also exploiting these defense mechanisms to develop new small molecule tools for biological analysis. Finally, we are working to better understand how cell extensions like axons reach their target destinations during normal animal development using a previously unexploited model system in C. elegans, a tiny nematode worm.

Ian Scott

My lab uses the zebrafish model organism to study vertebrate embryonic heart development. In a forward genetic screen I have isolated several novel mutations that affect diverse steps of cardiac development. Analysis of the grinch mutant has revealed a role for the G-protein coupled receptor Agtr1lb in the specification of the myocardial lineage. We are currently using transgenic and embryological approaches to determine the mechanism through which Agtr1lb regulates the earliest events of heart formation. Furthermore, other organ systems affected in agtr1la, agtr1lb and agtr1l a/b mutants are also being examined.

In a related project, we have recently uncovered a combination of transcription factors that can reprogram embryonic cells to form cardiomyocytes at a high frequency \textit{in vivo}. Interestingly, these cells appear to migrate to the heart forming region of the embryo, even if placed in ectopic locations, including the CNS/forebrain. We are currently examining how these factors can induce this procardiac behaviour.

Genes affected by a second class of mutations, that cause defects in the later morphogenesis of the heart tube, are also being studied. The logelei mutant affects morphogenesis of a number of epithelial organs. We have resolved the logelei critical region, and found it to affect a member of the mediator complex. Positional cloning of additional heart mutants has also been initiated. It is hoped that by combining genetic and cell imaging approaches we will gain a deeper understanding of the developmental processes that regulate heart development. As dysfunction of these processes in humans lead to congenital heart defects, these studies should help inform future curative approaches to this significant constellation of diseases. To this end, the usefulness of a chemical genetic approach to zebrafish congenital heart disease models is currently being evaluated in the lab.


Andrew Spence

Sex determination and sexual differentiation in Caenorhabditis elegans: We are interested in how genes direct animal development. We study the small, genetically tractable nematode worm, Caenorhabditis elegans, to address the questions of how cells acquire different fates, and how they form functional organs, in a developing animal. Much of our work focusses on mechanisms involved in sex determination and sexual differentiation in C. elegans.


Derek van der Kooy

Our work on neural development & stem cell biology research focuses on the lineage steps in the development of the mammalian brain from totipotent embryonic stem (blastocyst) cells to neural stem cells to more restricted neural progenitor cells that make neurons and glia. Of particular interest are the earliest steps in the production of self-renewing neural stem cells from mouse embryonic stem cells, in terms of discovering novel and testing candidate neural determination genes.


Mei Zhen

Dr. Zhen’s laboratory investigates how neurons establish synaptic connectivitites during development. The focus is on dissecting the molecular components of syd-2 and sad-1 signaling pathways using C. elegans as a model system. The lab has developed a number of fluorescent GFP/YFP/CFP markers which allows direct visualization of different synaptic structures in live C. elegans.


Immunology

Michele Anderson

Our research is aimed at understanding the role of transcription factors in T cell development. T cells develop from hematopoietic stem cells, which initially can become any of the eight major blood cell types. As this process begins, new genes are expressed, and the expression of these genes is directed by transcription factors. We are focusing on two families of transcription factors that are involved in these processes, the Ets and basic helix-loop-helix families.

We have identified several members of these families that are active during early T cell development. To study the roles these factors play, we are disrupting or enhancing their activities in hematopoietic stem cells using retroviral gene transfer. We then monitor the effects of these perturbations on fate choice, differentiation, cell growth and cell death as the stem cells develop into T cells.

We have found that one transcription factor, HEB, can be expressed in different forms that in turn have different effects on cell growth. We believe that the ratios of these factors in developing T cells could be critical in determining if T cells are programmed with the necessary growth control responses that protect them from overgrowth and that could result in cancerous transformation, but that permit proliferation in response to infection. Studies are underway to understand the molecular interactions among these transcription factors, their target genes and the other cellular machinery that controls the normal and aberrant development of T cells.

Ultimately, it is in these networks of interactions that the answers will be found to provide an understanding of the genetic programs that are installed during T cell development and that allow their unique and essential immune functions to be deployed while avoiding malfunctions that can lead to leukemia, lymphoma or autoimmune disease.


Cynthia Guidos

While at Stanford Dr. Guidos identified several novel precursor-progeny relationships during murine intrathymic T cell development. These studies provided the impetus for establishing her independent research program, which is focused on elucidating molecular mechanisms that regulate survival, proliferation, and lineage commitment during lymphocyte development. Defects in this process are known to cause lymphoblastic leukemia and immune deficiency. Dr. Guidos’ current research is focused on two broad goals:

1) To elucidate essential functions of the Notch signaling pathway in T and B cell development
2) To elucidate mechanisms of T and B cell leukemogenesis, by identifying pathways that allow T and B cell progenitors to escape death, proliferate and self-renew aberrantly
Juan Carlos Zuniga-Pflucker

The process of differentiation allows a small population of continuously self-renewing stem cells to generate a remarkably diverse range of mature progeny. Understanding how molecular signals in developing tissues induce commitment and differentiation of stem cells is a fundamental question of developmental biology. In the context of blood cells, this question also has therapeutic implications in the treatment of leukemia, which arises from dysregulated differentiation.

In the context of the immune system, the thymus provides a model system to study the mechanisms controlling tissue-specific differentiation events and lineage commitment pathways. Hematopoietic progenitor cells from the bone marrow migrate to the thymus where they receive the necessary signals that mediate their commitment and differentiation into T lymphocytes. The absolute requirement for the thymus in the generation of T cells from hematopoietic progenitors has been recognized for over 40 years. However, until recently, the precise molecular interactions responsible for this thymic requirement remained elusive.

We contributed to the identification of these molecular interactions by demonstrating that a bone marrow-derived stromal cell line (OP9) ectopically expressing Delta-like-1 (OP9-DL1), a Notch receptor ligand, gains the ability to induce the full differentiation of T cells from hematopoietic stem cells (HSC). Interestingly, expression of Delta-like-1 by OP9 cells results in a complete switch in lymphocyte lineage commitment, as control OP9 cells allow for robust B cell differentiation, while OP9-DL1 cells support only T cell differentiation from HSCs. These findings have recently been extended to totipotent embryonic stem cells (ESCs), which can also be induced to differentiate into functional T cells in vitro by coculture on OP9-DL1 cells. Thus, our findings show that Delta-like-1/Notch interactions occurring within the thymus underpin its unique ability to induce the lineage commitment and differentiation of T cells. With this in mind, our current focus involves identifying the molecular mechanisms that govern progenitor lymphocyte lineage commitment, T cell development, and Delta-like-1 expression by thymic stromal cells, and the development of a stromal cell-free system for the induction of T cell differentiation from defined sources of stem cells. We are also developing strategies to adapt our current model system for the induction of T cell differentiation from defined sources of human stem cells.


Cell and Systems Biology

Thomas Berleth

Molecular developmental genetics and genomics; Plant embryo and vascular development. Projects focus on the molecular genetic analysis of signaling pathways involved in embryonic root initiation and vascular tissue formation in the model plant Arabidopsis thaliana and in trees. The strategy is based on the identification of genes by mutation in Arabidopsis, which are subsequently isolated and analyzed at the molecular level. The strategy involves the generation of genomic resources in Arabidopsis, such as transgenic enhancer-trap and activation-tag collections and the transfer of knowledge obtained in Arabidopsis to biotechnological applications in trees.


**Ashley Bruce**

The goal of my research program is to answer the question of how cell movements are coordinated during embryonic development. Transformation of a simple cleavage stage embryo into a complex adult relies upon an exquisite series of carefully orchestrated cell movements. In all animals, dramatic cellular rearrangements generate the multilayered body plan by a process termed gastrulation. Although modes of gastrulation vary widely in the animal kingdom, they all draw upon a set of relatively simple cell behaviors, different combinations of which generate the array of different gastrulation patterns observed in nature. By examining cell behaviors in the experimentally tractable zebrafish system, we will learn about general cellular properties and mechanisms of cell movements that are likely to be widely used throughout animal development. This knowledge should also be useful in understanding disease states resulting from abnormal cell movements, such as congenital birth defects.

**Malcolm Campbell**

Despite the incredible diversity in plant forms, the molecular mechanisms that control plant architecture are highly conserved across diverse genera. It is thought that the timing and localization of these mechanisms, in response to environmental and developmental cues, determine the overall structure of the plant body. My research team tests hypotheses aimed at understanding the molecular mechanisms that control plant architecture. Much of my group's work has focused on the regulation of aspects of plant growth and development that are critical in architectural design. This work has largely centred on an exploration of the molecular mechanisms that underpin the timing and localization of lignin biosynthesis. Lignins are complex three-dimensional polymers that reinforce specific plant cell walls and thereby impart strength that is important in supporting the plant body against gravity. The control of the timing and localization of lignin biosynthesis is important in establishing the architectural design of the plant body. My group focuses on the role of members of the MYB family of transcription factors in controlling the timing and localization lignin biosynthesis. As a complement to this work, my team has also been characterising mutant plants that accumulate lignins in tissues where they would not normally be found, in order to understand the mechanisms controlling the localisation of this important building material. Other work in my lab is aimed at understanding how members of the MYB family of transcription factors affect plant architecture beyond their role in the control of lignin biosynthesis.


**Dorothea Godt**

Cells come in different shapes. They can be round, columnar, spindle shaped, they come with or without protrusions, and they can change their shape rapidly during development. Interactions between cells allow them to build highly organized tissue structures. What are the molecules that control cell shape and movements? To find and analyze the factors that are involved in morphogenesis my laboratory uses a genetic approach. We study the development of the ovary of Drosophila melanogaster that consists of a regular array of tubes in which the eggs mature, and gene mutations, which disturb the formation of the egg tubes cause sterility. With the help of such mutations we isolate and characterize genes that regulate morphogenetic processes in ovarian development on the molecular, cellular and genetic level. Our current work focuses on the function of several morphogenetic regulators, such as adhesion molecules of the cadherin family.


**Tony Harris**

We are using confocal and time-lapse microscopy in combination with Drosophila genetics, molecular biology and proteomics to study how epithelial cell polarity is established. Epithelia are sheets of adherent cells that form boundaries between our body compartments. Each side of an epithelial sheet has distinct molecular properties. This epithelial polarity is critical for guiding embryo development and directing adult functions (e.g. nutrient uptake in the gut), and its loss is associated with cancer. We are focusing on the polarity-organizing machinery operating in each epithelial cell. We are identifying the proteins making up this machinery, and determining how they function together to establish and maintain epithelial polarity in the Drosophila embryo. By using cutting edge microscopy in combination with Drosophila genetics, we can literally see how identified proteins interact to control epithelial polarity and structure. It is really exciting to see how cells and tissues are built, and it is important for understanding cancer and developing regenerative medicine.


**Ellen Larsen**

We explore the relationship between the mechanisms by which genes control morphogenesis during development and the evolution of form. An overall goal is to gain insight into what has to be genetically encoded and what is the outcome of self-organized behaviour of cellular systems involved in morphogenesis. Two projects in the lab address this problem, one is based the development and evolution of sex combs in male fruit flies and the other is to produce a laboratory model lichen system.

Lichens are composed of a fungal and photobiont component, (algae and/or cyanobacteria), neither of which, when grown separately, can make the three dimensional structures of the lichen.


**Peter McCourt**

In plants, hormones influence many diverse developmental processes ranging from seed germination to root, shoot and flower formation. I have chosen to study the plant hormones abscisic acid (ABA) and gibberellin (GA) in Arabidopsis thaliana as a model genetic system to understanding hormone signaling in plants. The program involves the identification of mutants with altered hormonal responses and the cloning of the subsequent genes that have been identified through these genetic screens.


**Maurice Riguette**

The physiochemical properties and specialized functions of tissues are dependent on dynamic interactions and communication between cells and their extracellular matrix (ECM) environment. In addition to forming elaborate three-dimensional frameworks that establish tissue patterns and boundaries, ECM macromolecules play a critical role in regulating the biological activities of cells. Consequently, a dynamic reciprocal dialogue is established whereby cell
secretions and their organization into a matrix in turn influences the activity of secreting cells, promoting a permissive environment for further growth and development. My research program is focused using molecular biology techniques to examine the expression and morphogenic contributions of two structurally related ECM glycoproteins, SPARC (Secreted Protein, Acidic, Rich in Cysteine) and SC1, on early embryonic development. Using the South African clawed frog Xenopus laevis as an experimental organism, our data indicate that SPARC and SC1 have pleiotrophic effects on the development of muscular and neural tissues, e.g., somitic myotomes, neural tube and brain development. Their complex transient expression patterns indicate they make overlapping but distinct contributions to the development of these tissues. Since SPARC is associated with tissue remodelling and repair, we are also examining changes in its expression at different stages of tumour progression in humans. Our preliminary data indicate that SPARC plays a permissive role in the invasion of tumour cells in the stroma of human ovarian tumours. The lessons learned should serve as a stepping stone towards a better understanding of abnormal development and the design of novel therapeutic strategies in the treatment of human diseases.


Ulrich Tepass

Cell Biology of Animal Development: Finding out how cells adopt specific shapes and organize themselves into tissues and organs in multicellular organisms is one of the most exciting questions in modern biology with profound implications for human health. Our work focuses on epithelial cells, the basic building blocks of all animals and humans that are major components of many organs such as skin, gut, liver, kidney or the retina. These cells form two-dimensional sheets that separate different compartments of the body. Cell polarity is a key feature of simple and more complex epithelial cells such as photoreceptor cells. The polar organization of these cells is fundamental to their anatomy and physiology and an area of intense research in current cell biology. Our aim is to better understand both the cellular and molecular mechanisms that control the polarity of epithelial cells and the cell adhesion between epithelial cells that binds cells into tissues. Some of the main questions that we pursue are:

- How do epithelial cell establish and maintain their polar organization during development?
- How do epithelial tissues adopt specific shapes such as tubes?
- How do epithelial cells adhere to each other and move along each other without compromising epithelial tissue integrity?
- How do photoreceptor cells establish different, functionally and structurally distinct plasma membrane region?

Abnormalities of epithelial cells including defects in cell polarity and cell adhesion cause many diseases. Our research currently explores genetic models for cancer and blindness. In fact, more than 80% of all human cancer cases are caused by the abnormal behaviour of epithelial cells. Blindness results often from death of the retina that is caused by defects in the polarity and adhesion of the epithelial cells that compose the retina including the light sensing photoreceptor cells.


Vincent Tropepe

The production of nerve cells in the brain (neurogenesis) is regionally specialized for the formation of distinct functional domains in the vertebrate brain. Moreover, neurogenesis in the adult brain may contribute to the structural changes that underlie neural plasticity, which is crucial for sensory processing, learning and memory. My lab investigates the fundamental questions of how the development of neural tissue is initiated in the early embryo, and how neurogenesis contributes to the generation and maintenance of regional nerve cell diversity throughout life. We use mouse and zebrafish as complementary vertebrate model systems and employ a variety of technical approaches that range from histological and cell culture techniques to molecular biology and genetics in order to identify and characterize the molecular mechanisms that govern vertebrate neurogenesis.


Susan Varmuza

Research in Dr. Varmuza's lab is focused on two aspects of mammalian reproductive biology - spermatogenesis and genomic imprinting. Spermatogenesis is being pursued through analysis of a targeted mutation in the protein phosphatase 1c (PP1) gene made in the Varmuza lab that causes male sterility by disrupting spermiogenesis. The phenotype of the PP1 knockout closely resembles male infertility in humans. Experiments are in progress to determine the precise mechanism by which loss of this vital enzyme impedes cytodifferentiation in the testis. Human male infertility is also being studied through high throughput SNP discovery studies. Preliminary evidence revealed that a cluster of de novo substitutions in the SBF1 gene associates with human male infertility.

Genomic imprinting is an epigenetic mechanism that silences one parental allele of a small number of genes, many of which are involved in development and function of the placenta. Microarray analysis of uniparental embryos revealed the paternally expressed Sfmbt2 gene in mice, which was subsequently shown to be expressed at high levels in placenta and yolk sac. The Sfmbt2 gene encodes both a PcG protein (SFMBT2) and a large number of miRNAs from a block of pre-mi-RNAs within one of the introns in the primary transcript, suggesting that this locus may play multiple roles during mouse development.


Rudolf Winklbauer

We study the molecular and cellular basis of several morphogenetic ("shape-generating") processes that contribute to gastrulation in the amphibian, Xenopus laevis. In particular, we examine how cell migration and fibronectin matrix formation in the gastrula are controlled by paired-class genes, we analyze the control and mechanisms of embryonic cell sorting and convergent extension, and we study new gastrulation processes like vegetal rotation and active mesoderm involution.


Biochemistry

Craig Smibert

Specification of various cell and tissue types relies on differential patterns of gene expression which are often controlled at the level of transcription. Regulation, however, does not cease once transcripts are made. Instead, a variety of post-transcriptional control events, including translational controls, may also contribute to proper expression patterns. For example, recent studies have shown that selective translational controls operate in such diverse processes as red blood cell development and spermatogenesis in mammals, sex determination in C. elegans, and dosage compensation in Drosophila. Although these results highlight the fact that translational controls are likely to function in a wide range of developmental processes, little is known about the molecular mechanisms that underlie selective translational regulation.

Several of the most prominent examples of translational controls have been revealed by studying the expression of mRNAs that direct early Drosophila development. For example, nanos (nos) protein, which directs posterior body patterning in Drosophila, is localized to the posterior of the embryo through the coordinate action of systems that
regulate the translation, localization, and stability of nos mRNA.

Our long-term goals are to identify factors that regulate and coordinate post-transcriptional control of nos expression. We employ a combination of genetic and biochemical approaches to pursue these investigations. The ability to apply both genetics and biochemistry to a problem is one of the advantages of the Drosophila system. In addition, the use of Drosophila allows one to readily explore the biological significance of processes in a complex multicellular organism.


Physiology

Norm Rosenblum

The overall goal of my research is to identify molecular mechanisms that control normal and abnormal kidney development. Renal malformation is a general clinical category which contains two major sets of renal disorders: (i) renal dysplasia, defined as malformation of tissue elements, and (ii) renal hypoplasia, defined as a kidney with normal architecture but a low number of nephrons. Renal dysplasia and severe hypoplasia are the major causes of childhood renal failure. Less severe forms of renal hypoplasia characterized by nephron number at the lower end of the population distribution is considered to be an antecedent to adult-onset high blood pressure and kidney disease. We have developed novel genetic mouse models for both renal dysplasia and renal hypoplasia. In so doing, we are generating new insights into the functions members of the bone morphogenetic protein (BMP) family, Sonic Hedgehog and beta-catenin in distinct epithelial and mesenchymal lineages of the kidney.


Laboratory Medicine and Pathobiology

Benjamin Alman

Our laboratory studies the molecular mechanisms responsible for the deregulation of cellular growth control in aggressive fibromatosis (desmoid tumour) and cartilage neoplasms (e.g. chondrosarcomas). We identified developmental signaling pathways that are inappropriately activated in both types of lesions. Our current work focuses on determining somatic mutations that may be responsible for the activation, identifying novel mediators in the signaling pathways, and determining if a pharmacologic approach can be used to modulate the pathway activation. The long-term goal of this work is to develop novel pharmacologic therapies for these otherwise difficult to treat lesions. Some of the information learned from our work on tumours can be applied to repair processes and bone growth. We are currently working to determine how these signaling pathways regulate normal bone growth and wound healing.


APPENDIX III

CALENDAR ENTRY (updated to reflect proposed addition of MSc)

Developmental Biology

Lead Faculty
Medicine

Degree Programs
Biochemistry – MSc, PhD
Cell and Systems Biology – MSc, PhD
Immunology – MSc, PhD
Laboratory Medicine and Pathobiology – MSc, PhD
Molecular Genetics – MSc, PhD
Physiology – MSc, PhD

Overview
The graduate programs listed above participate in the Collaborative Program in Developmental Biology. The objectives of the program are to:
1. promote and foster excellence in developmental biology research in Toronto.
2. provide a means for MSc and PhD graduate students working on developmental biology projects to be exposed to a broad range of issues and approaches in modern developmental biology.
3. provide a single comprehensive advanced PhD-level graduate course to complement a number of introductory courses provided by different departments.
4. provide a forum for interaction between investigators in Developmental Biology in different departments via participation in student seminars, supervisory committees, journal clubs, retreats and seminars/symposia.

Upon successful completion of the MSc or PhD requirements of the host department and the program, students receive the notation “Completed Program in Developmental Biology” on their transcript.

Contact and Address
Web: www.utoronto.ca/devbiol/
E-mail: dev.bio@utoronto.ca
Telephone: (416) 586-8267
Fax: (416) 586-8857

Dr. Helen McNeill, Director
Collaborative Program in Developmental Biology
Department of Molecular Genetics
University of Toronto
600 University Avenue, Room 884
Toronto, Ontario M5G 1X5
Canada
Degree Programs

Master of Science

Minimum Admission Requirements
- Students who wish to enrol in the Collaborative Program must apply to and be admitted to both the Collaborative Program and a graduate degree program in one of the collaborating departments.

Program Requirements
- Students must be registered in the master’s program of one of the participating departments and must be undertaking research in developmental biology under the supervision of a member of the collaborative program.
- Complete all degree program requirements of the participating department. In addition, they must complete the interdepartmental course JDB1024Y.
- Complete an MSc thesis in the topic area of developmental biology.

Doctor of Philosophy

Minimum Admission Requirements
- Students who wish to enrol in the Collaborative Program must apply to and be admitted to both the Collaborative Program and a graduate degree program in one of the collaborating departments.

Program Requirements
- Students must be registered in the doctoral program of one of the participating departments and must be undertaking research in developmental biology under the supervision of a member of the collaborative program.
- Complete all degree program requirements of the participating department. In addition, they must complete the interdepartmental course JDB 1025H and the seminar course JDB 1026Y. These courses may be taken in place of some host department courses.
- Complete a PhD thesis in the topic area of developmental biology.

Course List
The following courses are offered by the program every year.
JDB 1024Y Topics in Developmental Biology
JDB 1025H Developmental Biology
JDB1026Y Student Seminars in Developmental Biology

Program Committee
Dr. Helen McNeill, PhD, Molecular Genetics (Director)
Dr. Julie Brill, PhD, Molecular Genetics
Ms. Nicole Forgione, Cell & Systems Biology (student representative)
Dr. Peter Roy, PhD, Molecular Genetics
Dr. Tony Harris, PhD, Cell & Systems Biology
Dr. Mei Zhen, PhD, Molecular Genetics
Dr. JC Zuniga-Pflucker, PhD, Immunology
## Governance Form C:
### New Course
2008-2009, Version #1

### SECTION A: Required information

<table>
<thead>
<tr>
<th>Course designator/code (three letters):</th>
<th>Course Number (four digits):</th>
<th>Format (lecture/ seminar/ readings, distance delivery, etc.):</th>
<th>Number of contact hours per week:</th>
</tr>
</thead>
<tbody>
<tr>
<td>JDB</td>
<td>1024Y</td>
<td>Seminar</td>
<td>2</td>
</tr>
</tbody>
</table>

**Course Title:**
Topics in Developmental Biology

**Department:** Collaborative Program in Developmental Biology

**Participating MSc Programs**
- Biochemistry
- Cell and Systems Biology
- Immunology
- Laboratory Medicine and Pathobiology
- Molecular and Medical Genetics
- Physiology

**Course coordinator (including any other lecturers/instructors, if applicable; indicate responsibility of each instructor):**
Dr. Helen McNeill, Director
Collaborative Program in Developmental Biology

**Course Description (approximately 100-150 words; may include further description of format of course presentation, e.g., lectures, seminars, readings, etc.):**

Students attend the monthly meetings of the CGPDB and the Distinguished Lecturers in Developmental Biology. In addition, MSc students will present one poster at the Annual Scientific retreats of the Collaborative Program in Developmental Biology (CGPDB) which will be evaluated by program faculty.

**Academic Relevance – state the reason for creating the course, and its place in your program (required, elective, etc.):**
An essential element of graduate education in the biological sciences is learning how to present ongoing research, and to interact with the greater scientific research community. By providing a forum for students to present their work, they gain insight into the strengths and weaknesses of their work, and learn how to effectively present their progress. We propose two venues for this education. First, a monthly meeting, where the students hear the most current, cutting-edge work being conducted in the University of Toronto Developmental Biology Community by leading faculty. Secondly, at the yearly Annual Scientific Retreat the students have the opportunity to present their research and are graded by the developmental faculty on the progress of their research, and their presentation skills.

**Enrolment projection (estimate):**
2010-11   (18 students)
2011-12   (22 students)
2012-13   (24 students)
2013-14   (25 students)

Prerequisite: MSc students in the CGPDB program

Co-requisites/ exclusions/ enrolment restrictions (if any): none

Course weight (indicate one below): ___ H ___ Y

Regular/continuing/ extended (indicate one below)*: ___ Regular ___ Continuous ___ Extended

*See SGS Calendar, Section 6 Course Codes

Start Session/Date: September 2010

Abbreviated Course Title (maximum 30 characters and/or space or punctuation):

Grading Scheme (indicate letter grade or credit/no credit (CR/NCR) designation):

___ X ___ Letter grades
___ CR/ NCR

List components of course and percentage value for each component

Poster Presentation  80%
Attendance at Monthly Meetings 10%
Distinguished Lecturers Attendance  10%

List graduate units where significant similarity or overlap may occur (confirm endorsement by those units of this new course; attach documentation as appropriate; indicate “None” if no overlap):

None

Indicate resources required for delivery of course (instructor/teaching assistant/lab equipment, computing resources, distance delivery elements, etc.) and indicate whether requirements will be met through existing resources or whether additional resources will be required:

X All elements of the course will be met with existing resources.
□ Additional resources will be required. Indicate type, source, and approval received:

Confirm that course proposal has been approved by a graduate unit committee (provide committee name and meeting date):

DEV Bio Steering Committee – meeting held February 6, 2009

Date: 3 November 2009

Submitted by:
Dr. Helen McNeill, Director
Collaborative Graduate Program in Developmental Biology
Developmental Biology

Lead Faculty
Medicine

 Participating Degree Programs
Biochemistry – MSc, PhD
Cell and Systems Biology – MSc, PhD
Immunology – MSc, PhD
Laboratory Medicine and Pathobiology – MSc, PhD
Molecular Genetics – MSc, PhD
Physiology – MSc, PhD

Overview
The graduate programs listed above participate in the Collaborative Program in Developmental Biology. The objectives of the program are to:
1. promote and foster excellence in developmental biology research in Toronto.
2. provide a means for MSc and PhD graduate students working on developmental biology projects to be exposed to a broad range of issues and approaches in modern developmental biology.
3. provide a single comprehensive advanced PhD-level graduate course to complement a number of introductory courses provided by different departments.
4. provide a forum for interaction between investigators in Developmental Biology in different departments via participation in student seminars, supervisory committees, journal clubs, retreats and seminars/symposia.

Upon successful completion of the MSc or PhD requirements of the host department and the program, students receive the notation “Completed Program in Developmental Biology” on their transcript.

Contact and Address
Web: www.utoronto.ca/devbiol/
E-mail: dev.bio@utoronto.ca
Telephone: (416) 586-8267
Fax: (416) 586-8857

Dr. Helen McNeill, Director
Collaborative Program in Developmental Biology
Department of Molecular Genetics
University of Toronto
600 University Avenue, Room 884
Toronto, Ontario M5G 1X5
Canada

Degree Programs

Master’s Level

Minimum Admission Requirements
- Students who wish to enrol in the Collaborative Program must apply to and be admitted to both the Collaborative Program and a graduate degree program in one of the collaborating departments.
Program Requirements

- Students must be registered in the master’s program of one of the participating departments and must be undertaking research in developmental biology under the supervision of a member of the collaborative program.
- Complete all degree program requirements of the participating department. In addition, they must complete the interdepartmental course JDB1024Y.
- Complete an MSc thesis in the topic area of developmental biology.

Doctoral Level

Minimum Admission Requirements

- Students who wish to enrol in the Collaborative Program must apply to and be admitted to both the Collaborative Program and a graduate degree program in one of the collaborating departments.
- Prospective students should contact the coordinator for additional details on admission procedures and course requirements.

Program Requirements

- Students must be registered in the doctoral program of one of the host departments and must be undertaking research in developmental biology under the supervision of a member of the program.
- Complete all degree program requirements of the participating department. In addition, they must complete the interdepartmental course JDB 1025H and the seminar course JDB 1026Y. These courses may be taken in place of some host department courses.
- Complete a PhD thesis in the topic area of developmental biology.

Course List

The following courses are offered by the program every year.

JDB 1024Y Topics in Developmental Biology

JDB 1025H Developmental Biology

JDB1026Y Student Seminars in Developmental Biology

Program Committee

Dr. Helen McNeill, PhD, Molecular Genetics (Director)

Dr. Julie Brill, PhD, Molecular Genetics

Ms. Nicole Forgione, Cell & Systems Biology (student representative)

Dr. Peter Roy, PhD, Molecular Genetics

Dr. Tony Harris, PhD, Cell & Systems Biology
Dr. Mei Zhen, PhD, Molecular Genetics

Dr. JC Zuniga-Pflucker, PhD, Immunology
MOTION
Graduate Education Council
Tuesday, January 19, 2010

ITEM 7.2

Proposal for the following new Collaborative Program:
Collaborative master’s and doctoral program in Educational Policy
Lead Faculty: Ontario Institute for Studies in Education (OISE)

MOTION
THAT Graduate Education Council approve the proposal of the Ontario Institute for Studies in Education (OISE) for a new graduate Collaborative master’s and doctoral program in Educational Policy, to be housed within SGS Division II for administrative purposes, and with OISE as the program’s lead Faculty, effective September 2010.

See attached documents:
• Governance Form E
• U of T Proposal Document
• OCGS Brief, Vol. I
• Calendar Entry

Prior Approvals and Discussion
The proposal was posted on the GWS for the usual 14-day feedback period. Feedback received asked for clarification about the core courses for the doctoral students. In response, it was made clear that all doctoral students must take both TPS 3045H and TPS 3145H to complete the requirements for the collaborative program.

The proposal was approved by the OISE Graduate Education Committee on November 13, 2009; at the meeting it was noted that a new course, TPS 3145H, was added to the doctoral level requirements in response to GWS feedback. After discussions with SGS, it was determined that another common learning experience for doctoral students was necessary, especially as some might have completed the first required half course at the master’s level. All department chairs have agreed to the addition of the new course at the doctoral level. The proposal was further approved by the OISE Faculty Council on December 16, 2009; no substantive discussion arose at the meeting.

Further Governance
GEC approval is the final University of Toronto approval. It will be sent for information to the Academic Policy and Programs Committee of Academic Board in SGS’s annual report. The proposal will be submitted to OCGS for approval.
Governance Form E:
New Program
2008-2009, Version #1

Name of Proposed Graduate Program:
Collaborative Master’s and Doctoral Program in Educational Policy

Faculty Affiliation:
(e.g. Arts and Science, Medicine, etc.)
Ontario Institute for Studies in Education (OISE)

Name of Graduate Unit involved, if any:
(Graduate department/centre/institute; you may indicate “N/A” if proposing a collaborative program.)
N/A

Graduate Programs proposed or involved in proposal:
- M.Ed., M.A., and Ph.D. in the Adult Education and Community Development program, in the Department of Adult Education and Counselling Psychology
- M.Ed., M.A., and Ph.D. in the Curriculum Studies and Teacher Development program, in the Department of Curriculum, Teaching and Learning
- M.Ed., M.A., and Ph.D. in the Second Language Education program, in the Department of Curriculum, Teaching and Learning
- M.Ed., M.A., Ed.D. and Ph.D. in the Sociology in Education program, in the Department of Sociology and Equity Studies in Studies in Education

Brief Summary of Proposal:
(Include a one-paragraph summary below or refer to Executive Summary attached. Attach a new Calendar entry, if required. In the case of proposed collaborative, combined or joint degree programs, provide list of all programs and degree levels that will participate.)

Policy research is a vital dimension of many of OISE’s academic and research programs—in K-12 and post-secondary education policy, the relationships between policy, leadership and social diversity, the history of various policy domains, policy ethics, comparative education policy, adult education policy, teacher development and curriculum policy, language policy, early childhood policy, policies supporting equity and social diversity, and assessment and measurement research and evaluation practices relevant to policy analysis. The Collaborative Program in Educational Policy will allow OISE to consolidate policy expertise across graduate programs and departments, to better
profile OISE’s strengths in this area and enhance student recruitment. The program will serve students interested in developing understandings of the factors in play in educational policy development and implementation, with particular emphasis on developing theoretical and practical strategies for improving educational processes.

**Prior Approvals/Actions:**
(List committees at the Department level and the Faculty level that have approved or will approve the proposal, and identify any other relevant approvals or actions taken. Consultation with graduate students should be included; indicate how consultation with graduate students has occurred.)

- **Fall 2004:** Proposal submitted for Academic Initiative Funding (AIF)
- **Winter 2005:** Faculty search
- **Fall 2005:** Faculty and administrative staff appointments associated with program begin
- **Winter 2006:** Program development group begins meeting to identify program purposes and structure
- **Winter 2006:** Preliminary discussions with School of Public Policy leadership about relationship between two programs; confirmation of complimentarity and minimal overlap between two programs
- **Winter 2006:** TPS students polled on-line (as part of departmental review) regarding interest in program
- **Fall 2006:** Discussions with potential OISE faculty participants
- **Fall 2006:** Approval in principle by OISE Deans and Chairs
- **Winter 2007:** Approval in principle by Department of Theory and Policy Studies
- **Winter 2008:** Initial discussions with School of Graduate Studies about degree options
- **Spring 2008:** Development of plan for first conference event
- **Spring 2008:** Further discussions with School of Public Policy leadership
- **Fall 2009:** Initiation of seminar series
- **Fall-Winter 2009:** Revision of program proposal
- **Winter 2009:** Approval by collaborating departments at OISE
- **Spring 2009:** Communication with Chairs of University of Toronto departments
- **Spring 2009:** Approval in principle by OISE Faculty Council

**Proposed Effective Date:**
(Effective dates may NOT be retroactive. The Faculty Graduate Affairs Office and SGS reserve the right to alter the effective date. New programs usually commence in September.)

<table>
<thead>
<tr>
<th>Month</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>09</td>
<td>2010</td>
</tr>
</tbody>
</table>
Contact name, e-mail address and telephone #:
(Name and contact information for Chair of the graduate unit and any other individual who would
attend meetings to discuss the proposal and respond to questions.)

Nina Bascia, Professor
Department of Theory and Policy Studies in Education
Ontario Institute for Studies in Education
nbascia@oise.utoronto.ca
416/978-1159

Submitted by:
(Chair of graduate unit or Faculty Dean)

Lana Stermac
Associate Dean, Research and Graduate Studies
OISE

Date:
September 9, 2009
UNIVERSITY OF TORONTO

Proposal for

Collaborative Master’s and Doctoral Program in Educational Policy

OISE (Lead Faculty)

October 2009
1 Executive Summary

OISE is the largest faculty of education in Canada and an international leader in many educational fields. Policy research is a vital dimension of many of OISE’s academic and research programs—in K-12 and post-secondary education policy, the relationships between policy, leadership and social diversity, the history of various policy domains, policy ethics, comparative education policy, adult education, teacher development, curriculum, language policy, early childhood policy, policies supporting equity and social diversity as well as assessment and measurement research and evaluation practices relevant to policy analysis. OISE academics include seven Canada Research Chairs (CRCs) in the University of Toronto’s Public Policy cluster, as well as one of the University’s three Ontario Research Chairs, also in the policy domain. In the past few years there has been a consolidation of policy expertise through publications (including an international handbook), conferences and consultations, further demonstrating OISE’s capacity in this domain. These kinds of activities can provide an intellectually rich environment for a new collaborative program in educational policy.

Graduate programs in every one of OISE’s five departments have noted students interested in educational policy as a dimension of their academic and professional interests. These students take courses, participate in a variety of funded research projects, and complete masters and doctoral theses focused on educational policy issues. The Collaborative Program in Educational Policy would allow OISE to consolidate policy expertise across graduate programs and departments, to better profile OISE’s strengths in this area and enhance student recruitment. The theoretical and empirical analysis of educational policy development, implementation and outcomes, while addressed in some of the University of Toronto’s other programs across campus (as well as in the recently established School of Public Policy and Governance) is a definitive preoccupation of educational studies.

The program will initially be open to students in the following graduate programs:

- M.Ed., M.A., and Ph.D. in the Adult Education and Community Development program, in the Department of Adult Education and Counseling Psychology
- M.Ed., M.A., and Ph.D. in the Curriculum Studies and Teacher Development program, in the Department of Curriculum, Teaching and Learning
- M.Ed., M.A., and Ph.D. in the Second Language Education program, in the Department of Curriculum, Teaching and Learning
Proposal for a Collaborative Master’s and Doctoral Program in Educational Policy
School of Graduate Studies, University of Toronto

- M.Ed., M.A., Ed.D. and Ph.D. in the Sociology in Education program, in the Department of Sociology and Equity Studies in Studies in Education

Consultation has occurred with other related faculties and programs at the University of Toronto, including the School of Public Policy and Governance.

Students will be required to enrol in one required half-course (TPS 3045; doctoral students who have taken TPS 3045 during their master’s program will be required to enrol in one of the courses on the doctoral elective course list relative to their field of studies), to attend a regular seminar series and to write a thesis in the area (for thesis students). Students will be encouraged to enrol in policy-relevant courses in their own home programs.

Interest in educational policy is already high as indicated by course enrolments and thesis supervision levels. In the first year we expect to attract 18 doctoral and 18 master’s level students. The program is expected to grow over the next five years. After two years, enrolment trends will be evaluated to determine whether quotas should be established. (See tables of projected enrolments on pp. 12-13.)

Administrative costs (detailed below) will be borne by TPS as the departmental level, using existing resources, including those allocated to TPS by the Academic Initiative Fund (AIF). Program evaluation once the program has run for three years (in the 2013-14 academic year) will allow participating departments to assess program impact on enrolment expansion.

2 Academic

2.1 Description and rationale for the proposal

2.1.1 Description of the proposed program
The Collaborative Program in Educational Policy will serve students interested in developing understandings of the factors associated with educational policy development and implementation, with particular emphasis on developing theoretical and practical strategies for improving educational processes. The Collaborative Program’s intellectual objectives include providing students with exposure to cross-field and cross-disciplinary approaches to educational problem framing and problem solving in order to broaden the possibilities for innovative and effective policy analysis; helping students understand how to apply theoretical concepts to particular social and educational problems in particular settings; and understanding the broader social, institutional and policy contexts within which educational policy processes occur.

Annual activities including a lecture series, conferences for educators and researchers, publications and cross-specialization research initiatives would both enhance the intellectual infrastructure of the academic program and provide a basis for collaborative
work. Canada Research Chairs, Ontario Research Chair, endowed chairs and others with policy expertise in TPS, across OISE, the University of Toronto and other educational institutions could link their work through these program-related activities.

2.1.2 Rationale for the proposal
OISE is the largest faculty of education in Canada and an international leader in many educational fields. Policy research is a vital dimension of many of OISE’s academic and research programs—in K-12 and post-secondary education policy, the relationships between policy, leadership and social diversity, the history of various policy domains, policy ethics, comparative education policy, adult education, teacher development, curriculum, language policy, early childhood policy, policies supporting equity and social diversity as well as assessment and measurement research and evaluation practices relevant to policy analysis. OISE academics include seven Canada Research Chairs (CRCs) in the University of Toronto’s Public Policy cluster, as well as one of the University’s three Ontario Research Chairs, also in the policy domain. In the past few years there has been a consolidation of policy expertise through publications (including an international handbook), conferences and consultations, further demonstrating OISE’s capacity in this domain. These kinds of activities can provide an intellectually rich environment for a new collaborative program in educational policy.

Policy expertise is a dimension of nearly every graduate program at OISE. The sum of OISE’s policy expertise is cross-sector, cross-disciplinary and involves a wide variety of research methodologies. Creating a program framework that brings this wealth of approaches together will afford students powerful and unique opportunities to understand and devise new educational conceptions of policy processes and new ways of working with policy.

There are few sites in Canada with any focused educational policy program efforts. At the University of Toronto, the new School of Public Policy and Governance (of which OISE is a partner) has recently established a master’s program focusing on policy formation. OISE has the capacity to launch a complimentary program that would emphasize OISE strengths in empirically-based, cross-disciplinary educational research that highlight educational policy implementation and impact. In 2004-05, OISE was awarded Academic Initiative Fund support for a five-year period to develop this collaborative program in ways that capitalize on local expertise and complement other University programs.

2.2 Pedagogical and other academic issues, including expected benefits of the proposed program
The initial program development group included community partners representing provincial educational organizations and OISE academics who have ongoing professional relationships with national, provincial and local educational organizations. There is strong consensus that policy analysis skills are lacking within these organizations and in public policy systems as a whole. Students will be able to gain an understanding of policy issues and processes relevant to their home program field of study and will be
exposed to a variety of disciplinary approaches to these policy issues and processes that will enrich their ability to study and resolve policy problems.

2.3 Projected student demand

Indicators of potential demand

Student interest
As part of regular cyclic departmental review practices, graduate students in the Department of Theory & Policy Studies (the department that has agreed to take primary responsibility for administering the collaborative program) were polled online about their interest in the creating of a Collaborative Program in Educational Policy. Two dozen students responded affirmatively. These students included those seeking degrees in master’s and doctoral, professional and academic programs in all of TPS’ programs – Educational Administration, Higher Education, and History and Philosophy of Education.

TPS3045H, “Policy and Program Evaluation,” the proposed core course which is currently offered roughly once per year, attracts students from many OISE programs. The current (Winter 2009) course session includes students in Educational Administration, Higher Education, Curriculum Studies and Teacher Development, Adult Education, Sociology & Equity Studies as well as OISE’s Master of Teaching (MT) in Elementary and Secondary Education program and the School of Public Policy and Governance. This cross-program representation has been typical. Over the years since 2002, students from every proposed participating program have enrolled in the course. Once the Collaborative Program is established, students who are enrolled in it will have first priority in the course.

Faculty response
Faculty response has been enthusiastic. The program idea initiated with the submission of TPS’ Academic Plan in 2004. Program approval in principle was secured at a full departmental meeting in 2007. Consultations with Department Chairs and Graduate Program Coordinators across OISE throughout 2006 and 2007 yielded a sense of universal support for the program and the identification of a sizeable number of faculty across all OISE graduate programs whose interests would be served by such a program (see below). Consultations with faculty and leadership at the School of Public Policy and Governance also yielded a sense of general enthusiasm about the program.

Review of thesis topics (examples)
See Appendix A for a list of OISE thesis topics relevant to educational policy
Projected enrolments:

<table>
<thead>
<tr>
<th>Degree/Year of study</th>
<th>2010/11</th>
<th>2011/12</th>
<th>2012/13</th>
<th>2013/14</th>
<th>2014/15</th>
<th>2015/16</th>
<th>2016/17</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEd</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 1</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Year 2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Year 3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Year 4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 5</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 6</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>MA - PT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Year 2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Year 3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Year 4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>6</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>MA - FT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 1</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Year 2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Year 3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Year 4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 6</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>6</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

1 It would be visually confusing to attempt to portray estimated enrollments by participating (home) program by degree by year. The above table provides estimated total enrollments for each degree for each year. In addition it is estimated that the relative proportion of enrollments would be as follows: 20% Educational Administration; 20% Higher Education; 5% History and Philosophy of Education; 10% Adult Education and Community Development; 15% Curriculum Studies & Teacher Development; 5% Developmental Psychology and Education; 10%, Second Language Education; 15%, Sociology in Education.

2 These rows refer to students’ enrollment years. For example, for the 2011/12 year, projections are for 4 new (1st year) M.Ed. students and 2 2nd year students.
<table>
<thead>
<tr>
<th></th>
<th>EdD</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Year 2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Year 3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Year 4</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Year 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Year 6</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Year 7</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Year 8</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>PhD-Flex</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Year 2</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Year 3</td>
<td></td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Year 4</td>
<td></td>
<td></td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Year 5</td>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Year 6</td>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 7</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 8</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>9</td>
<td>14</td>
<td>18</td>
<td>22</td>
<td>25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>PhD-Reg</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Year 2</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Year 3</td>
<td></td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Year 4</td>
<td></td>
<td></td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Year 5</td>
<td></td>
<td></td>
<td>2</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Year 6</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Year 7</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>21</td>
<td>26</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Prof'l. Masters</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>6</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Academic Masters</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8</td>
<td>17</td>
<td>23</td>
<td>26</td>
<td>29</td>
<td>29</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Prof'l. Doctorate</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>11</td>
<td>17</td>
<td>22</td>
<td>27</td>
<td>30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Academic Doctorate</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>21</td>
<td>26</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Grand total</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20</td>
<td>39</td>
<td>54</td>
<td>63</td>
<td>75</td>
<td>83</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Funded cohort</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13</td>
<td>17</td>
<td>22</td>
<td>27</td>
<td>50</td>
<td>55</td>
</tr>
</tbody>
</table>

Source: Retention rates BIUtrendJan08revamped
2.4 Impact on the Departments’ and Divisions’ program of study, including impact on other divisions
The program will enhance the departments’ current programs of study by consolidating and profiling strengths that already exist.

It is anticipated that this program may enhance the departments’ current programs’ ability to attract new students. This will be seen as beneficial to some departments; all departments, and the collaborative program, will need to ensure available supervisory capacity if and as interest from prospective students results in new, strong applications for admission.

2.5 Evidence of consultation with other affected divisions
Program development activities in Winter 2006 included several discussions with the Director and lead program developer of the School of Public Policy and Governance (Mark Stabile and Carolyn Tuohy) to ensure program compatibility and minimal overlap.

Other faculty members from across the University of Toronto who have been notified about the proposed program and invited to respond with any concerns include

- Faculty of Physical Education & Health: Dean Bruce Kidd and Prof. Peter Donnelly
- Department of Economics: Chair Arthur Hosios, Prof. Michael Baker and Prof. Robert McMillan
- Department of Political Science: Chair John MacDonald
- Department of Sociology: Chair Blair Wheaton

These faculty members did not indicate any concerns, nor were any interested in considering developing working relationships with the program at this time.

2.6 Appropriateness of the name and designation of the new program
This is a graduate collaborative program. The name “Collaborative Program in Educational Policy” is a concise reflection of the program offerings in terms of courses, faculty expertise and program-related activities.

2.7 Program description and requirements, course titles/numbers, and faculty members
Master’s Level
Admission Requirements
Students interested in participating in the Collaborative Program in Educational Policy at the master’s level must apply to and be accepted by both their “home” program and the Collaborative Program in Educational Policy. Students who know they are interested in the Collaborative Program in Educational Policy at the time of their initial application to their home graduate program will indicate this on their application and indicate to referees that their letters of support will be used in application for both the home program and the Collaborative Program in Educational Policy.
In addition to corresponding to all home program requirements, the application shall include a sample of writing, no longer than three pages, that includes:

- Relevant personal and/or professional experiences, a career plan, motivation in seeking admission to the Students who develop an interest in admission to the Collaborative Program in Educational Policy
- An indication of specific courses of interest
- (For thesis students) A brief outline of proposed research project
- (For thesis students) Indication of preference of supervisor

Students who develop an interest in admission to the Collaborative Educational Policy Program after they have been admitted to their home program may also apply during their course of study. Requests from already enrolled applicants will be considered once a year at the same time as initial admission files are reviewed.

**Program Requirements**

All master’s students in the Collaborative Program will:

- Take the following core half-course: **TPS3045H, “Policy and Program Evaluation.”**
- Attend the Collaborative Program in Educational Policy Seminar Series over two consecutive sessions. Collaborative Educational Policy Seminars occur once a month. Attendance is required.
- Students are encouraged but not required to enroll in an elective half course in the area of educational policy selected from the list of electives below.
- Take the remaining courses for the fulfillment of the degree requirements of the home program.
- Students enrolled in home programs requiring a master’s research project or thesis will be required to incorporate educational policy issues in their research; a member of the Collaborative Program core faculty will serve as supervisor or committee member.

**M.Ed. Program:** The total number of courses required for graduation will equal 6, 8 or 10.

**M.A. Program:** The total number of courses required for graduation will equal 6 or 8.

*Master’s level electives*

AEC 1171H Aboriginal Education: Contemporary Policies & Programs
CTL 1816H Official Discourses and Minority Education
CTL 3000H Foundations of Bilingual & Multicultural Education
CTL 3008H Critical Pedagogy, Language & Cultural Diversity
CTL 3018H Language Planning & Policy
HDP 1211H Psychological Foundations of Early Development & Education
HDP 1241H Outcomes of Early Education & Child Care
HDP 1259H Child and Family Relationships – Implications for Education
SES 1902H Introduction to Sociological Methods in Education
SES 1903H Introduction to Sociological Theory in Education
SES 1912H Foucault & Research in Education
SES 1948H Sociology of Race & Ethnicity
SES 1951H School & Community
SES 1954H Marginality & the Politics of Resistance
SES 2942H Education & Work
TPS 1020H Teachers and Educational Change
TPS 1428H Immigration and the History of Canadian Education
TPS 1429H Ethnicity and the History of Canadian Education

Doctoral Level
Admission Requirements
Students interested in participating in the Collaborative Program in Educational Policy at the doctoral level must apply to and be accepted by both their “home” program and the Collaborative Program. Students who know they are interested in the Collaborative Program in Educational Policy at the time of their initial application to their home graduate program will indicate this on their application and indicate to referees that their letters of support will be used in application for both the home program and the Collaborative Program.

In addition to corresponding to all home program requirements, the application shall include a sample of writing, no longer than three pages, that includes:

- Relevant personal and/or professional experiences, a career plan, motivation in seeking admission to the Students who develop an interest in admission to the Collaborative Program in Educational Policy
- An indication of specific courses of interest
- A brief outline of proposed research project
- Indication of preference of supervisor

Students who develop an interest in admission to the Collaborative Program in Educational Policy after they have been admitted to their home program may also apply during their course of study. Requests from already enrolled applicants will be considered once a year at the same time as initial admission files are reviewed.

All doctoral students in the Collaborative Program will:

- Take half-course TPS3045H, “Policy and Program Evaluation,” if not already taken
- All doctoral students in the Collaborative Program will attend the Collaborative Program in Educational Policy Seminar Series over two consecutive sessions. Collaborative Educational Policy Seminars will occur once a month. Attendance is required.
Students also are encouraged but not required to consider one or more elective half courses in the area of educational policy selected from the list of electives below.

- The remaining half-courses will be those required for the fulfillment of the degree requirements of the home program.
- Students will also be required to complete a thesis which incorporates issues of educational policy. A member of the Collaborative Program core faculty will serve as supervisor or committee member.
- The total number of courses required for graduation for both the Ed.D. and Ph.D. will equal 8, depending on the requirements of the student’s home program.

**Doctoral stream electives**

- AEC 3113H Adult Education and Public Policy
- CTL 1816H Official Discourses and Minority Education
- CTL 3008H Critical Pedagogy, Language & Cultural Diversity
- CTL 3018H Language Planning & Policy
- SES 2941H Social Inequality in Education
- SES 2999H Aboriginal Peoples & Citizenship
- JSA 5147H Language, Nationalism & Postnationalism
- TPS 3018H Governing Education: A seminar on Politics
- TPS3020H Educational Change in the Post-Modern Age
- WPL 3931H Doctoral Seminar in Workplace Learning and Social Change

**Collaborative Program Core Faculty Members:**

- Department of Adult Education and Counseling Psychology
  - Nancy Jackson
  - Shahrzad Mojab
  - Karen Mundy
  - Daniel Schugarensky

- Curriculum, Teaching and Learning
  - Kathy Bickmore
  - Alister Cumming
  - Jim Cummins
  - Diane Gerin-Lajoie
  - Eunice Jang
  - Normand Labrie

- Human Development and Applied Psychology
  - Ruth Childs
  - Carl Corter
  - Katreena Scott
  - Richard Volpe
3 Planning and Budget

3.1 Resource implications
The department of Theory and Policy Studies has determined that the faculty and administrative staff complements are sufficient to ensure ongoing support for the program. Over a five year period, AIF funding provided core budget funds to increase the faculty complement and administrative staff complement for the Collaborative Program; these positions are now in the core budget. Theory & Policy Studies will provide a half-course release for the Director’s work. Graduate Assistant funding will be allocated (one position per year) to support the seminar series and related activities. The Memorandum of Agreement indicates that no other department will be asked to contribute financial support to the Collaborative Program.

Administrative costs will be borne by TPS at the departmental level, using existing resources, including the AIF resources provided by the University as stated above. Program evaluation once the program has run for three years will allow participating departments to assess program impact on enrolment expansion. If student interest in the program is high and significant enrolment expansion occurs, additional resource support may be sought from OISE or the University of Toronto for future years.

3.1.1 Staffing
The core course TPS3045 is currently taught annually as part of designated program Coordinator’s course load (she is currently a member of the program committee). The second core course for doctoral students, TPS3145, will be taught by a member of the program committee and supported by TPS. The elective courses are currently regularly offered by the designated home programs.
Details of Administrative Duties

Program Director
- Chair program meetings of all faculty and relevant staff
- Program report writing including OCGS
- Evaluation of student experience based on course evaluations and yearly student consultations
- Yearly meeting with Chairs of associated departments
- Review of individual student progress
- Coordination of course offerings and teaching assignments
- SGS and OISE yearly academic calendar updating
- Coordination of student recruitment strategy

TPS Departmental Staff
- Assistance with promotion and room booking for seminar series and other events
- Admissions and enrolment support

A program evaluation carried out once the Collaborative Program has been running for three years will determine whether existing resources are sufficient, whether new admissions must be capped to ensure program quality, or whether additional resources (such as faculty complement, course stipends or administrative support) should be sought. The Collaborative Program will be included in regular cross-TPS program coordination discussions to ensure ongoing efficiencies in terms of administrative processes.

3.1.2 Space
There are no new space requirements for this program. Participating departments already provide work/study space for thesis students. Classes will take place in rooms that are available for booking for teaching at OISE. TPS and other departments have seminar rooms which will be used for the seminar series and other events. Since all students are first admitted through home participating programs, enrolment increases would not be undertaken without participating programs’ conclusions that departmental capacity is adequate to enrolment expansion.

3.1.3 Libraries
The OISE library already contains an extensive collection on educational policy.

3.1.4 Computing facilities
No new computing facilities are required. Students will make use of their home departments’ resources as well as the computers and printers available through OISE and the University of Toronto libraries.

3.1.5 Enrolment/admissions
Enrolments may increase. OISE departments are currently in a phase of graduate enrolment expansion. If interest in admissions rises significantly as a result of the
Collaborative Program, faculty resources may be sought as part of departmental complement planning. The Collaborative Program would be subject to evolving University and OISE enrolment expansion plans. The current interest in professional degree enrolments is consistent with the profile of potential Collaborative Program students.

3.1.6. Financial aid
Students will be eligible for financial aid as per existing policies and programs.

4. Space and Facilities

4.1 Requirements for physical facilities
No new space is required.

4.2 Capital projects for approvals
There are no requirements for the construction of new space.

5. Students

5.1 Student affairs and services
Students will have access to regular facilities and services.

5.2 Student conduct and discipline
Students will be governed by regulations in place for all OISE graduate students set out by the current university regulation, both academic and non-academic.

5.3 Financial support
No special financial resources will be available to students. Students can compete for grants and financial aid available to any other graduate students.

5.4 Student registration and information systems
The usual registration and enrolment procedures will apply. An orientation session will be held for Collaborative Program students annually.
Appendix A: OISE Thesis Topics Relevant to Educational Policy, 2004-2009

Critical theory and the spectacle of CAAT program Review: A Foucadian discourse analysis (2008) TPS

Personal change and organizational passages: Transitions from leading to vice-principalship in reform climate (2004) TPS

Considering growth in teaching: Teacher perspectives on Ontario’s performance appraisal (2006) CTL

Employment facilitation programs for professional immigrants in the GTA: surveying participants opinions about programs”. (2007) CTL

Police Response to anti-terrorism policy (2006) TPS

Factors that affect the decisions of racial/ethnic minorities to enter and stay in teaching and implications for school boards’ teacher recruitment and retention (2002) SESE

Career materialism context of a mandated intervention at grade 10 level (2005) AECP

Achieving government, community and institutional goals through the measurement of performance: Accountability and performance indicators in Ontario Colleges and universities (2006) TPS

Ontario government policy on accessibility to the colleges of applied arts and technology: 1965-1995 (2003) TPS

The Revenue generation strategies of four Canadian universities: A comprehensive analysis (2005) TPS

Knowledge management as a tool for district-level instruction renewal (2005) TPS

Vivre Le Francais: An examination of a “French – Only” policy as an educational experience (2003) CTL

The intersection of policy and practice in one stand-alone vocational school (2006) TPS

Effects of policy shifts on marital relations in Central China villages (2006) SESE

Ideology, policy and the (re) production of labour market inequality: A critical analysis of access to professions and trades (2005) TPS

The role of the Ontario College of Teachers in the professionalization of teaching (2005) TPS
A two year evaluation of the impact of in-service professional development on primary students literacy outcomes (2005) HDAP


Equity, Literacy testing and marginalized youth: the social construction of “illiterate” identities (2008) CTL

The Effectiveness of orientations as an alternative to traditional hazing practices (2007) SESE

Effects of external testing on curriculum implementation (2003) CTL

Relating performance- based accountability policy to the accountability practices of school leaders (2006) TPS

Effectiveness and improvement processes in Canada’s isolated schools: The relationship between the schools implementation of core-plus process and parental involvement (2007) TPS

Pendulums and paradigms: Education Reform Ontario (2008) TPS

Implementing professional development: impact of contextual factors (2006) CTL

An exploration of teacher vulnerability in a context of large-scale government mandated secondary reform (2004) TPS

Participatory governance; the role of student trustee on Ontario school boards (2004) TPS

The identities of policy and practice: narratives of 150s female secondary school teachers in Toronto (2002) TPS

Implementing integrative anti-racist education: Negotiating conflicts and tensions utilizing experiential collaborative mentoring (2005) CTL

The Efficacy of a course management system in learning: perceptions of students and faculty at one Ontario College (2008) TPS
Teachers’ Reported understanding and implementation of a new grade 8 mathematics curriculum (2002) CTL


The decade of uncertainty: educational change in Poland: Kochan, Anna B. (2006) CTL


Participatory teacher evaluation: A vehicle for professional development (2002) CTL

Suspended in perpetuity? Teacher professional identity in a time of educational reform (2006) TPS

Situating the political in nurses’ lives: the intersection of policy, practice and career for leasbian heath advocates (2005) SESE

Teacher Evaluation Pre-service to in-service (2006) CTL

Study of performance funding of the Ontario colleges of applied arts and technology (2002) TPS

The effects of decision condition in a judgmental policy capturing exercise (2005) CTL


Distributed leadership in a comprehensive guidance and counseling program: collaboration between education and health in the context of school reform (2008) TPS

The restructuring of the welfare system in Ontario. A study in the social organization of knowledge (2002) SESE


Restructuring leadership through comprehensive school reform: the impact on teacher leadership (2005) TPS
Evaluating international adult education programs in health: A case study of the Chile – Canada primary health care training program (2003) AECP

Promoting equitable schools: The role of equity polices (2006) SESE

Immigrants’ integration seen through the prism of multiculturalism: a comparative analysis of policies and educational provisions to facilitate integration, based on the case studies of Canada and Italy (2002) CTL

From nature-cure to naturopathic medicine: the institutionalizing of naturopathic medical education in Ontario (2005) TPS

Discourse and politics of Canadian history curriculum documents used in Ontario secondary schools, 1945 – 2004 (2005) CTL

Federalism, foreign policy and the internationalization of higher education: a case study of international academic relations division, department of foreign affairs and international trade Canada (2007) TPS

Re-training in the post-industrial era: a comparison of government policy responses to widespread worker displacement in Canada and Britain (2004) AEC
UNIVERSITY OF TORONTO

Brief for the Standard Appraisal

of the

Collaborative Master’s and Doctoral Program

in

Educational Policy

Submitted to the

Ontario Council on Graduate Studies

November 2009
Table of Contents

1. Introduction and Rationale ........................................................................................................... 3
2. Objectives and Value ....................................................................................................................... 4
3. Admission Requirements ............................................................................................................... 4
4. Program Requirements ................................................................................................................... 5
5. Participation of the Home Graduate Programs ............................................................................. 8
6. Administration ............................................................................................................................... 8
7. Resource Issues ............................................................................................................................ 9
8. Registration Information/Enrollment Projections ....................................................................... 11
APPENDIX I: Program Requirements for Participating Programs ............................................... 13
APPENDIX II: Core Faculty Research Synopses ............................................................................. 20
APPENDIX III: Calendar Entry ........................................................................................................ 25
1. Introduction and Rationale

OISE is the largest faculty of education in Canada and an international leader in many educational fields. Policy research is a vital dimension of many of OISE’s academic and research programs: in K-12, post secondary and adult education policy, the relationships between policy, leadership and social diversity, the history of various policy domains, policy ethics, comparative education policy, international education activities, teacher development, curriculum, second language education, language, early childhood policy, school to work transitions, policies supporting equity and social diversity as well as assessment and measurement research, and evaluation practices relevant to policy analysis. OISE academics include seven Canada Research Chairs (CRCs) in the University of Toronto’s Public Policy cluster, and one of the University’s three Ontario Research Chairs. Educational policy expertise has been consolidated through publications (including an international handbook), conferences and consultations, further demonstrating OISE’s capacity in this domain. These kinds of activities provide an intellectually rich environment for a new collaborative program in educational policy.

Graduate programs in every one of OISE’s five departments have noted students interested in educational policy as a dimension of their academic and professional interests. These students take courses, participate in a variety of funded research projects, and complete masters and doctoral theses focused on educational policy issues. The Collaborative Program in Educational Policy would allow OISE to consolidate policy expertise across graduate programs and departments, to better profile OISE’s strengths in this area and enhance student recruitment. The theoretical and empirical analysis of educational policy development, implementation and outcomes, while addressed in some of the University of Toronto’s other programs across campus (as well as in the recently established School of Public Policy and Governance) is a definitive preoccupation of educational studies at OISE.

The program will initially be open to students in the following graduate programs:

- M.Ed., M.A., and Ph.D. in the Adult Education and Community Development program, in the Department of Adult Education and Counseling Psychology
- M.Ed., M.A., and Ph.D. in the Curriculum Studies and Teacher Development program, in the Department of Curriculum, Teaching and Learning
- M.Ed., M.A., and Ph.D. in the Second Language Education program, in the Department of Curriculum, Teaching and Learning
• M.Ed., M.A., Ed.D. and Ph.D. in the Sociology in Education program, in the Department of Sociology and Equity Studies in Studies in Education.

2. Objectives and Value

The Collaborative Program in Educational Policy will serve students interested in developing an understanding of the factors associated with educational policy development and implementation, with particular emphasis on developing theoretical and practical strategies for improving educational processes. The collaborative program’s intellectual objectives include providing students with exposure to cross-field and cross-disciplinary approaches to educational problem framing and problem solving in order to broaden the possibilities for innovative and effective policy analysis; helping students understand how to apply theoretical concepts to particular social and educational problems in particular settings; and understanding the broader social, institutional and policy contexts within which educational policy processes occur.

Annual activities including a lecture series, conferences for educators and researchers, publications and cross-specialization research initiatives will both enhance the intellectual infrastructure of the academic program and provide a basis for collaborative work. Canada Research Chairs, the Ontario Research Chair, endowed chairs and others with policy expertise in Theory and Policy Studies, across OISE, the University of Toronto and other educational institutions will be able to link their work through these program-related activities.

3. Admission Requirements

Master’s Level
Students interested in participating in the Collaborative Program in Educational Policy at the master’s level must apply to and be accepted by both their “home” program and the Collaborative Program in Educational Policy. Students who know they are interested in the Collaborative Program in Educational Policy at the time of their initial application to their home graduate program will indicate this on their application and indicate to referees that their letters of support will be used in application for both the home program and the Collaborative Program in Educational Policy.

In addition to corresponding to all home program requirements, the application shall include a sample of writing, no longer than three pages, that includes:
• Relevant personal and/or professional experiences, a career plan, motivation in seeking admission to the Collaborative Program in Educational Policy
• An indication of specific courses of interest
• (For thesis students) A brief outline of proposed research project
• (For thesis students) Indication of preference of supervisor

Students who develop an interest in admission to the Collaborative Educational Policy Program after they have been admitted to their home program may also apply during their course of study.
Requests from already enrolled applicants will be considered once a year at the same time as initial admission files are reviewed.

**Doctoral Level**
Students interested in participating in the Collaborative Program in Educational Policy at the doctoral level must apply to and be accepted by both their “home” program and the Collaborative Program. Students who know they are interested in the Collaborative Program in Educational Policy at the time of their initial application to their home graduate program will indicate this on their application and indicate to referees that their letters of support will be used in application for both the home program and the Collaborative Program.

In addition to corresponding to all home program requirements, the application shall include a sample of writing, no longer than three pages, that includes:

- Relevant personal and/or professional experiences, a career plan, motivation in seeking admission to the Collaborative Program in Educational Policy
- An indication of specific courses of interest
- A brief outline of proposed research project
- Indication of preference of supervisor

Students who develop an interest in admission to the Collaborative Program in Educational Policy after they have been admitted to their home program may also apply during their course of study. Requests from already enrolled applicants will be considered once a year at the same time as initial admission files are reviewed.

### 4. Program Requirements

**Master’s Level**
All master’s students in the Collaborative Program will:

- Take the following core half-course:

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>TPS3045</td>
<td>Policy and Program Evaluation</td>
</tr>
</tbody>
</table>

**Synopsis:**
This course helps students develop a working knowledge of educational policy processes, emphasizing implementation and consequences, toward a comprehensive understanding of policy analysis and program evaluation in practical settings. While not a “how to” course, the curriculum emphasizes the challenges, choices and possibilities available to evaluators and analysts. Major topics include problem definition; policy options; understanding policy processes at system, organization and individual actor levels; and the role of analysts and evaluators.

- Attend the Collaborative Program in Educational Policy Seminar Series over two consecutive sessions. Collaborative Educational Policy Seminars occur once a month. Attendance is required.
• Students are encouraged but not required to enroll in an elective half course in the area of educational policy selected from the list of electives below.
• Take the remaining courses for the fulfillment of the degree requirements of the home program.
• Students enrolled in home programs requiring a master’s research project or thesis will be required to incorporate educational policy issues in their research; a member of the Collaborative Program core faculty will serve as supervisor or committee member.

Master’s level electives
AEC 1171H Aboriginal Education: Contemporary Policies & Programs
CTL 1816H Official Discourses and Minority Education
CTL 3000H Foundations of Bilingual & Multicultural Education
CTL 3008H Critical Pedagogy, Language & Cultural Diversity
CTL 3018H Language Planning & Policy
HDP 1211H Psychological Foundations of Early Development & Education
HDP 1241H Outcomes of Early Education & Child Care
HDP 1259H Child and Family Relationships – Implications for Education
SES 1902H Introduction to Sociological Methods in Education
SES 1903H Introduction to Sociological Theory in Education
SES 1912H Foucault & Research in Education
SES 1948H Sociology of Race & Ethnicity
SES 1951H School & Community
SES 1954H Marginality & the Politics of Resistance
SES 2942H Education & Work
TPS 1020H Teachers and Educational Change
TPS 1428H Immigration and the History of Canadian Education
TPS 1429H Ethnicity and the History of Canadian Education
Doctoral Level
All doctoral students in the Collaborative Program will:
- Take the half-course TPS3045H, “Policy and Program Evaluation,” if not already taken
- Take the following core half-course:

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>TPS3145</td>
<td>Advanced Issues in Policy &amp; Program Evaluation</td>
</tr>
</tbody>
</table>

**Synopsis:** This course helps students develop a working knowledge of issues arising in conducting policy research and program evaluation. Topics include problem framing, use of existing evidence, project scope and scale, writing for different audiences, and the politics of policy research.

- All students in the Collaborative Program will attend the Collaborative Program in Educational Policy Seminar Series over two consecutive sessions. Collaborative Educational Policy Seminars will occur once a month. Attendance is required.
- Students also are encouraged but not required to consider one or more elective half courses in the area of educational policy selected from the list of electives below.
- The remaining half-courses will be those required for the fulfillment of the degree requirements of the home program.
- Students will also be required to complete a thesis which incorporates issues of educational policy. A member of the Collaborative Program core faculty will serve as supervisor or committee member.

**Doctoral stream electives**
AEC 3113H Adult Education and Public Policy
CTL 1816H Official Discourses and Minority Education
CTL 3008H Critical Pedagogy, Language & Cultural Diversity
CTL 3018H Language Planning & Policy
SES 2941H Social Inequality in Education
SES 2999H Aboriginal Peoples & Citizenship
JSA 5147H Language, Nationalism & Postnationalism
TPS 3018H Governing Education: A seminar on Politics
TPS3020H Educational Change in the Post-Modern Age
WPL 3931H Doctoral Seminar in Workplace Learning and Social Change

**Completion of program requirements**
All students enrolled in the collaborative program must complete the requirements of the Collaborative Program, in addition to those requirements for the degree program in their home graduate unit. The required half-course for the Collaborative Program may also be counted as an elective in students’ home programs. The collaborative Program Committee is responsible for certifying the completion of the collaborative program requirements. The home graduate unit is solely responsible for the approval of the student’s home degree requirements.
5. Participation of the Home Graduate Programs

The Collaborative Program’s core faculty members are available to students in the home program as advisors or supervisors. If a student’s program includes a thesis, it is expected that core faculty members in the student’s home department will be involved in thesis supervision. Core faculty members contribute to the Collaborative Program through teaching of the core course and participating in the delivery of seminar series and other common learning elements. Not all faculty members participate each year and, in some cases, simply may remain available to interested students. Some faculty may teach courses in the subject area of the collaborative program in the home program. The list of the collaborative program’s core faculty members is available in Appendix II. Each participating degree program contributes to the collaborative program through student enrollments, although not necessarily every year.

6. Administration

The Collaborative Program will have an approved Program Director. It also will have a Program Committee composed of a faculty representative from each participating graduate unit. The Program Committee will initiate and recommend the appointment of a new Program Coordinator to the Dean of SGS, after consultation with chairs of all five participating departments. The Dean of the School of Graduate Studies approves appointments of directors and/or program coordinators of collaborative programs. The initial term normally is three years, with subsequent terms normally up to five years. An appointment is renewable upon recommendation of the Program Committee in consultation with the chair/directors of participating graduate units, and approval of the Dean of SGS. The Program Director and the Program Committee are responsible for the approval of admissions to the collaborative program as well as the approval of the completion of collaborative program requirements, including the granting of the collaborative program designation. The Committee and Director also oversee and recommend changes to the program as required, approves advertising, provides additional student support, and develops the seminar series and other program events.

Program Director
Nina Bascia, Educational Administration, Theory and Policy Studies in Education, Three Year Term.

Program Committee Members
The Program Committee includes at least one faculty member from each participating department (AECP, CTL, HDAP, SESE, and TPS) and, if possible, a faculty member from each participating home program where there is more than one participating program in a department.
Nina Bascia (TPS)
Carl Corter (HDAP)
Alister Cumming (Second Language Education program-CTL)
Kari Dehli (SESE)
Eunice Jang (Curriculum Studies and Teacher Development program -CTL)
Sharhzad Mojab (AECP)
7. Resource Issues

All resource allocations are covered by the department of Theory and Policy Studies through faculty course releases and existing administrative staffing.

Staffing
Administrative costs (detailed below) will be borne by TPS at the departmental level, using existing resources, including those allocated to TPS by the Academic Initiative Fund (AIF). Program evaluation once the program has run for three years will allow participating departments to access program impact on enrollment. If student interest in the program is high and significant enrolment expansion occurs, additional resource will be sought from OISE or the University of Toronto for future years.

Details of Administrative Duties

Program Coordinator

a. Overall program oversight and development (in consultation with Program Committee)
   i. Chair program meetings of all faculty and relevant staff
   ii. Program report writing including OCGS
   iii. Evaluation of student experience based on course evaluations and
   iv. Yearly student consultations
   v. Yearly meeting with Chairs of associated departments
   vi. Review of individual student progress
   vii. Coordination of course offerings and teaching assignments
   viii. SGS and OISE yearly academic calendar updating
   ix. Coordination of student recruitment strategy
   x. Scheduling and chairing meetings of the Program committee twice per year

The core course TPS3045 is currently taught annually as part of Nina Bascia’s course load. Dr. Bascia is currently a member of the Program Committee. The additional core course for doctoral students will also be covered as part of Dr. Bascia’s course load.

b. Admissions
   i. Overall coordination of admissions reviews with Chairs of Admissions Committees
      in each department
   ii. Review of admissions
   iii. Recruitment and coordination of additional faculty reviewers
   iv. Additional academic unit reporting (program application levels, enrollment, yields, discontinuing, and so on)

c. Additional student support
   i. Oversight in student supervisor identification
   ii. Coordination of graduation requests with existing departmental staff
   iii. Coordination for student award/funding application with existing department staff
   iv. Development of seminar series and other program events
TPS Departmental Staff

- Assistance with promotion and room booking for seminar series and other events
- Admissions and enrolment support

A program evaluation will be carried out once the Collaborative Program has been running for three years, and will determine whether existing resources are sufficient, whether new admissions must be capped to ensure program quality, or whether additional resources (such as faculty complement course stipends or administrative support) should be sought. The Collaborative Program will be included in regular cross-TPS program coordination discussions to ensure ongoing efficiencies in terms of administrative processes.
## 8. Registration Information/Enrollment Projections

**Projected enrolments:**

<table>
<thead>
<tr>
<th>Degree/ Year of study</th>
<th>2010/11</th>
<th>2011/12</th>
<th>2012/13</th>
<th>2013/14</th>
<th>2014/15</th>
<th>2015/16</th>
<th>2016/17</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEd¹</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 1</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Year 2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Year 3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 6</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 7</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>MA - PT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Year 2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Year 3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Year 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>6</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>MA - FT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 1</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Year 2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Year 3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 5</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>6</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

1. It would be visually confusing to attempt to portray estimated enrollments by participating (home) program by degree by year. The above table provides estimated total enrollments for each degree for each year. In addition it is estimated that the relative proportion of enrollments would be as follows: 20% Educational Administration; 20% Higher Education; 5% History and Philosophy of Education; 10% Adult Education and Community Development; 15% Curriculum Studies & Teacher Development; 5% Developmental Psychology and Education; 10%, Second Language Education; 15%, Sociology in Education.

2. These rows refer to students’ enrollment years. For example, for the 2011/12 year, projections are for 4 new (1st year) M.Ed. students and 2 2nd year students.
<table>
<thead>
<tr>
<th></th>
<th>Ed.D.</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>1 1 1 1 1 1 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 2</td>
<td>1 1 1 1 1 1 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 3</td>
<td>1 1 1 1 1 1 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 4</td>
<td>1 1 1 1 1 1 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 5</td>
<td>1 1 1 1 1 1 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 6</td>
<td>1 1 1 1 1 1 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 7</td>
<td>1 1 1 1 1 1 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 8</td>
<td>1 1 1 1 1 1 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1 2 3 4 5 5 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>PhD-Flex</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>4 5 5 5 5 5 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 2</td>
<td>4 5 5 5 5 5 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 3</td>
<td>4 5 5 5 5 5 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 4</td>
<td>4 5 5 5 5 5 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 5</td>
<td>2 3 3 3 3 3 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 6</td>
<td>2 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4 9 14 18 22 25 28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>PhD-Reg</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>5 5 5 5 5 5 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 2</td>
<td>5 5 5 5 5 5 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 3</td>
<td>5 5 5 5 5 5 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 4</td>
<td>4 4 4 4 4 4 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 5</td>
<td>2 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>5 10 15 20 21 26 31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Prof’l. Masters</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 6 7 7 7 7 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Academic Masters</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8 17 23 26 29 29 29</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Prof’l. Doctorate</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 11 17 22 27 30 33</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Academic Doctorate</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 10 15 20 21 26 31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Grand total</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20 39 54 63 75 83 92</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Funded cohort</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13 17 22 27 50 55 60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Retention rates BIUtrendJan08revamped
APPENDIX I
APPRAISAL BRIEF
COLLABORATIVE DEGREE PROGRAM IN
EDUCATIONAL POLICY

RELATIONSHIP BETWEEN COLLABORATIVE PROGRAM REQUIREMENTS AND
DEGREE PROGRAM REQUIREMENTS FOR PARTICIPATING PROGRAMS

In all programs requiring a thesis or major research paper, the topic should be in the area of educational policy

DEPARTMENT OF THEORY AND POLICY STUDIES IN EDUCATION

M.Ed. in Educational Administration
Home Program Requirements:
3 (1.5FTE) required courses
5 other elective courses plus a Major Research Paper (MRP) (Option II); OR
3 other elective courses plus a thesis (Option III);

OR

4 (2.0FTE) required courses
7 (3.5FTE) other elective courses (Option IV)

Collaborative Program in Educational Policy Requirements:
The collaborative program core course (.5FTE) may be counted as one of the electives. No additional courses are required. In programs requiring a thesis or MRP, the topic should be in the area of educational policy.

M.A. in Educational Administration
Home Program Requirements:
3 (1.5FTE) required courses
5 (2.5) elective courses plus a thesis

Collaborative Program in Educational Policy Requirements:
The collaborative program core course (.5FTE) may be counted as one of the electives. No additional courses are required. In programs requiring a thesis or MRP, the topic should be in the area of educational policy.

Ed.D. in Educational Administration
Home Program Requirements:
4 (2.0FTE) required courses
4 (2.5) elective courses plus a comprehensive exam and a thesis
Collaborative Program in Educational Policy Requirements:
Two collaborative program core courses (1.0 FTE) may be counted as two of the electives. No additional courses are required. The thesis topic should be in the area of educational policy.

Ph.D. in Educational Administration
Home Program Requirements:
3 (1.5FTE) required courses
3 (1.5) elective courses plus a comprehensive exam and a thesis

Collaborative Program in Educational Policy Requirements:
Two collaborative program core courses (1.0 FTE) may be counted as two of the electives. No additional courses are required. The thesis topic should be in the area of educational policy.

M.Ed. in Higher Education
Home Program Requirements:
1 (1.0FTE) required course
8 (4.0) required courses plus a comprehensive exam (Option I);

OR

1 (1.0FTE) required course
6 (3.0) elective courses plus a research project (MRP) and a comprehensive exam (Option II)

Collaborative Program in Educational Policy Requirements:
The collaborative program core course (.5FTE) may be counted as one of the electives. No additional courses are required. In programs requiring a thesis or MRP, the topic should be in the area of educational policy.

M.A. in Higher Education
Home Program Requirements:
1 (1.0FTE) required course
6 (3.0 FTE) elective courses plus a thesis and a comprehensive exam

Collaborative Program in Educational Policy Requirements:
The collaborative program core course (.5FTE) may be counted as one of the electives. No additional courses are required. In programs requiring a thesis or MRP, the topic should be in the area of educational policy.

Ed.D. in Higher Education
Home Program Requirements:
2 (1.5FTE) required courses
5 (2.5FTE) elective courses plus a thesis, a comprehensive exam and a doctoral specialization exam

**Collaborative Program in Educational Policy Requirements:**
Two collaborative program core courses (1.0 FTE) may be counted as two of the electives. No additional courses are required. The thesis topic should be in the area of educational policy.

**Ph.D. in Higher Education**

*Home Program Requirements:*
2 (1.5FTE) required courses
3 (1.5FTE) elective courses plus a thesis, a comprehensive exam and a Doctoral specialization exam

**Collaborative Program in Educational Policy Requirements:**
Two collaborative program core courses (1.0 FTE) may be counted as two of the electives. No additional courses are required. The thesis topic should be in the area of educational policy.

**M.Ed. in History and Philosophy of Education**

*Home Program Requirements:*
1 (.5FTE) elective course
7 (3.5FTE) elective courses plus a Major Research Paper (Option II),

OR

9 (4.5FTE) elective courses (Option IV)

**Collaborative Program in Educational Policy Requirements:**
The collaborative program core course (.5FTE) may be counted as one of the electives. No additional courses are required. In programs requiring a thesis or MRP, the topic should be in the area of educational policy.

**M.A. in History and Philosophy of Education**

*Home Program Requirements:*
2 (1.0FTE) required courses
4 (2.0FTE) elective courses plus a thesis

**Collaborative Program in Educational Policy Requirements:**
The collaborative program core course (.5FTE) may be counted as one of the electives. No additional courses are required. In programs requiring a thesis or MRP, the topic should be in the area of educational policy.

**Ed.D. in History and Philosophy of Education**

*Home Program Requirements:*
2 (1.0FTE) required courses
6 (3.0FTE) elective courses plus a comprehensive exam and a thesis

**Collaborative Program in Educational Policy Requirements:**
Two collaborative program core courses (1.0 FTE) may be counted as two of the electives. No additional courses are required. The thesis topic should be in the area of educational policy.

**Ph.D. in History and Philosophy of Education**

*Home Program Requirements:*
1 (.5FTE) required course
5 (2.5FTE) elective courses plus a comprehensive exam and a thesis

**Collaborative Program in Educational Policy Requirements:**
Two collaborative program core courses (1.0 FTE) may be counted as two of the electives. No additional courses are required. The thesis topic should be in the area of educational policy.

**DEPARTMENT OF ADULT EDUCATION AND COUNSELING PSYCHOLOGY**

**M.Ed. in Adult Education and Community Development**

*Home Program Requirements:*
1 (.5FTE) required course
9 (4.5) elective courses

**Collaborative Program in Educational Policy Requirements:**
The collaborative program core course (.5FTE) may be counted as one of the electives. No additional courses are required. In programs requiring a thesis or MRP, the topic should be in the area of educational policy.

**M.A. in Adult Education and Community Development**

*Home Program Requirements:*
2 (1.0FTE) required courses
4 elective courses plus a thesis

**Collaborative Program in Educational Policy Requirements:**
The collaborative program core course (.5FTE) may be counted as one of the electives. No additional courses are required. In programs requiring a thesis or MRP, the topic should be in the area of educational policy.

**Ph.D. in Adult Education and Community Development**

*Home Program Requirements:*
1 (.5FTE) required course
5 (2.5FTE) elective courses plus a thesis and comprehensive exam

**Collaborative Program in Educational Policy Requirements:**
Two collaborative program core courses (1.0 FTE) may be counted as two of the electives. No additional courses are required. The thesis topic should be in the area of educational policy.
DEPARTMENT OF CURRICULUM, TEACHING AND LEARNING

**M.Ed. in Curriculum Studies and Teacher Development**
*Home Program Requirements:*
1 (.5FTE) required course
9 (4.5FTE) elective courses

*Collaborative Program in Educational Policy Requirements:*
The collaborative program core course (.5FTE) may be counted as one of the electives. No additional courses are required. In programs requiring a thesis or MRP, the topic should be in the area of educational policy.

**M.A. in Curriculum Studies and Teacher Development**
*Home Program Requirements:*
2 (1.0FTE) required courses
6 (4.0FTE) elective courses

*Collaborative Program in Educational Policy Requirements:*
The collaborative program core course (.5FTE) may be counted as one of the electives. No additional courses are required. In programs requiring a thesis or MRP, the topic should be in the area of educational policy.

**Ph.D. in Curriculum Studies and Teacher Development**
*Home Program Requirements:*
2 (1.0FTE) required courses
4 (2.0FTE) elective courses plus a thesis and a comprehensive exam

*Collaborative Program in Educational Policy Requirements:*
Two collaborative program core courses (1.0 FTE) may be counted as two of the electives. No additional courses are required. The thesis topic should be in the area of educational policy.

**M.Ed. in Second Language Education**
*Home Program Requirements:*
2 (1.0FTE) required courses
8 (4.0FTE) elective courses

*Collaborative Program in Educational Policy Requirements:*
The collaborative program core course (.5FTE) may be counted as one of the electives. No additional courses are required. In programs requiring a thesis or MRP, the topic should be in the area of the collaborative program.

**M.A. in Second Language Education**
*Home Program Requirements:*
2 (1.0FTE) required courses
6 (3.0FTE) elective courses plus a thesis
Collaborative Program in Educational Policy Requirements:
The collaborative program core course (.5FTE) may be counted as one of the electives. No additional courses are required. In programs requiring a thesis or MRP, the topic should be in the area of educational policy.

Ph.D. in Second Language Education
Home Program Requirements:
2 (1.0FTE) required courses
4 (2.0FTE) elective courses plus a comprehensive exam and a thesis

Collaborative Program in Educational Policy Requirements:
Two collaborative program core courses (1.0 FTE) may be counted as two of the electives. No additional courses are required. The thesis topic should be in the area of educational policy.

DEPARTMENT OF HUMAN DEVELOPMENT AND APPLIED PSYCHOLOGY

M.Ed. in Developmental Psychology and Education
Home Program Requirements:
2 (1.0FTE) required courses
8 (4.0FTE) elective courses

Collaborative Program in Educational Policy Requirements:
The collaborative program core course (.5FTE) may be counted as one of the electives. No additional courses are required. In programs requiring a thesis or MRP, the topic should be in the area of educational policy.

M.A. in Developmental Psychology and Education
Home Program Requirements:
3 (1.5FTE) required courses
3 (1.5FTE) elective courses plus a thesis

Collaborative Program in Educational Policy Requirements:
The collaborative program core course (.5FTE) may be counted as one of the electives. No additional courses are required. In programs requiring a thesis or MRP, the topic should be in the area of educational policy.

Ph.D. in Developmental Psychology and Education
Home Program Requirements:
2 (1.0FTE) required courses
4 (2.0FTE) elective courses plus a comprehensive exam and a thesis

Collaborative Program in Educational Policy Requirements:
Two collaborative program core courses (1.0 FTE) may be counted as two of the electives. No additional courses are required. The thesis topic should be in the area of educational policy.
DEPARTMENT OF SOCIOLOGY AND EQUITY STUDIES IN EDUCATION

**M.Ed. in Sociology in Education**
*Home Program Requirements:*
10 (5.0FTE) elective courses (Option IV),

OR

8 (4.0FTE) elective courses plus a thesis (Option II),

OR

6 (3.0FTE) elective courses plus a Masters Research Paper (Option III)

*Collaborative Program in Educational Policy Requirements:*
The collaborative program core course (.5FTE) may be counted as one of the electives. No additional courses are required. In programs requiring a thesis or MRP, the topic should be in the area of educational policy.

**M.A. in Sociology in Education**
*Home Program Requirements:*
6 (3.0FTE) elective courses plus a thesis

*Collaborative Program in Educational Policy Requirements:*
The collaborative program core course (.5FTE) may be counted as one of the electives. No additional courses are required. In programs requiring a thesis or MRP, the topic should be in the area of educational policy.

**Ed.D. in Sociology in Education**
*Home Program Requirements:*
1 (.5FTE) required course
7 (3.5FTE) elective courses plus a thesis

*Collaborative Program in Educational Policy Requirements:*
Two collaborative program core courses (1.0 FTE) may be counted as two of the electives. No additional courses are required. The thesis topic should be in the area of educational policy.

**Ph.D. in Sociology in Education**
*Home Program Requirements:*
6 (3.0FTE) elective courses plus a comprehensive exam and a thesis

*Collaborative Program in Educational Policy Requirements:*
Two collaborative program core courses (1.0 FTE) may be counted as two of the electives. No additional courses are required. The thesis topic should be in the area of educational policy.
APPENDIX II

APPRAISAL BRIEF FOR THE
COLLABORATIVE M.Ed./M.A./Ed.D./Ph.D PROGRAM IN
EDUCATIONAL POLICY

CORE FACULTY RESEARCH SYNOPSES

The following is a list of the collaborative program’s core faculty:

Department of Adult Education and Counseling Psychology: Adult Education and Community Development Program

Nancy Jackson
2001 Jackson, N. Writing up people at work: Investigations of workplace literacy. Literacy and numeracy studies, (Australia) 10 (1-2),

Shahrzad Mojab

Karen Mundy

Daniel Schugarensky

Curriculum, Teaching and Learning: Curriculum Studies and Teacher Development Program (CSTD) and Second Language Education Program (SLE)

Kathy Bickmore (CSTD)
Alister Cumming (SLE)

Jim Cummins (SLE)

Diane Gerin-Lajoie (CSTD)

Eunice Jang (CSTD)

Normand Labrie (SLE)

Human Development and Applied Psychology: Developmental Psychology and Education Program

Ruth Childs

**Carl Corter**


**Katreena Scott**


**Rick Volpe**


**Sociology and Equity Studies in Education: Sociology in Education Program**

**Kari Dehli**


**Diane Farmer**

David Livingstone

Peter Sawchuk

Theory and Policy Studies in Education: Educational Administration (EA), Higher Education (HE), and History and Philosophy of Education (H&P) Programs

Nina Bascia (EA)

Joseph Flessa (EA)

Reva Joshee (EA)
Dan Lang (HE)

Ken Leithwood (EA)

Ben Levin (EA)

Jamie-Lynn Magnusson (HE)

Blair Mascall (EA)

John Portelli (EA, H&P)
APPENDIX III

CALENDAR ENTRY

Collaborative Program in Educational Policy

Lead Faculty
Ontario Institute for Studies in Education (OISE)

Participating Degree Programs
• Adult Education and Community Development program, M.Ed., M.A., and Ph.D.
• Curriculum Studies and Teacher Development program, M.Ed., M.A., and Ph.D.
• Developmental Psychology and Education M.Ed., M.A., and Ph.D.
• Educational Administration, M.Ed., M.A., Ed.D. and Ph.D.
• Higher Education program, M.Ed., M.A., Ed.D. and Ph.D.
• History and Philosophy program, M.Ed., M.A., Ed.D. and Ph.D.
• Second Language Education program, M.Ed., M.A., and Ph.D.
• Sociology in Education program, M.Ed., M.A., Ed.D. and Ph.D.

Overview
The Collaborative Program in Educational Policy serves students interested in developing an understanding of the factors associated with educational policy development and implementation, with particular emphasis on developing theoretical and practical strategies for improving educational processes. The Collaborative Program’s intellectual objectives include providing students with exposure to cross-field and cross-disciplinary approaches to educational problem framing and problem solving in order to broaden the possibilities for innovative and effective policy analysis; helping students understand how to apply theoretical concepts to particular social and educational problems in particular settings; and understanding the broader social, institutional and policy contexts within which educational policy processes occur. Annual activities including a lecture series, conferences for educators and researchers, publications and cross-specialization research initiatives both enhance the intellectual infrastructure of the academic program and provide a basis for collaborative work. Canada Research Chairs, the Ontario Research Chair, endowed chairs and others with policy expertise in TPS, across OISE, the University of Toronto and other educational institutions link their work through these program-related activities.
Upon successful completion of the degree requirements of the home department and the Collaborative Program, students receive the notation “Completed Collaborative Program in Educational Policy” on their transcript.

Contact and Address
Web: TBA
e-mail: TBA
Telephone: 416 978-1203
Master’s Level
Admission Requirements
Students interested in participating in the Collaborative Program in Educational Policy at the master’s level must apply to and be accepted by both their “home” program and the Collaborative Program in Educational Policy. Students who know they are interested in the Collaborative Program in Educational Policy at the time of their initial application to their home graduate program will indicate this on their application and indicate to referees that their letters of support will be used in application for both the home program and the Collaborative Program in Educational Policy.

In addition to corresponding to all home program requirements, the application shall include a sample of writing, no longer than three pages, that includes:
• Relevant personal and/or professional experiences, a career plan, motivation in seeking admission to the Students who develop an interest in admission to the Collaborative Program in Educational Policy
• An indication of specific courses of interest
• (For thesis students) A brief outline of proposed research project
• (For thesis students) Indication of preference of supervisor

Students who develop an interest in admission to the Collaborative Educational Policy Program after they have been admitted to their home program may also apply during their course of study. Requests from already enrolled applicants will be considered once a year at the same time as initial admission files are reviewed.

Program Requirements
All master’s students in the Collaborative Program will:
• Take the following core half-course: TPS3045H, “Policy and Program Evaluation.”
• Attend the Collaborative Program in Educational Policy Seminar Series over two consecutive sessions. Collaborative Educational Policy Seminars occur once a month. Attendance is required.
• Students are encouraged but not required to enroll in an elective half course in the area of educational policy selected from the list of electives below.
• Take the remaining courses for the fulfillment of the degree requirements of the home program.
• Students enrolled in home programs requiring a master’s research project or thesis will be required to incorporate educational policy issues in their research; a member of the Collaborative Program core faculty will serve as supervisor or committee member.
• M.Ed. Program: The total number of courses required for graduation will equal 6, 8 or 10.
• M.A. Program: The total number of courses required for graduation will equal 6 or 8.

Master’s level electives
AEC 1171H Aboriginal Education: Contemporary Policies & Programs
CTL 1816H Official Discourses and Minority Education
CTL 3000H Foundations of Bilingual & Multicultural Education
CTL 3008H Critical Pedagogy, Language & Cultural Diversity
CTL 3018H Language Planning & Policy
HDP 1211H Psychological Foundations of Early Development & Education
HDP 1241H Outcomes of Early Education & Child Care
HDP 1259H Child and Family Relationships – Implications for Education
SES 1902H Introduction to Sociological Methods in Education
SES 1903H Introduction to Sociological Theory in Education
SES 1912H Foucault & Research in Education
SES 1948H Sociology of Race & Ethnicity
SES 1951H School & Community
SES 1954H Marginality & the Politics of Resistance
SES 2942H Education & Work
TPS 1020H Teachers and Educational Change
TPS 1428H Immigration and the History of Canadian Education
TPS 1429H Ethnicity and the History of Canadian Education

Doctoral Level
Admission Requirements
Students interested in participating in the Collaborative Program in Educational Policy at the doctoral level must apply to and be accepted by both their “home” program and the Collaborative Program. Students who know they are interested in the Collaborative Program in Educational Policy at the time of their initial application to their home graduate program will indicate this on their application and indicate to referees that their letters of support will be used in application for both the home program and the Collaborative Program.

In addition to corresponding to all home program requirements, the application shall include a sample of writing, no longer than three pages, that includes:
• Relevant personal and/or professional experiences, a career plan, motivation in seeking admission to the Students who develop an interest in admission to the Collaborative Program in Educational Policy
• An indication of specific courses of interest
• A brief outline of proposed research project
• Indication of preference of supervisor
Students who develop an interest in admission to the Collaborative Program in Educational Policy after they have been admitted to their home program may also apply during their course of study. Requests from already enrolled applicants will be considered once a year at the same time as initial admission files are reviewed.

Program Requirements
All doctoral students in the Collaborative Program will:
- Take the following core half-course: TPS3045H, “Policy and Program Evaluation,” If not already taken.
- Take the following core half-course: TPS3145, “Advanced Issues in Educational Policy Analysis and Program Evaluation.”
- All students in the Collaborative Program will attend the Collaborative Program in Educational Policy Seminar Series over two consecutive sessions. Collaborative Educational Policy Seminars will occur once a month. Attendance is required.
- Students also are encouraged but not required to consider one or more elective half courses in the area of educational policy selected from the list of electives below.
- The remaining half-courses will be those required for the fulfillment of the degree requirements of the home program.
- Students will also be required to complete a thesis which incorporates issues of educational policy. A member of the Collaborative Program core faculty will serve as supervisor or committee member.
- The total number of courses required for graduation for both the Ed.D. and Ph.D. will equal 8, depending on the requirements of the student’s home program.

Doctoral stream electives
AEC 3113H Adult Education and Public Policy
CTL 1816H Official Discourses and Minority Education
CTL 3008H Critical Pedagogy, Language & Cultural Diversity
CTL 3018H Language Planning & Policy
SES 2941H Social Inequality in Education
SES 2999H Aboriginal Peoples & Citizenship
JSA 5147H Language, Nationalism & Postnationalism
TPS 3018H Governing Education: A seminar on Politics
TPS3020H Educational Change in the Post-Modern Age
WPL 3931H Doctoral Seminar in Workplace Learning and Social Change
APPENDIX III

CALENDAR ENTRY

Collaborative Program in Educational Policy

Lead Faculty
Ontario Institute for Studies in Education (OISE)

Participating Degree Programs
- Adult Education and Community Development program, M.Ed., M.A., and Ph.D.
- Curriculum Studies and Teacher Development program, M.Ed., M.A., and Ph.D.
- Developmental Psychology and Education M.Ed., M.A., and Ph.D.
- Educational Administration, M.Ed., M.A., Ed.D. and Ph.D.
- History and Philosophy program, M.Ed., M.A., Ed.D. and Ph.D.
- Second Language Education program, M.Ed., M.A., and Ph.D.
- Sociology in Education program, M.Ed., M.A., Ed.D. and Ph.D.

Overview
The Collaborative Program in Educational Policy serves students interested in developing an understanding of the factors associated with educational policy development and implementation, with particular emphasis on developing theoretical and practical strategies for improving educational processes. The Collaborative Program’s intellectual objectives include providing students with exposure to cross-field and cross-disciplinary approaches to educational problem framing and problem solving in order to broaden the possibilities for innovative and effective policy analysis; helping students understand how to apply theoretical concepts to particular social and educational problems in particular settings; and understanding the broader social, institutional and policy contexts within which educational policy processes occur. Annual activities including a lecture series, conferences for educators and researchers, publications and cross-specialization research initiatives both enhance the intellectual infrastructure of the academic program and provide a basis for collaborative work. Canada Research Chairs, the Ontario Research Chair, endowed chairs and others with policy expertise in TPS, across OISE, the University of Toronto and other educational institutions link their work through these program-related activities.

Upon successful completion of the degree requirements of the home department and the Collaborative Program, students receive the notation “Completed Collaborative Program in Educational Policy” on their transcript.

Contact and Address
Web: TBA
e-mail: TBA
Telephone: 416 978-1203

Program Director (proposed):
Nina Bascia
Professor
Department of Theory and Policy Studies in Education
Ontario institute for Studies in Education
University of Toronto
252 Bloor Street West, 6-119
Toronto, Ontario M5S 1V6
Tel: 416/978-1159
FAX: 416/926-4741

Master’s Level
Admission Requirements
Students interested in participating in the Collaborative Program in Educational Policy at the master’s level must apply to and be accepted by both their “home” program and the Collaborative Program in Educational Policy. Students who know they are interested in the Collaborative Program in Educational Policy at the time of their initial application to their home graduate program will indicate this on their application and indicate to referees that their letters of support will be used in application for both the home program and the Collaborative Program in Educational Policy.

In addition to corresponding to all home program requirements, the application shall include a sample of writing, no longer than three pages, that includes:

- Relevant personal and/or professional experiences, a career plan, motivation in seeking admission to the Students who develop an interest in admission to the Collaborative Program in Educational Policy
- An indication of specific courses of interest
- (For thesis students) A brief outline of proposed research project
- (For thesis students) Indication of preference of supervisor

Students who develop an interest in admission to the Collaborative Educational Policy Program after they have been admitted to their home program may also apply during their course of study. Requests from already enrolled applicants will be considered once a year at the same time as initial admission files are reviewed.

Program Requirements
All master’s students in the Collaborative Program will:

- Take the following core half-course: TPS3045H, “Policy and Program Evaluation.”
- Attend the Collaborative Program in Educational Policy Seminar Series over two consecutive sessions. Collaborative Educational Policy Seminars occur once a month. Attendance is required.
• Students are encouraged but not required to enroll in an elective half course in the area of educational policy selected from the list of electives below.
• Take the remaining courses for the fulfillment of the degree requirements of the home program.
• Students enrolled in home programs requiring a master’s research project or thesis will be required to incorporate educational policy issues in their research; a member of the Collaborative Program core faculty will serve as supervisor or committee member.
• **M.Ed. Program:** The total number of courses required for graduation will equal 6, 8 or 10.
• **M.A. Program:** The total number of courses required for graduation will equal 6 or 8.

*Master’s level electives*

AEC 1171H Aboriginal Education: Contemporary Policies & Programs  
CTL 1816H Official Discourses and Minority Education  
CTL 3000H Foundations of Bilingual & Multicultural Education  
CTL 3008H Critical Pedagogy, Language & Cultural Diversity  
CTL 3018H Language Planning & Policy  
HDP 1211H Psychological Foundations of Early Development & Education  
HDP 1241H Outcomes of Early Education & Child Care  
HDP 1259H Child and Family Relationships – Implications for Education  
SES 1902H Introduction to Sociological Methods in Education  
SES 1903H Introduction to Sociological Theory in Education  
SES 1912H Foucault & Research in Education  
SES 1948H Sociology of Race & Ethnicity  
SES 1951H School & Community  
SES 1954H Marginality & the Politics of Resistance  
SES 2942H Education & Work  
TPS 1020H Teachers and Educational Change  
TPS 1428H Immigration and the History of Canadian Education  
TPS 1429H Ethnicity and the History of Canadian Education

*Doctoral Level*  
**Admission Requirements**  
Students interested in participating in the Collaborative Program in Educational Policy at the doctoral level must apply to and be accepted by both their “home” program and the Collaborative Program. Students who know they are interested in the Collaborative Program in Educational Policy at the time of their initial application to their home graduate program will indicate this on their application and indicate to referees that their letters of support will be used in application for both the home program and the Collaborative Program.

In addition to corresponding to all home program requirements, the application shall include a sample of writing, no longer than three pages, that includes:

• Relevant personal and/or professional experiences, a career plan, motivation in seeking admission to the Students who develop an interest in admission to the Collaborative Program in Educational Policy
• An indication of specific courses of interest
• A brief outline of proposed research project
• Indication of preference of supervisor

Students who develop an interest in admission to the Collaborative Program in Educational Policy after they have been admitted to their home program may also apply during their course of study. Requests from already enrolled applicants will be considered once a year at the same time as initial admission files are reviewed.

Program Requirements
All doctoral students in the Collaborative Program will:
• Take the following core half-course: **TPS3045H, “Policy and Program Evaluation,” If not already taken.**
• **Take the following core half-course: TPS3145, “Advanced Issues in Educational Policy Analysis and Program Evaluation.”**
• All students in the Collaborative Program will attend the Collaborative Program in Educational Policy Seminar Series over two consecutive sessions. Collaborative Educational Policy Seminars will occur once a month. Attendance is required.
• Students also are encouraged but not required to consider one or more elective half courses in the area of educational policy selected from the list of electives below.
• The remaining half-courses will be those required for the fulfillment of the degree requirements of the home program.
• Students will also be required to complete a thesis which incorporates issues of educational policy. A member of the Collaborative Program core faculty will serve as supervisor or committee member.
• The total number of courses required for graduation for both the Ed.D. and Ph.D. will equal 8, depending on the requirements of the student’s home program.

Doctoral stream electives
AEC 3113H Adult Education and Public Policy
CTL 1816H Official Discourses and Minority Education
CTL 3008H Critical Pedagogy, Language & Cultural Diversity
CTL 3018H Language Planning & Policy
SES 2941H Social Inequality in Education
SES 2999H Aboriginal Peoples & Citizenship
JSA 5147H Language, Nationalism & Postnationalism
TPS 3018H Governing Education: A seminar on Politics
TPS3020H Educational Change in the Post-Modern Age
WPL 3931H Doctoral Seminar in Workplace Learning and Social Change
MOTION
Graduate Education Council
Tuesday, January 19, 2010

ITEM 8

Proposal to **cease admission to and close** the following Collaborative Program:
**Collaborative master’s and doctoral program in Developmental Science**
Lead Faculty: Ontario Institute for Studies in Education (OISE)

**MOTION**

**THAT** Graduate Education Council approve the proposal of the Ontario Institute for Studies in Education (OISE) to cease admissions to the Collaborative master’s and doctoral program in Developmental Science, effective immediately, and to close the program when there are no more students registered.

See attached documents:
- *Governance Form A*

**Prior Approvals and Discussion**

There are 14 students currently registered in the program, but they are expected to graduate by May 2010.

The proposal was approved by the HDAP Executive Committee on February 23, 2009. It was approved by the OISE Graduate Education Committee on October 9, 2009 and by the OISE Faculty Council on December 16, 2009; no substantive discussion arose at the meeting.

**Further Governance**

GEC approval is final. It will be sent for information to the Academic Policy and Programs Committee of Academic Board in SGS’s annual report. It will also be sent to OCGS for information.
Governance Form A: General
2009-2010

Faculty Affiliation:
Ontario Institute for Studies in Education (OISE)

Name of Graduate Unit:
N/A as is a collaborative program

Graduate Program/s involved in proposal, if any:
Collaborative Program in Developmental Science

Department of Psychology, MA/PhD
Department of Human Development and Applied Psychology (HDAP), OISE/UT MA/PhD

Brief Summary of Proposed Change:
The Collaborative Program in Developmental Science will cease admissions effective immediately and will close when there are no more students registered in it.

Rationale:
There is not enough interest or faculty support to make this a viable program. The program has not been able to deliver on its commitment to cross-departmental activities such as a colloquium series. The two content-based courses listed under the CP will continue to be offered by HDAP as regular graduate courses: HDP 1233 and HDP 1249 (formerly JDS 1233 and JDS 1249). JDS 3000 will be dropped.

There will be no major impact on students either in Psychology or in HDAP. Students will still be encouraged to enroll in courses in both departments. There are currently 14 students in the collaborative program. All 14 students are expected to graduate by May 2015.

Prior Approvals/Actions and Comments:
DPE Developmental Psychology and Education Program – February 23, 2009
HDAP Executive Committee – February 23, 2009
Psychology Department approval confirmed – September 2, 2009 by Professor Charles Helwig (see attached email)
GECO – October 9, 2009

Approval has been obtained from all faculty from both departments directly involved in the Collaborative Program. The issue has been discussed and there were no strong objections. The Chairs of both departments have approved the change in principle.

Some graduate students were approached by individual faculty members with whom they worked. Since they did not receive much value from the CP, these students were not opposed to the prospect of closing it.

Proposed Effective Date:
Immediately to cease admissions and close when no more students are registered in it.
Students are currently enrolled in the program but are expected to graduate by May 2010.

Financial and/or Planning Implications:
There are no financial implications.

Chair/Director Name and Contact Information:
Ester Geva, Chair, Human Development and Applied Psychology, egeva@oise.utoronto.ca, 416 978 0916
Marc Lewis, acting head of CP in Developmental Science, HDAP (mlewis@oise.utoronto.ca, 416 978 0938
Jenny Jenkins, member of steering committee, HDAP (jenny.jenkins@utoronto.ca, 416 978 0939
Romin Tafarodi, member, Dept of Psychology (tafarodi@psych.utoronto.ca, 416 946 3024
Charles Helwig, member, Dept of Psychology (helwig@psych.utoronto.ca, 416 978 7609

Faculty Dean Name and Contact Information:
(Faculty Vice-Dean, Graduate Studies, or other Faculty Dean’s Designate)
Lana Stermac, Associate Dean, Research and Graduate Studies, OISE
lstermac@oise.utoronto.ca
416-978-1117

Date:
September 10, 2009
MOTION
Graduate Education Council
Tuesday, January 19, 2010

ITEM 9

Proposal to change the name of the following program:
From: Clinical Biomedical Engineering, MHSc
To: Clinical Engineering, MHSc
Institute of Biomaterials & Biomedical Engineering (IBBME), Faculty of Applied Science & Engineering

MOTION
THAT Graduate Education Council approve the proposal of the Faculty of Applied Science and Engineering to change the name of the Clinical Biomedical Engineering program to Clinical Engineering, leaving the degree name, Master of Health Science (MHSc), unchanged. This change is effective September 2010.

See attached documents:
• SGS Governance Form A

Prior Approvals and Discussion
The proposal was approved by the Engineering Graduate Education and Research Committee on December 7, 2009.

Further Governance
GEC approval is the final University of Toronto approval. It will be sent for information to the Academic Policy and Programs Committee of Academic Board in SGS’s annual report. The proposal will be submitted to OCGS for approval.
Faculty Affiliation:
Faculty of Applied Science & Engineering

Name of Graduate Unit:  Institute of Biomaterials and Biomedical Engineering

Graduate Program/s involved in proposal, if any:  Master of Health Science in Clinical Biomedical Engineering

Brief Summary of Proposed Change:
The name of the program ought to be changed from "Clinical Biomedical Engineering" to “Clinical Engineering”.

Rationale:
The field of study in question is internationally known as “Clinical Engineering” rather than “Clinical Biomedical Engineering”. The original nomenclature may have arisen (some 30 years ago) due to the infancy of the field and the need to associate it with "biomedical engineering”. This association is no longer necessary as clinical engineering has matured into a certified engineering discipline and its relationship with the “biomedical” field is understood. The name change does not impact program delivery or content. Below, we outline some of the key reasons why this change is necessary.

a) Graduate recruitment - The antiquated program name may negatively impact our ongoing recruitment initiatives as it has caused confusion among prospective graduate students. Time after time, we need to clarify to prospective students that we are offering a program in clinical engineering (the field), rather than something else.
b) Employment prospects for alumni – We recently have had past students lamenting that the words “clinical engineering” were not on their transcripts/parchment as the degree title was not in line with posted jobs in hospitals and industry.
c) General popularity of the term – A Google search of “Clinical Biomedical Engineering” yields only 2,280 hits, many of which are actually instances of the aggregate term “Clinical/Biomedical” whereas “Clinical Engineering” yields 176,000 hits.
d) Key textbooks and handbooks in the field use the term “Clinical Engineering”. For example:

e) Key academic journals in the field also use the term “Clinical Engineering”.
   a. Journal of Clinical Engineering, Lippincott Williams & Wilkins
   b. Clinical Engineering, Association for the Advancement of Medical Instrumentation
f) The professional certification in the field is entitled “CCE”, i.e., Certified Clinical Engineer and the governing body also uses this name, i.e., American College of Clinical Engineering. Due to the growing popularity of the field, the Canadian certification is being resurrected this fall and will also use the “CCE” nomenclature.

g) Research literature also uses the term “Clinical Engineering”. A Pubmed search of “Clinical Engineering” yields 1067 hits, whereas “Clinical Biomedical Engineering” returned only 1 article.

h) A recent email survey of scientists and faculty in the affiliated hospitals and St. George campus area unanimously singled out “Clinical Engineering” as the appropriate, contemporary term. In fact, most were surprised that the program was anything other than “Clinical Engineering”.

Prior Approvals/Actions:
Current and incoming graduate students were polled via email for their opinion about the name change. Of the 45 students polled:
31 (69%) – Agreed with the name change
2 (4%) – Disagreed with the name change
12 (27%) – Had no preference

The graduate studies and awards committee at IBBME (consisting of Paul Santerre, Director, IBBME, Chirs Yip, Associate Director, Warren Chan, Associate Director, Collaborative Program) approved of the above-mentioned name change on August 13, 2009.

Proposed Effective Date:

<table>
<thead>
<tr>
<th>Month</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>September</td>
<td>2010</td>
</tr>
</tbody>
</table>

Financial and/or Planning Implications:
None

Contact name, e-mail address and telephone #:
Tom Chau – Graduate Coordinator, Clinical Engineering Program, IBBME

Submitted by:
Chris Damaren, Vice-Dean, Graduate Studies, Faculty of Applied Science & Engineering

Date: September 15, 2009
MOTION
Graduate Education Council
Tuesday, January 19, 2010

Item 10

Proposal for a new hood for the following degree offered by the Health Informatics program:
Master of Health Informatics (MHI)
Department of Health Policy, Management and Evaluation, Faculty of Medicine

MOTION
THAT Graduate Education Council approve the proposal of the Faculty of Medicine for a
new hood for the Master of Health Informatics, (MHI) offered by the Health Informatics
program.

See attached documents:
• Letter of Approval

Prior Approvals and Discussion

The Department Chair has approved the design. It is the responsibility of Graduate Education Council (GEC) to
receive and approve proposed hood designs.

Further Governance

If approved by GEC, the proposal will be brought to the Ceremonials Committee of Academic Board for final
approval.
School of Graduate Studies
University of Toronto

October 20, 2009

Louise Lemieux-Charles
Department of Health Policy, Management and Evaluation
Faculty of Medicine, University of Toronto
Health Sciences Building
155 College Street, Suite 425
Toronto, ON M5T 3M6

Dear Professor Lemieux-Charles:

Congratulations on the approval of the new Master of Health Informatics (M.H.I) program. A new hood will now be created for graduates of this program.

In accordance with the University of Toronto master's hood pattern, the new M.H.I. hood would be as follows:

- A shell of black corded silk with trim of white soutache braid on both outside cd  ca, starting 1 ½” from the back edge and tapering to ½” apart at the neck band. This is mandatory for all master's hoods.

You may choose either:

- [ ] A) a lining of white silk to represent the Master of Health Informatics hood, and one ¾” silk strips of royal blue (representing the Faculty of Medicine) and one strip of cérise (representing the Faculty of Information) or

- [ ] B) a lining of white silk to represent this degree with the edges trimmed in royal blue.

[Signature]

Date: Oct. 20, 2009

Please indicate your choice of option A) or B), sign, date, and return the letter to my attention. Once you approve the new design, we can bring it forward to be approved by the SGS Council and then by the Academic Board.

If you would like assistance regarding color choices of the hood, please contact Mr. Ben Harcourt, Harcourtts, (416) 977-4408 (email: info@harcourtts.com).

Yours truly,

[Signature]

Heather Kelly
Director, Student Services
Co: Jane Alderdice, Director, Quality Assessment and Governance

53/55 St. George Street Toronto Canada M5S 2Z9 Fax: (416) 978-4367
Item 11

Proposal to change the admission requirements and program requirements for the following program:
Sociology in Education, MA, MEd, EdD, PhD
Department of Sociology and Equity Studies in Education, Ontario Institute for Studies in Education (OISE)

MOTION
THAT Graduate Education Council approve the proposal of the Ontario Institute for Studies in Education to change the admission requirements of the MA, MEd, EdD and PhD in Sociology in Education program as follows:

• For all degrees, note that students are admitted under the general regulations of the School of Graduate Studies.

• For the MA, change the undergraduate standing required from B+ or better in the final year to mid-B or better in the final year.

• For the MEd, remove the requirement that the appropriate four-year University of Toronto degree or its equivalent from a recognized university be in sociology or a relevant discipline.

• For the PhD, students who are admitted without sufficient previous study in sociology or a cognate discipline may be required to take a longer program; change this so that such students may be required to take additional courses.

• Make these changes effective September 2009.

MOTION
THAT Graduate Education Council approve the proposal of the Ontario Institute for Studies in Education to change the program requirements of the MA, MEd, EdD and PhD in Sociology in Education program as follows:

• For all degrees, change the note regarding students registered in a collaborative program as follows: students who are registered in a collaborative program may apply to have their Sociology in Education course requirement reduced by 0.5 FCE; students must consult with their faculty advisor before enrolling in any out-of-department course for which they wish to receive credit.

• For the MA, require students to take 3.0 FCEs rather than noting that they normally take 3.0 FCEs.
• For the EdD, remove mention of specific course requirements stated in the offer of admission; require students to take 4.0 FCEs rather than at least 4.0 FCEs.
• For the PhD (both full-time and flexible time options):
  • require students to take 3.0 FCEs rather than noting that they normally take 3.0 FCEs;
  • remove the option of students being permitted to take the equivalent of 1.0 FCE at another recognized graduate institution with prior approval of their faculty advisor and the Registrar’s Office;
  • add a statement that students must submit a thesis and defend it at a final oral examination. The thesis must embody the results of original investigation conducted by the student under the direction of an OISE thesis committee. The thesis must constitute a significant contribution to the knowledge of the field of study. The student must have an approved thesis topic, supervisor, and an approved thesis committee by the end of the third year of registration, and must have completed all other program requirements.
• Make these changes effective September 2009.

See attached documents:
  • SGS Governance Form A
  • Calendar Entry

Prior Approvals and Discussion
The changes in this proposal bring the Calendar text into line with existing practice at the Department and are proposed to take effective retroactively in consideration of this.

The proposal was approved by the OISE Graduate Education Committee on November 13, 2009 and by the OISE Faculty Council on December 16, 2009; no substantive discussion arose at the meeting.

Further Governance
GEC approval is final. It will be sent for information to the Academic Policy and Programs Committee of Academic Board in SGS’s annual report.
Faculty Affiliation:
OISE

Name of Graduate Unit:
Sociology & Equity Studies in Education

Graduate Program/s involved in proposal, if any:
Sociology in Education (M.Ed., M.A., Ph.D., Ed.D)

Brief Summary of Proposed Change:
We are submitting changes to the SGS Calendar to bring the wording in the Calendar in line with our existing program practices. The revisions marked in these copies have been approved by the SESE Chair, Dr. Kari Dehli. The addition of the two collaborative programs, which were approved last year by SGS, have been approved by the SESE Chair, Dr. Kari Dehli, for inclusion in the SESE section of the SGS Calendar.

Rationale:
Text corrections to the SESE section will provide more clarity. The additions of the two collaborative programs, Diaspora and Transnational Studies, approved by Graduate Education Council April 24, 2009 AND Workplace Learning and Social Change, approved by Graduate Education Council June 20, 2008 will notify interested students in SESE of collaborative programs that relate to internal research interests of the department.

Prior Approvals/Actions and Comments:
Dr. Kari Dehli, Chair, Department of Sociology & Equity Studies in Education, has approved textual changes, including the addition of the two collaborative programs.

Proposed Effective Date:
November 2009
Month Year

Financial and/or Planning Implications:
No financial implications to textual changes. Any financial implications of the two collaborative programs have already been noted in the original proposals approved by Graduate Education Council previously.

Chair/Director Name and Contact Information:
Dr. Kari Dehli, Chair, Department of Sociology & Equity Studies in Education: kari.dehli@utoronto.ca ; 416-978-0506

Faculty Dean Name and Contact Information:
Lana Stermac
Associate Dean, Research and Graduate Studies
416-978-1117

Date: October 20, 2009
Sociology and Equity Studies in Education

Faculty Affiliation
Ontario Institute for Studies in Education

Degree Programs Offered
Sociology in Education – MA, MEd, EdD, PhD

Collaborative Programs Offered
Degree programs that participate in:
1. Aboriginal Health, see p. 404
   • Sociology in Education,
     MA, MEd, EdD, PhD
2. Comparative, International, and Development Education, see p. 430
   • Sociology in Education,
     MA, MEd, EdD, PhD
3. Diaspora and Transnational Studies, see p. ???
   • Sociology in Education,
     MA, MEd, EdD, PhD
4. Environmental Studies, see p. 443
   • Sociology in Education,
     MA, MEd, EdD, PhD
5. Ethnic and Pluralism Studies, see p. 445
   • Sociology in Education,
     MA, MEd, EdD, PhD
6. Sexual Diversity Studies, see p. 469
   • Sociology in Education,
     MA, MEd, EdD, PhD
7. South Asian Studies, see p. 471
   • Sociology in Education,
     MA, MEd, EdD, PhD
8. Women and Gender Studies, see p. 473
   • Sociology in Education,
     MA, MEd, EdD, PhD
9. Workplace Learning and Social Change, see p. ???
   • Sociology in Education,
     MA, MEd, EdD, PhD
Overview

The Department of Sociology and Equity Studies in Education (SESE) offers a full range of programs leading to Master of Arts, Master of Education, Doctor of Education, and Doctor of Philosophy degrees. These programs offer students preparation in sociology in education with an emphasis on equity issues.

Sociology in education is the study of the social context of education. The department understands education as a broad, multi-faceted concept, that is, a social organization of knowledge, teaching, and learning which takes place both within and beyond schooling. “Equity” is the lens through which we approach these phenomena. We blend with this vision the principles of interdisciplinarity and community engagement, and in our programs we actively seek to bridge divisions between theory and practice.

The department offers opportunities to investigate and integrate several thematic areas. Students are encouraged to integrate their studies across a variety of areas. Included in our offerings are courses related to Aboriginal and Indigenous studies in education, critical race and anti-racism studies in education, culture, communication and critical education, disability studies in education, feminist studies and gender relations in education, les études francophones, learning, work and social change, and queer studies in education.

Contact and Address

Web: www.oise.utoronto.ca/depts/sese
Email: kpearson@oise.utoronto.ca
Telephone: (416) 978-0397
Fax: (416) 926-4751

Department of Sociology and Equity Studies in Education
The Ontario Institute for Studies in Education of the University of Toronto
252 Bloor Street West
Toronto, Ontario M5S 1V6
Canada

Degree Programs

Sociology in Education

Master of Arts

Minimum Admission Requirements

· The department welcomes applicants with diverse but relevant backgrounds.
· Students are admitted under the general regulations of the School of Graduate Studies.
Admission to the MA program requires an appropriate four-year University of Toronto degree in sociology or a related discipline or its equivalent from a recognized university, with standing equivalent to a University of Toronto mid-B or better in the final year.

Applicants are required to submit the following. Incomplete applications may be subject to processing delays or rejection.

- a careful statement of intellectual interests and concerns relevant to sociology and equity studies in education as well as reasons for undertaking a program in the department, including a statement of preference for one or more of the departmental research areas;
- two letters of reference, preferably from university instructors with whom the applicant has studied or worked;
- at least one sample of written work in the social sciences.

See the OISE Graduate Bulletin for further information.

Program Requirements

The MA is a research-based degree program which can be taken on a full-time or part-time basis.

- 3.0 full-course equivalents (FCE), of which at least 2.0 must be SESE courses. Students who are registered in a collaborative program may apply to have their SESE course requirement reduced by 0.5 FCE. Students must consult with their faculty advisor before enrolling in any out-of-department course for which they wish to receive SESE credit.
- Additional courses may be required of some students, and some students may be required to take specified courses in research methods and/or sociological theory.
- Students complete a thesis which may lay the groundwork for doctoral research.

Master of Education

Minimum Admission Requirements

The department welcomes applicants with diverse but relevant backgrounds.

Students are admitted under the general regulations of the School of Graduate Studies.

Admission to the MEd requires an appropriate four-year University of Toronto degree or its equivalent from a recognized university, with standing equivalent to a University of Toronto mid-B or better in the final year.

Applicants must have the equivalent of 12 months' professional experience.

Applicants are required to submit the following. Incomplete applications may be subject to processing delays or rejection.

- a careful statement of intellectual interests and concerns relevant to sociology and equity studies in education as well as reasons for undertaking a program in the department, including a statement of preference for one or more of the departmental research areas;
- two letters of reference, preferably from university instructors with whom the applicant has studied or worked;
- at least one sample of written work in the social sciences.
Program Requirements

- Students choose to complete the MEd program by one of three options:
  - Option II - 4.0 full-course equivalents (FCE) plus a Major Research Paper (MRP)
  - Option III - 3.0 full-course equivalents (FCE) plus a thesis
  - Option IV - 5.0 full-course equivalents (FCE)

- At least half of the FCE in an MEd program must be SESE courses. Students who are registered in a collaborative program may apply to have their SESE course requirement reduced by 0.5 FCE; students must consult with their faculty advisor before enrolling in any out-of-department course for which they wish to receive SESE credit.

- The degree may be completed on a full-time or part-time basis.

Doctor of Education

- The EdD degree program is distinct from the PhD in that students are encouraged to orient toward applied and theoretical dimensions of professional educational practice understood as knowledge, teaching and learning which takes place within or beyond schooling.

Minimum Admission Requirements

- The department welcomes applicants with diverse but relevant backgrounds.
- Students are admitted under the general regulations of the School of Graduate Studies.
- Admission to the EdD requires a University of Toronto MEd or MA in Education, or its equivalent from a recognized university, in the same field of specialization proposed at the doctoral level, completed with standing equivalent to a University of Toronto B+ or better in master's courses.
- Applicants must have the equivalent of 12 months' professional experience.
- Applicants are required to submit the following. Incomplete applications may be subject to processing delays or rejection.
  - a careful statement of intellectual interests and concerns relevant to sociology and equity studies in education as well as reasons for undertaking a program in the department, including a statement of preference for one or more of the departmental research areas;
  - two letters of reference, preferably from university instructors with whom the applicant has studied or worked;
  - at least one sample of written work in the social sciences.

- See the OISE Graduate Bulletin for further information.

Program Requirements

- The EdD degree may be pursued on a full-time or part-time basis.
· 4.0 full-course equivalents (FCE), of which at least 2.0 FCE must be SESE courses. Students who are registered in a collaborative program may apply to have their SESE course requirement reduced by 0.5 FCE; students must consult with their faculty advisor before enrolling in any out-of-department course for which they wish to receive SESE credit.

EdD students may begin their studies on a part-time basis. However, they must register full-time for a minimum of two consecutive sessions, not including summer, of on-campus study and then maintain continuous registration full-time subsequently until all degree requirements, including the thesis, are completed.

Doctor of Philosophy

The PhD degree program is designed to provide opportunities for advanced study, original research, and theoretical analysis.

Minimum Admission Requirements

· The department welcomes applicants with diverse but relevant backgrounds.
· Students are admitted under the general regulations of the School of Graduate Studies.
· PhD students who are admitted without sufficient previous study in sociology or a cognate discipline may be required to take additional courses.
· Applicants are required to submit the following. Incomplete applications may be subject to processing delays or rejection.
  o a careful statement of intellectual interests and concerns relevant to sociology and equity studies in education as well as reasons for undertaking a program in the department, including a statement of preference for one or more of the departmental research areas;
  o two letters of reference, preferably from university instructors with whom the applicant has studied or worked;
  o at least one sample of written work in the social sciences.

· See the OISE Graduate Bulletin for further information.

Program Requirements

· PhD students have the option of undertaking the program on a full-time or flexible-time basis.
  o Full-time PhD students must maintain full-time status throughout their program of study and complete the requirements of their degree within six years. Students take 3.0 full-course equivalents (FCE), though additional courses may be required, and some students may be required to take specified courses in research methods and/or sociological theory. At least 3/4 of students’ PhD course work must be taken within SESE. Students who are registered in a collaborative program may apply to have their SESE course requirement reduced by 0.5 FCE; students must consult with their faculty advisor before enrolling in any out-of-department course for which they wish to receive SESE credit.
  o Flexible-time PhD students register full-time during the first four years and part-time during subsequent years of the program. The flexible-time PhD degree is designed to
accommodate demand by practicing professionals for a PhD degree that permits continued employment in areas related to their fields of research. Students must complete the requirements of their degree within eight years. Degree requirements for the flexible-time PhD programs are the same as for fulltime PhD studies: at least 3.0 FCE of which at least 2.0 FCE must be taken in SESE with a possibility to apply for a reduction of 0.5 FCE in the SESE course requirement if the student is also registered in a collaborative program. Students would normally take at least one specialized research methods course.

- All PhD students must also successfully complete the non-credit course SES 1913H SESE Thesis Students' Seminar.

- All PhD students must complete a comprehensive examination.

- All PhD students must submit a thesis and defend it at a final oral examination. The thesis must embody the results of original investigation conducted by the student under the direction of an OISE thesis committee. The thesis must constitute a significant contribution to the knowledge of the field of study. The student must have an approved thesis topic, supervisor, and an approved thesis committee by the end of the third year of registration, and must have completed all other program requirements.
MOTION
Graduate Education Council
Tuesday, January 19, 2010

ITEM 12.1

Proposal to change the program requirements for the following program:
Health Informatics, MHI
Department of Health Policy, Management and Evaluation (HPME), Faculty of Medicine

MOTION
THAT Graduate Education Council approve the proposal of the Faculty of Medicine to change the program requirements of the Master of Health Informatics (MHI) by increasing the number of required courses from 6.5 to 7.5 FCE and reducing the number of required elective courses from 1.5 to 0.5 FCE, leaving the overall number of required courses unchanged at 10.0 FCE (which includes a 2.0 FCE Practicum), effective September 2009.

See attached documents:
• SGS Governance Form A
• Calendar Entry

Prior Approvals and Discussion
The changes in this proposal bring the Calendar text in line with practices existing at the Department since September 2009.

The proposal was approved by the Faculty of Medicine Graduate Curriculum Committee on December 15, 2009. No substantive discussion arose at the meeting.

Further Governance
GEC approval is final. It will be sent for information to the Academic Policy and Programs Committee of Academic Board in SGS’s annual report.
Faculty Affiliation:
Faculty of Medicine

Name of Graduate Unit:
Department of Health Policy, Management and Evaluation (HPME)

Graduate Program/s involved in proposal, if any:
Master of Health Informatics (MHI)

Brief Summary of Proposed Change:
To alter the number of required courses in the MHI program from 6.5 to 7.5 FCE, and change the elective requirement from 1.5 to 0.5 FCE (and 2.0 FCE Practicum, which is unchanged). The total number of courses required, 10.0 FCE, remains the same.

Rationale:
The original OCGS proposal submitted to SGS in 2007 described the program requirements as 1.5 FCE for “Level One” Courses, 5.0 FCE for “core” seminar/lecture work, plus 2.0 FCE for the Practicum, for a total of 8.5 FCE of “required” courses and 1.5 FCE for electives for a total of 10.0 FCE.

In July 2008, following the OCGS approval, and after reviewing the needs of our newly admitted student cohort, we were compelled to make a minor change to the program requirements which made both levelling courses (MHI1001H and MHI1002H) required instead of students being required to enrol in one of the two. Therefore we added 0.5 FCE to the required list and, to accommodate the extra 0.5 FCE, we dropped one elective 0.5 FCE course.

Please note that all students have been fulfilling the requirements as outlined above since September 2008.

Prior Approvals/Actions and Comments:
HPME Curriculum Committee: October, 2009
Faculty of Medicine Graduate Curriculum Committee: December, 2009

Proposed Effective Date:
September 2008

Financial and/or Planning Implications:
None
Chair/Director Name and Contact Information:
Louise Lemieux-Charles Chair, HPME
Rhonda Cockerill, Graduate Coordinator, HPME
Twylla Bird-Gayson, Director, MHI Program

Faculty Dean Name and Contact Information:
Andrea Sass-Kortsak
Vice Dean, Office of Graduate Affairs
Faculty of Medicine

Date:  October 20, 2009
Health Policy, Management and Evaluation

Faculty Affiliation
Medicine

Degree Programs Offered

Health Administration – MSc, PhD
  Field: Clinical Epidemiology and Health Care Research – MSc, PhD
  Field: Health Services Research – MSc, PhD
  Field: Health Technology Assessment and Management - MSc

Health Administration – MHSc, Combined MHSc/MN, Combined MHSc/MSW

Health Informatics – MHI (pending approval)

Management of Innovation – MMI

[...]

Degree Programs
[...]

Health Informatics

The Master of Health Informatics is an innovative professional, graduate-level program which provides graduates with the expertise in clinical, information and communication technologies required to lead organizational and health system change. The MHI degree program prepares health informaticians – clinically and technically savvy solution architects – to bridge the gap between clinicians and information and communication technology (ICT) specialists.

Minimum Admission Requirements

Students are admitted under the general regulations of the School of Graduate Studies. Appropriate four year undergraduate degree, or its equivalent, from a recognized university, and demonstrated English language proficiency. Eligible undergraduate degrees include those in a Health Sciences or Social Sciences specialty, Regulated Health Professions in Ontario, or a computer science or information science specialty with the equivalent of a minimum mid-B average in the last academic year. Successful applicants normally have relevant professional experience as a health services professional (e.g., manager or administrator) or health sciences/clinical practitioner with demonstrated basic literacy and/or programming skills in computer applications relevant to the health sector, or a computer or information technician within a health care setting or health software vendor.

Program Requirements

Completion of 10.0 FCE, including required course work (7.5 FCE), elective course work (0.5 FCE), and a 4-month full-time practicum or field placement (2.0 FCE),...
Degree requirements will be completed in 16 months across 4 consecutive sessions.

Required Courses

- MHI 1001H Introduction to Information and Communication Technology in Health Informatics
- MHI 1002H Complexity of Clinical Care
- MHI 2001H Health Informatics I
- MHI 2002H Health Informatics II
- INF 1003H Information Systems, Services and Design
- INF 1341H Analyzing Information Systems
- MHI 2003H Consumer and Public Health Informatics
- MHI 2004H Change management and Human Factors in Health Informatics
- MHI 2005Y Practicum Placement
- MHI 2006H Advanced Topics in Health Informatics
- MHI 2007H Quantitative Skills in Health Informatics
- MHI 2007H Quantitative Skill in Health Informatics
- MHI 2008H Project Management for Health Informatics
- HAD 5010H Canada’s Health System and Health Policy I
- HAD 5726H Design and Evaluation in E-Health Innovation and Information Management
- HAD 5728H Performance Measurement in Health Care

Elective Course

- MHI 3000H Independent Reading for Health Informatics

Students are encouraged to select an elective that allows them to focus on their individual areas of interest in Health Informatics. For this reason the MHI program does not impose a selection of electives. Students are free to choose from all graduate courses across all disciplines at the University of Toronto. All selections are subject to approval in advance by the Program Director and the HPME Chair.
MOTION
Graduate Education Council
Tuesday, January 19, 2009

ITEM 12.2

Proposal to change the program requirements for the following program:
Music, PhD (Music Education field)
Faculty of Music

MOTION
THAT Graduate Education Council approve the proposal of the Faculty of Music to change the program requirements of the Doctor of Philosophy (PhD) in Music program (Music Education Field) by introducing a flexible time option, effective September 2010.

See attached documents:
• SGS Governance Form A
• Calendar Entry

Prior Approvals and Discussion
Consultation with faculty, graduate students and alumni was conducted; see the attached Governance Form for details. The proposal was approved by the Faculty of Music Faculty Council Executive on November 17, 2009.

Further Governance
GEC approval is final. It will be sent for information to the Academic Policy and Programs Committee of Academic Board in SGS’s annual report.
Faculty Affiliation: Faculty of Music
Name of Graduate Unit: Faculty of Music

Graduate Program/s involved in proposal, if any: Music, PhD Program, Music Education field

Brief Summary of Proposed Change: Flexible-Delivery Option to the PhD in Music Education

Rationale:
Doctoral students in the Music program (Music Education field) enter directly from a Master’s degree program or from employed positions in the music education field. They often hold positions as classroom teachers, school administrators or on university faculties. Until now, students have had to take extended leaves from their places of employment, or resign from full-time positions in order to pursue a Ph.D. These students who have been working in the field are often some of the most attractive to our Music Education program and we have not been able to offer them a reasonable plan that enables them to continue working while pursuing a Ph.D. on a more flexible basis.

To enable us to offer these students a program suitable to their needs, the Faculty of Music proposes to offer the flexible-time Ph.D. in Music Education beginning in September, 2010.

Prior Approvals/Actions and Comments:
The following meetings and actions were taken in preparation for this proposal:
- Preliminary meetings were held by Music Education faculty members
- Music Education faculty consulted with the Dean, Faculty of Music
- Graduate students were informed by email that a flex-time program was being discussed. Students were asked for feedback and this feedback was collected and discussed further by Music Education faculty.
- A survey was taken of current Music Education students and alumni to obtain more in-depth feedback about the flex-time option.
- The proposed degree option was presented and accepted by Faculty Council Executive Nov 17, 2009

Proposed Effective Date:
September 2010

Financial and/or Planning Implications:
The addition of a flexible-time PhD program option will have no financial implications.
The addition of a flexible-time Ph.D. program option will have no impact on the full-time Ph.D. program. The admission process will be the same for flexible-time Ph.D. students as for full-time applicants. Applicants for the flexible-time Ph.D. program option must apply specifically to this Ph.D. option to be considered. The department will determine at the admissions interview if the applicant is suitable for the flexible-time option. Flexible-time Ph.D. students will not be eligible for guaranteed funding.

As governed by the university regulations, flexible-time students must be registered full-time and pay full-time fees for four years and may apply to be registered part-time thereafter. The number of courses, major field examination and thesis requirements will be the same as those required for the full-time Ph.D. The difference is
that students enrolled in the flexible-time Ph.D. will have the flexibility of a part-time course load and will have an overall time limit to completion of 8 years.

The Faculty of Music expects to admit about 2 flexible-time students each year.

Chair/Director Name and Contact Information:
Gillian MacKay
Associate Dean, Graduate Education

Faculty Dean Name and Contact Information:
Russell Hartenberger, Dean
Faculty of Music

Date: 18 NOV 09
Doctor of Philosophy

The PhD in Music degree is offered in three fields:
1. Musicology
2. Ethnomusicology
3. Music Education

Field: Music Education

Minimum Admission Requirements

- Applicants must hold a master's degree in music education from this university with an average standing of B+ or better, or an equivalent degree and standing from another university.
- An interview with the music education faculty must be scheduled whenever possible.
- An assigned essay may be substituted for the interview with faculty approval.
- Applicants must provide their results on the Miller Analogies Test.
- At the discretion of the faculty, applicants may be required to provide a videotape of their teaching expertise.
- Appropriate letters of reference commenting on the applicant's teaching experience, music performance ability, and academic ability.

Program Requirements

The PhD program in Music Education may be completed as a full-time program or a flexible-time program.

Full Time PhD Option

- 6.0 full-course equivalents (FCE) including:
  - At least 2.0 FCE (including MUS 2995Y Music Education Doctoral Research Project) must be taken from the departmental offerings in music education.
  - The balance of the student’s required program must be approved by the department and may include courses from the MA/MMus/PhD/DMA list and/or from another graduate unit.
• At the department’s discretion, the student may receive credit for up to 3.0 FCE from an acceptable master’s degree program.
• Students must be registered full time, on campus for a minimum of two sessions, in order to be in such geographical proximity as to be able to participate fully in the department's activities associated with the program.
• Language requirements, if any, will be established by the student's advisory committee, based on specific research needs.
• As early as possible in year 2, the student will submit a thesis proposal which must be approved by the end of that year. On approval of the proposal by the Music Education division of the department, a principal advisor and an advisory committee of at least three members (including the advisor as chair) will be appointed. The committee will meet with the student at least two times each academic year.
• Upon successful completion of the comprehensive examination, the candidate proceeds to complete an oral defence of the thesis proposal, a thesis, and an oral defence of the thesis.

**Flexible Time Option**

- The admission, course and degree requirements for the flexible-time option are identical to those listed for the full-time PhD program.
- The flexible time option is offered only to practicing professionals whose employment or other professional work is related to their research or study interests.
- Applicants for the flexible-time Ph.D. program option must apply specifically to this program to be considered. All requirements for the degree must be completed satisfactorily within eight years from the date of the student’s first enrolment in the PhD program.
- Student who are considering the flexible-time PhD should ensure that they will have adequate time on campus to attend classes and to fulfil the academic requirements of a PhD program.
- Students are required to register full-time for the first four years of their program; thereafter, they may register part-time.

**Courses**

[...]
MOTION
Graduate Education Council
Tuesday, January 19, 2010

ITEM 12.3
Proposal to change the program requirements for the following program:
Nursing Science, PhD
Lawrence S. Bloomberg Faculty of Nursing

MOTION
THAT Graduate Education Council approve the proposal of the Lawrence S. Bloomberg Faculty of Nursing to change the program requirements of the Doctor of Philosophy (PhD) in Nursing Science program by replacing the requirement to take the course NUR 1080H “Theoretical Perspectives in Nursing Science” with a requirement to take one of the following three courses: NUR 1085H “Topics in Critical Perspectives in Health and Health Care”, NUR 1086H “Special Topics in Nursing/ Health Services Research Methods”, or NUR 1087H “Foundations of Clinical Research”. This does not change the overall number of courses required. The change will be effective January 2010.

See attached documents:
- SGS Governance Form A
- Calendar Entry

Prior Approvals and Discussion
The changes proposed reflect the replacement of the three existing fields in the PhD in Nursing Science with three new fields, pending OCGS approval (GEC approval is not required for changes to fields, but is required for related program requirement changes). The specific required course each student must choose will depend upon his or her field of study. The three new fields and their related courses are 1) Effective Care and Health Outcomes (NUR 1087H), 2) Critical Approaches to Health and Health Care (NUR 1085H) and 3) Nursing Health Systems (NUR 1086H).

Students entering the program in 2009 were informed of the proposed changes and the fact that they were pending approval; they will take the required course for their respective fields as the existing required course is not being offered. Consultation has occurred with faculty and PhD students. For details, see the attached Governance Form.

The proposal was approved by the Faculty’s Graduate Faculty Committee on December 5, 2007.

Further Governance
GEC approval is final. It will be sent for information to the Academic Policy and Programs Committee of Academic Board in SGS’s annual report.
Faculty Affiliation:  Lawrence S. Bloomberg Faculty of Nursing  
Name of Graduate Unit:  Nursing Science  
Graduate Program/s involved in proposal, if any:  PhD Program  
Brief Summary of Proposed Change:  
From its inception until 2009, the PhD program in the Graduate Department of Nursing science has required all students to take the same foundational course, NUR 1080. Instead of taking NUR 1080, the proposal is to have our PhD students take either NUR1085 or NUR 1086 or NUR 1087. The specific course each one takes will depend upon his/her field of study. The overall number of course requirements will not be changed.

This brief proposes the replacement of the three current fields in the Ph.D. in Nursing Science program with three new fields: (1) Effective Care and Health Outcomes, (2) Critical Approaches to Health and Health Care, and (3) Nursing Health Systems (see section 2 below for list of current fields). The name changes reflect the evolution and maturity of scholarship in the Faculty. All of our graduate faculty who teach and supervise students in the PhD program conduct research within the three new fields. The field of Effective Care and Health Outcomes focuses on rigorous evaluations of conventional and innovative forms of nursing and health care, using randomized controlled trials, theory-driven evaluations, and systematic reviews of the evidence. The field of Critical Approaches to Health and Health Care unites researchers who re-vision conventional ways of conceptualizing nursing, health care and health promotion. The field of Nursing Health Systems investigates questions related to nursing and health services resource planning, organization, management, financing, and delivery.

Rationale:  
The current fields were named in 1992 at the time of application to OCGS for a PhD program in nursing science in the University of Toronto. The fields served the Faculty well at the time, but they are no longer accurate depictions of faculty and student research. The new fields – Effective Care and Health Outcomes (ECHO), Critical Approaches to Health and Health Care, and Nursing Health Systems – began when the faculty members grouped themselves into research program clusters in 2003. When the Faculty moved to a new building in 2005,
the three program clusters determined faculty office and research program assignments. Thus one wing of one floor houses the ECHO faculty and research staff, with carrels for their PhD students; another wing houses the Critical Approaches to Health and Health Care faculty; and the Nursing Health Systems faculty, research staff, and students are together on another floor. These designated spaces, analogous to basic science laboratories, provide rich opportunities for faculty, students and research staff to interact on a daily basis. Recent faculty appointments to tenure stream positions have further strengthened the research program clusters. The new fields reflect the major research programs in the Faculty and will enable us to market the PhD program much more effectively.

There will be no difference in admission requirements, degree requirements, or enrolment projections, and no implications for faculty workload or capacity to supervise PhD students. The requirement for students to take NUR 1080, “Theoretical Perspectives in Nursing,” will be eliminated. In its place, each field has developed a new required course which addresses the most important theoretical and methodological issues within the field. The faculty members in each field participated in developing its new required course.

Those in the Effective Care and Health Outcomes field will take NUR 1085, Foundations of Clinical Research. Those in the Critical Approaches to Health and Health Care field will take NUR 1086 “Topics in Critical Perspectives in Health and Health Care.” Students in the Nursing Health Systems Field will take NUR 1087, “Special Topics in Nursing/Health Services Research Methods.”

Prior Approvals/Actions:
The Graduate Faculty Committee of the Lawrence S. Bloomberg Faculty of Nursing has approved the proposed changes to the fields of study. The proposed change will not affect our current PhD students, except insofar as they may wish to take one of the new courses as an elective. Consultations occurred with PhD student representatives on Faculty committees, who in turn sought their peers’ reactions, and with students in courses and in individual supervisor/student meetings; all welcomed the proposed changes, recognizing the changes had no impact on them but would improve the program for future students. The three new courses were approved by the Faculty’s Curriculum Committee and SGS. All students entering the program in 2009 were informed of the proposed changes and of the fact that they were pending SGS and OCGS approvals. They will be taking the required course for their respective fields; the former required course, NUR 1081, is not being offered. The Year 1 students were fully supportive of the proposed changes.

Proposed Effective Date:
01 2010
Month Year
Financial and/or Planning Implications:
None.

Contact name, e-mail address and telephone #:
Dr. Ellen Hodnett
Dr. Elizabeth Peter

Submitted by:

Date:

December 9, 2009
Nursing Science

Faculty Affiliation
Nursing

Degree Programs Offered
Nursing Science – MN, Combined MHSc (Health Administration)/MN, PhD

Diploma Programs Offered
Nurse Practitioner - Post-Master's Nurse Practitioner (PMNP) Diploma

Collaborative Programs
The following collaborative programs are available to students in participating degree programs as listed below:
1. Aboriginal Health, see p. 404
   Nursing Science, MN, PhD
2. Addiction Studies, see p. 408
   Nursing Science, MN, PhD
3. Aging, Palliative and Supportive Care Across the Life Course, see p. 408
   Nursing Science, MN/MHSc, PhD
4. Bioethics, see p. 416
   Nursing Science, MN, MN/MHSc, PhD
5. Cardiovascular Science, see p. 426
   Nursing Science, MN, PhD
6. Community Development
   Nursing Science, MN
7. Ethnic and Pluralism Studies, see p. 445
   Nursing Science, MN, PhD
8. Health Care, Technology and Place, see p. 454
   Nursing Science, PhD
9. Health Services and Policy Research, see p. 456
   Nursing Science, MN, PhD
10. Women and Gender Studies, see p. 473
    Nursing Science, MN, MN/MHSc, PhD
11. Women's Health, see p. 478
    Nursing Science, MN, PhD

Overview
The Master of Nursing program prepares advanced nursing practitioners with specialized knowledge, skills, and expertise in a defined area of nursing to design programs and influence practice in that area. The program offers three fields of study:
1. Nursing administration
2. Clinical nursing
3. Nurse Practitioner

The Combined Master of Health Science (Health Administration)/Master of Nursing program provides an opportunity for students with a strong interest in both nursing and health administration to engage in an integrated and coherent program of study leading to the concurrent receipt of the MN and MHSc (Health Administration) degrees within 2.5 years of full-time study.

The Doctor of Philosophy program prepares scientists with the required analytical and research skills for the study of clinical or administrative nursing problems. Each student will choose to study in one of three research fields:

1. Effective Care and Health Outcomes
2. Critical Approaches to Health and Health Care.
3. Nursing Health Systems.

The listed fields replace the current fields (Nursing Science of Healthy Individuals, Families, and Communities; Nursing Science of Individuals and Families Experiencing Acute and Chronic Illness; and Science of Nursing Administration), subsequent to approval by the Ontario Council of Graduate Studies.

Contact and Address
Web: http://bloomberg.nursing.utoronto.ca
E-mail: inquiry.nursing@utoronto.ca
Telephone: (416) 978-8727
Fax: (416) 978-8222

Graduate Department of Nursing Science
Suite 130, 155 College Street
Toronto, Ontario M5T 1P8
Canada

Degree Programs

Nursing Science

Master of Nursing

Minimum Admission Requirements
- Applicants must hold the BScN degree of the University of Toronto or an equivalent degree. Applicants must have obtained at least a mid-B standing in the final year of undergraduate study and, in addition, must have obtained at least B standing in the next-to-final year.
- Applicants seeking admission to the Acute Care Nurse Practitioner field must also have two years of clinical experience.
- For further information about admissions, please contact the Graduate Department of Nursing Science.

Program Requirements
- To qualify for the degree, a student shall complete a program of study outlined by the Graduate Department of Nursing Science.
- Students are strongly encouraged to enrol on a full-time basis; however, a part-time option is available on a limited enrolment basis. Part-time students must be enrolled at minimum in two out of three sessions in each academic year. The program will normally be completed within two years of full-time study. All requirements for the degree must be completed satisfactorily within six calendar years from the date of the student's first enrolment in the program.
- For the Nursing Administration and Clinical Nursing fields, the program requirement is 4.5 FCE, including a 1.0 FCE clinical course.
- For the Acute Care Nurse Practitioner field, the program requirement is 4.5 FCE (including two clinical courses of 1.0 FCE each). This field of study is offered in both e-learning and campus-based formats.

Combined Master of Health Science (Health Administration)/Master of Nursing

Minimum Admission Requirements
- Admission to the combined program is conditional upon independent admission to each of the participating graduate units. Applicants will normally be required to complete separate application forms on a concurrent basis and pay the application fees for admission to the MN Program and the MHSc (Health Administration) Program. Students must satisfy the full requirements for each of the participating graduate units.
- The aggregate criteria listed below must be satisfied to ensure that an application is considered complete for the purpose of entry into the Combined MHSc/MN Program in Health Administration and Nursing Science. Applicants must:
be accepted under the general regulations of the School of Graduate Studies. Meeting the minimum requirements does not guarantee admission.

- hold a University of Toronto BSc degree in nursing with B+ standing or better in the last two years of undergraduate study, or its equivalent from a recognized university. The student is expected to have good academic standing in non-nursing as well as nursing subjects.
- have successfully completed an introductory course in statistics prior to admission.
- have at least three years of work experience in the health care field.

Program Requirements

- Year 1 - students enrol in the Faculty of Nursing and complete 4.0 required full-course equivalents (FCE) for the MN degree.
- Year 2 - students enrol in the Department of Health Policy, Management and Evaluation (HPME) and complete 5.5 FCE towards the MHS (Health Administration) degree plus 1.0 elective FCE that can be taken from either degree program.
- Year 3 – 1.0 FCE taken in HPME.

Doctor of Philosophy

Minimum Admission Requirements

- Applicants must normally have a master's degree in nursing with at least a B+ standing, or its equivalent from a recognized university.
- For further information about admissions, please contact the Graduate Department of Nursing Science. The deadline for applications is February 1.

Program Requirements

- The PhD program in nursing may be completed as a full-time program or a flexible-time program.

Full-time PhD Option

- The program of study includes a minimum of five courses, including NUR 1081Y PhD Student/Faculty Seminars, one required course (either NUR 1085, 1086, or 1087), depending on the chosen field of study, and a thesis.
- In order to qualify for the degree, the student shall complete a program of study to support her/his research plan.
- An examination of the dissertation proposal is required, usually in the second year and no later than August 31 of the third year, at the completion of the minimum course work requirements. The student's dissertation will be defended in the departmental oral examination and the final oral examination of the School of Graduate Studies.
- All requirements for the degree must be completed satisfactorily within six calendar years from the date of the student's first enrolment in the PhD program.

Flexible-time PhD Option

- Applicants must indicate on the application form their preference for the flexible-time option. The admission, course, and degree requirements for the flexible-time option are identical to those listed for the full-time PhD program.
- The dissertation proposal is usually examined in the third year and no later than the fourth year.
- All requirements for the degree must be completed satisfactorily within eight years from the date of the student's first enrolment in the PhD program.

Nurse Practitioner

Post-Master's Nurse Practitioner Diploma

Minimum Admission Requirements

- Applicants to the Post-Master's Nurse Practitioner (PMNP) Diploma program must have completed a master's degree in nursing or an equivalent graduate degree that includes clinical nursing experience and a minimum of two years of clinical nursing experience. A signed preceptor agreement is required.
• Preference is given to applicants who have one or more years in an advanced nursing practice role (in addition to clinical experience) and support within their employment setting.

Program Requirements
All students in the Post-Master's NP Diploma program are required to complete a total of 3.5 FCE as follows:
• NUR1101H (Adult) OR NUR1102H (Child) - Advanced Health Assessment and Clinical Reasoning; course consists of 100 clinical hours.
• NUR1100Y - Pathophysiological Concepts and Therapeutics
• NUR1110Y - Advanced Nursing Practice in Caring for Clients and Families I; course consists of 300 clinical hours
• NUR1111Y - Advanced Nursing Practice in Caring for Clients and Families II; course consists of 300 clinical hours
• During the final two courses of the program, learners are engaged in clinical practice.
• The program can be completed in one year on a full-time basis or in 20 months on a part-time basis. Part-time students must be enrolled in a minimum of two out of three sessions in each academic year.

Courses
NUR 1012H  Culture and Relations
NUR 1014H  The Politics of Aboriginal Health
NUR 1016H  Health Systems, Policy, and the Profession
NUR 1017H  History of Ideas in Nursing Practice
NUR 1021H  Nursing Ethics
NUR 1022H  Research Design, Appraisal, and Utilization
NUR 1023H  Critical Issues in the Design and Conduct of Controlled Trials of Behavioural Health Care Interventions (For Ph.D. students only. Prerequisite: Introductory graduate course in research design and biostatistics. For students planning an RCT for their thesis research.)
NUR 1024H  Foundations of Qualitative Inquiry
NUR 1025H  Doing Qualitative Research: Design and Data Collection
NUR 1026H  Evaluating Interventions in Clinical Settings (Prerequisites: Intermediate level statistics course (graduate level), basic knowledge of research design and methods, and advanced knowledge of statistical analyses.)
NUR 1028H  Introduction to Qualitative Research: Methodologies, Appraisal and Knowledge Translation
NUR 1031H  Technology and Place in Contemporary Health Care Work
NUR 1032H  Group Process and Professional Practice
NUR 1033H  Current Mental Health Issues and their Implications for Practice
NUR 1034H  Program Planning and Evaluation in Nursing (Prerequisite: NUR1022H)
NUR 1035H  Public and Population Health Perspectives
NUR 1036H  Advanced Nursing Practice in Oncology
NUR 1037H  Aging and Place: Social and Policy Transitions
NUR 1038H  Theories and Methods in Global Inequalities of Health
NUR 1039H  Women's Health Across the Lifespan
NUR 1040H  Issues in Women's Health Care
NUR 1041H  Caring for Children: Places, Programs and Caregivers
NUR 1042H  Responses of Children and Families to Illness in Childhood
NUR 1043H  Theories of Interpersonal Process
NUR 1044H  “Thinking” About Children: Implications for Health Care Research, Practice and Policy
NUR 1045H  Theories of Pain: Impact on the Individual, Family and Society
NUR 1046H  Persistent Illness: Theoretical, Research and Practice Implications
NUR 1047H  Community Participation and Health
NUR 1048H  Politics of Health in the Community
NUR 1049H  Nursing Approaches to Common Physiological and Behavioural Manifestations of Critically Ill Patients
NUR 1050H  Coping With Illness
NUR 1051H  Assessment and Management of Common Responses to Illness
NUR 1052H  Perinatal Nursing Sciences
NUR 1056H  Places, Programs, and People Who Provide Care
NUR 1057H  Interventions to Enhance Health, Abilities and Well-being
NUR 1058H  Aging, Gender and Equity
NUR 1059H  Informatics: Theory and Application in Nursing
NUR 1060H  Leadership and Management of Nursing and Health Services
NUR 1061H  Patient Information Systems/Workload Measurement
NUR 1062H  Measuring Nursing Care Effectiveness: Economic and Financial Perspectives
NUR 1064H Behaviour in Health Care Organizations
NUR 1066H Theoretical Basis for Methodology for Quality Improvement in Nursing Services
NUR 1067H Recovery-Oriented Mental Health Systems of Care
NUR 1068H Youth and Mental Health Promotion
NUR 1072Y Advanced Nursing Practice Scholarship
NUR 1073H Research in Health Informatics
NUR 1080H Theoretical Perspectives in Nursing Science (Required course for Ph.D. students only)
NUR 1081Y Ph.D. Student/Faculty Seminars
NUR 1082H Knowledge Production in Nursing and Health
NUR 1083H Comparative Politics of Health Policy in Globalizing World
NUR 1084H Essentials in Applied Statistics in Nursing
NUR 1085H Topics in Critical Perspectives in Health and Health Care
NUR 1086H Special Topics in Nursing/ Health Services Research Methods
NUR1087H Foundations of Clinical Research
NUR 1090H Measuring Nursing Phenomena (Prerequisite: completion of an advanced graduate level statistics course)
NUR 1100Y Pathophysiologic Concepts and Therapeutics
NUR 1101H Advanced Health Assessment and Clinical Reasoning (Adult) (Pre- or corequisite: NUR 1022H)
NUR 1102H Advanced Health Assessment and Clinical Reasoning (Child) (Pre- or corequisite: NUR 1022H)
NUR 1103Y Advanced Nursing Practice in Caring for Clients and Families I (Prerequisites: Successful completion of NUR 1017H, NUR 1022H, NUR 1101H or 1102H, NUR 1103H, and NUR 1104H)
NUR 1104Y Advanced Nursing Practice in Caring for Clients and Families II (Credit/No Credit) (Prerequisite: NUR 1103Y. Pre- or corequisite: NUR 1034H)
NUR1201H Principles Of Anaesthesia Care
NUR1202H Pain Management Across Clinical Settings: Theory, Research And Practice
NUR1209H Advanced Nursing Practice For Caring For Families Requiring Anaesthesia I
NUR/PDN1210H Advanced Nursing Practice For Caring For Families Requiring Anaesthesia II

Joint Courses
JNH 5001H Health Care Settings, Site and Human Well Being
JNH 5002H The Body, Health Care, Technology and Place
JPX 1001H Parenting: Multidisciplinary Perspectives
MOTION
Graduate Education Council
Tuesday, January 19, 2010

ITEM 12.4

Proposal to change the **program requirements** for the following program:
**School and Clinical Child Psychology, MA, PhD**
Department of Human Development and Applied Psychology, Ontario Institute for Studies in Education (OISE)

**MOTION**

**THAT** Graduate Education Council approve the proposal of the Ontario Institute for Studies in Education to change the program requirements of the Master of Arts (MA) and Doctor of Philosophy (PhD) in School and Clinical Child Psychology program as follows:

- For the MA, allow students who have 1.0 FCE in Cognitive/Affective Bases of Behaviour at the undergraduate level approved by the program to substitute an elective course instead of the required 0.5 FCE in Cognitive/Affective Bases of Behaviour.
- For the PhD, allow students who have 1.0 FCE in Social Bases of Behaviour at the undergraduate level approved by the program to substitute an elective course instead of the required 0.5 FCE in Social Bases of Behaviour. Also allow students who have 1.0 FCE in Biological Bases of Behaviour at the undergraduate level approved by the program to substitute an elective course instead of the required 0.5 FCE in Biological Bases of Behaviour.
- Make the changes effective September 2010.

**MOTION**

**THAT** Graduate Education Council approve the proposal of the Ontario Institute for Studies in Education to change the program requirements of the Doctor of Philosophy (PhD) in School and Clinical Child Psychology program by increasing the overall required number of FCEs from 5.0 to 5.5, effective January 2010.

See attached documents:
- **SGS Governance Form A** (for the first motion)
- **SGS Governance Form A** (for the second motion)
- **Calendar Entry** (for the changes brought about by both motions)

Prior Approvals and Discussion

The proposals in both motions were approved by the School and Clinical Child Psychology Committee (comprised of faculty and MA and PhD student representatives) on October 14, 2009 and by the Department Faculty on October 21, 2009.
The proposals were approved by the OISE Graduate Education Committee on November 13, 2009. At the meeting it was asked how the program would determine which undergraduate courses are equivalent to determine if a student must take a required course (with respect to the proposal in the first motion). It was answered that course titles and descriptions would be sufficient and that specific marks would not typically matter, as students are usually accepted into the program with high marks.

The proposals were approved by the OISE Faculty Council on December 16, 2009; no substantive discussion arose at the meeting.

**Further Governance**

GEC approval is final. It will be sent for information to the Academic Policy and Programs Committee of Academic Board in SGS’s annual report.
Governance Form A: General
2009-2010

Faculty Affiliation:
(e.g., Arts and Science, Medicine, etc.)

OISE

Name of Graduate Unit:
(Graduate department/centre/institute/School of Graduate Studies)

Human Development & Applied Psychology

Graduate Program/s involved in proposal, if any:
(List program/s and degree level/s involved in the proposal, if any)

School and Clinical Child Psychology (SCCP), MA and PhD

Brief Summary of Proposed Change:
(Summarize the changes proposed; please ensure ALL changes are captured here. Most changes require SGS Calendar revision – attach a revised Calendar entry using Track Changes in Word)

1. MA Program Change:
The current MA program requires students to take a half course from an approved list of “cognitive/affective bases of behaviour” courses. Our proposed program change is that students who have 1.0 FCE in cognitive/affective bases of behaviour at the undergraduate level as approved by our program may substitute an elective course for this requirement.

2. PhD Program Change:
The current PhD program requires students to take a half course from an approved list of “social bases of behaviour” courses and a half course from an approved list of “biological bases of behaviour” courses. These were APA requirements. CPA specifies that students may fulfill these requirements by taking 1 full course or 2 half courses in each of social bases of behaviour and biological bases of behaviour at the undergraduate level. Our proposed program change is that students who have 1.0 FCE in social bases of behaviour at the undergraduate level as approved by our program may substitute an elective course for this requirement. Similarly, we propose that students who have 1.0 FCE in biological bases of behaviour at the undergraduate level as approved by our program may substitute an elective course for this requirement. This is consistent with CPA’s requirements and gives students more flexibility in choosing courses at the PhD level, where they currently have no elective courses.

Rationale:
(Explain why the change is being proposed and its anticipated effect on the program/s and students)

The SCCP program was accredited by the American Psychological Association (APA) until recently. We are now accredited by the Canadian Psychological Association (CPA) and have withdrawn from the APA accreditation process. These accrediting bodies have different requirements for programs that they accredit and the change from APA to CPA accreditation has made it possible to change our MA and PhD programs in ways that are desirable to both students and faculty. The cognitive/affective, social, and biological bases of behaviour courses are APA requirements. CPA specifies that students may fulfill this requirement by taking 1 full course or 2 half courses in cognitive/affective bases of behaviour at the undergraduate level. Our proposed program changes permit students who have 1.0 FCE in these bases of behaviour courses at the undergraduate level to substitute an elective course for these requirements. This is consistent with CPA’s requirements and gives students more flexibility in choosing courses at the master’s and PhD levels. Students currently have only one elective in 10 half
courses at the MA level and no elective courses (though they do have some choice in menu options) at the PhD level. Although the effective date of the change is September 2010, once the proposal is approved, current students who have not yet taken the required menu courses will be able to substitute electives for the courses in which they have the undergraduate equivalents. Thus, the impact of the change on current students is positive because they can take advantage of the flexibility as well.

**Prior Approvals/Actions and Comments:**
(List bodies at the Department level and the Faculty level that have approved or will approve the proposal, and summarize questions and comments that have arisen. Identify any other relevant approvals or actions taken. Consultation with graduate students should be included; indicate how it has occurred.)

SCCP Program committee (comprised of SCCP faculty and student representatives from the MA and PhD programs) – October 14, 2009
Department Faculty – October 21, 2009

**Proposed Effective Date:**
(Effective dates may NOT be retroactive. The Faculty Graduate Affairs Office and SGS reserve the right to alter the effective date – see Governance Form Information Sheet Note 2. Most program changes, including name changes, are effective as of September 1.)

September 2010
Month Year

**Financial and/or Planning Implications:**
(Provide details of financial implications – most proposals have financial implications, although sometimes minimal. In cases where the financial impact is substantial, provide a budget statement or other documentation. State “none” if there are no financial implications.)

None. Giving students more flexibility in the courses they take will help distribute students more evenly across departmental courses and allow for greater flexibility in course offerings across the department.

**Chair/Director Name and Contact Information:**
(Name and contact information for Chair of the graduate unit. List names and contact information for other individuals who will attend meetings at which the proposal will be discussed.)

Dr. Esther Geva, Chair HDAP. 416-978-0916 egeva@oise.utoronto.ca
Dr. Michele Peterson Badali, Program Chair, SCCP. 416-978-0937 mpetersonbadali@oise.utoronto.ca

**Faculty Dean Name and Contact Information:**
(Faculty Vice-Dean, Graduate Studies, or other Faculty Dean’s Designate)

Dr. Lana Stermac, Acting Associate Dean Research and Graduate Studies, OISE 416-978-0722 lstermac@oise.utoronto.ca

**Date:** October 22, 2009
Faculty Affiliation:
OISE

Name of Graduate Unit:
Human Development & Applied Psychology

Graduate Program/s involved in proposal, if any:
School and Clinical Child Psychology (SCCP) PhD

Brief Summary of Proposed Change:
1. Course weight change of HDP5284 from a half course to a full course
2. Increase in Number of Half Courses in PhD Program from 10 to 11:
   We also propose to increase the number of required courses in the PhD program to 11 half courses (5.5 FCE) from 10 (5.0 FCE) in order to accommodate a proposed change in course weight of HDP5284 from a half to a full course.

Rationale:
HDP5284H is a practicum course with a very intensive workload for both students and faculty. In addition to 14 3-hour classes, students spend a median of 30 hours of face-to-face time working with a client in the OISE Counselling and Psychoeducational Clinic. Examination of their work logs indicates that they spend a median of 15 hours being supervised by the instructor individually or in small groups, and a median of 175 hours doing preparatory work, specific research, and report writing. In addition to the normal course preparation and marking, the faculty instructor spends approximately 20 hours recruiting clients for the students to work with, 1.5 hours doing intake interviews with each client, meets with each student individually for an average of 5 hours over the course of the academic year and in groups for another 5 hours, and spends approximately 2 hours per student doing a feedback interview with the client. The psychological report describing the assessment and intervention is sent to parents, schools, and other professionals. As a result, students typically write 2 drafts of the report and the instructor provides intensive feedback on each draft before signing the final version. Although the class is relatively small (8 – 12 students depending on the year), the clinical work the student does and the clinical supervision on the part of the faculty members is such that the workload is at least equivalent to two half courses. In addition, HDP5284H is one of two instructional intervention courses offered to doctoral students in SCCP. The other course on the menu from which students choose (HDP5271Y) is currently a full course credit. HDP5271Y has a very similar structure and workload compared to HDP5284H. In their course evaluations, students consistently indicate that the course should be converted to a full course due to the workload involved. In sum, changing the weight of HDP5284H from a half to a full year course simply reflects the reality of the workload currently involved in the course. This change needs to be made to accurately represent the demands it places on both students and instructors.

Because HDP5284H is a part of a required menu that would contain only full year courses, the course weight change necessitates a change in the number of courses in the PhD program from 10 half courses to 11 half courses. This program change does not represent a substantive increase in program length or requirements for students but simply reflects the fact that a course that they have already been taking as a half course actually has the time and workload requirements of a full course.

Prior Approvals/Actions and Comments:
SCCP Program committee (comprised of SCCP faculty and student representatives from the MA and PhD programs) – October 14, 2009
Department Faculty – October 21, 2009
Proposed Effective Date:
September 2010
Month Year

Financial and/or Planning Implications:
Although changing HDP5284’s weight to a full course will entail providing faculty who are teaching it with credit for 2 half course on their load, this credit has already been given to faculty (e.g., by splitting the course into 2 sections of 4 to 6 students each) for the past several years due to the very high workload involved in the practicum supervision associated with the course. Because the increase in the PhD program from 10 to 11 half courses reflects this course weight change, there will be no funding required above current levels.

Chair/Director Name and Contact Information:
Dr. Esther Geva, Chair HDAP.  416-978-0916  egeva@oise.utoronto.ca
Dr. Michele Peterson Badali, Program Chair, SCCP.  416-978-0937  mpetersonbadali@oise.utoronto.ca

Faculty Dean Name and Contact Information:
Dr. Lana Stermac, Acting Associate Dean Research and Graduate Studies, OISE 416-978-0722
lstermac@oise.utoronto.ca

Date: October 22, 2009
SGS CALENDAR ENTRY

School and Clinical Child Psychology

The School and Clinical Child Psychology program (SCCP) is a Canadian Psychological Association (CPA) accredited program. It provides theoretical, research, and professional training in preparation for psychological work with children in schools, clinics, private practice, and research settings. The program is designed to provide training in assessment, therapy, and other psychosocial and instructional interventions, professional consultation, and prevention. The degrees are also intended to meet the academic requirements for registration as a psychological associate (MA) or psychologist (PhD). Opportunities are available for research and clinical work with infants, young children, adolescents, and families. The program follows the scientist-practitioner model for psychological training; emphasis on designing, conducting, and interpreting scientific research parallels emphasis on exemplary clinical practice.

Master of Arts

Minimum Admission Requirements

- Normally a four-year bachelor's degree in Psychology, or its equivalent, defined as 6.0 full course equivalents (FCE) in psychology, including 0.5 FCE in child development and 1.0 FCE in research methods/statistics (of which at least 0.5 FCE must be at the third or fourth year level) and at least 3.0 FCE at the third or fourth year levels. The usual admission standard is equivalency to a University of Toronto A- or better.
- Most applicants will have evidence of relevant professional experience and research experience.
- Applicants are requested to submit, in addition to two academic references, a letter of recommendation from an applied setting.

Program Requirements

- The program is undertaken on a full-time basis and normally takes two years to complete.
- 5.0 full-course equivalents (FCE) (including a practicum course) and a thesis.
- HDP 1215H Psychological Assessment of School-Aged Children
- HDP 1216H Psychoeducational Assessment
- HDP 1218H Seminar and Practicum in Assessment
- HDP 1219H Ethical Issues in Applied Psychology
- HDP 1220H Introduction to School and Clinical Child Psychology
- HDP 1236H Developmental Psychopathology
- HDP 1285H Psychology and Education of Children with Learning Disabilities
- HDP 1288H Intermediate Statistics and Research Design
- 0.5 FCE in cognitive/affective bases of behaviour from an approved course listing. Note: Students who have 1.0 FCE in cognitive/affective bases of behaviour at the undergraduate level approved by the program may substitute an elective course for this requirement.
- 0.5 elective FCE.
- A listing of approved cognitive/affective bases of behaviour courses is available on the department Web site at hdap.oise.utoronto.ca/pages/sccp_ma.html, and in the Human Development and Applied Psychology Program Guidelines.
• The practicum portion of HDP 1218H consists of 250 hours (one day a week from September to June) and is normally taken in a school setting.
• In addition, students will be required to take HDP 1201H Childhood and Adolescent Development and HDP 1287H Introduction to Applied Statistics, if equivalent courses have not been taken previously.
• Students must achieve a minimum of A- in at least one of HDP 1215H Psychological Assessment of School-Aged Children and HDP 1216H Psychoeducational Assessment and must pass HDP 1218H Seminar and Practicum in Assessment and Intervention with Children in order to remain in good standing and be permitted to continue in the program.
• Failure to meet these criteria will normally result in a recommendation to the School of Graduate Studies to terminate the student's registration in the program.

Doctor of Philosophy

Minimum Admission Requirements

• Normally a four-year bachelor's degree in Psychology or its equivalent and a University of Toronto MA in SCCP or its equivalent. The usual admission standard is equivalency to a University of Toronto A- or better in the master's degree. A limited number of outstanding applicants holding equivalent bachelor's and master's degrees in Psychology from elsewhere may be considered. However, if the master's program was not equivalent to the University of Toronto MA in School and Clinical Child Psychology, the student will be required to take additional courses to receive equivalent training.

Program Requirements

• The program is undertaken on a full-time basis and normally takes four to five years to complete.
• 5.5 FCE, including a doctoral practicum course and an internship course, as follows:
  • HDP 3222Y Approaches to Psychotherapy Across the Lifespan
  • HDP 3240H Advanced Social and Emotional Assessment Techniques
  • HDP 3241H Seminar and Practicum in Assessment and Intervention with Children (normally taken in Year 2 of the program). The practicum portion of HDP 3241H consists of 500 hours (two days a week from September to June) and is normally taken in a clinical setting.
  • HDP 3242Y Internship in School and Clinical Child Psychology. The internship consists of a 1600 hour placement, normally taken on a full-time basis over the course of a year near the end of the student’s program.
  • 1.0 FCE from the Instructional Interventions menu.
• 0.5 FCE from each of the following menus (for a total of 1.5 FCE): Psychosocial Interventions, Social Bases of Behaviour, and Biological Bases of Behaviour. **Note: Students who have a 1.0 FCE in Social Bases of Behaviour at the undergraduate level approved by the program may substitute an elective course for this requirement. Students who have a 1.0 FCE in Biological Bases of Behaviour at the undergraduate level approved by the program may substitute an elective course for this requirement.** A listing of courses in these menus is available on the department Web site at hdap.oise.utoronto.ca/pages/sccp_phd.html and in the Human Development and Applied Psychology Program Guidelines.
A comprehensive examination
A doctoral dissertation
Students must have successfully completed all course work, passed the comprehensive examination, and have their dissertation completed or well underway, prior to commencing their internship.
In addition, students will be required to take HDP 1201H Childhood and Adolescent Development, HDP 1287H Introduction to Applied Statistics, and HDP 3204H Contemporary History and Systems in Human Development and Applied Psychology, if equivalent courses have not been taken previously.
Students must achieve a minimum of A- in at least one of HDP 1215H Psychological Assessment of School-Aged Children and HDP 1216H Psychoeducational Assessment and must pass HDP 1218H Seminar and Practicum in Assessment and HDP 3241H Seminar and Practicum in Assessment and Intervention with Children in order to remain in good standing and be permitted to continue in the program.
Failure to meet these criteria will normally result in a recommendation to the School of Graduate Studies to terminate the student's registration in the program.

Course List
HDP 1200H Foundations of Human Development and Education
HDP 1201H Child and Adolescent Development
HDP 1209H Research Methods and Thesis Preparation in Human Development and Applied Psychology
HDP 1211H Psychological Foundations of Early Development and Education
HDP 1215H Psychological Assessment of School-Aged Children
HDP 1216H Psychoeducational Assessment
HDP 1217H Foundations of Proactive Behavioural and Cognitive-Behavioural Intervention with Children
HDP 1218H+ Seminar and Practicum in Assessment
HDP 1219H Ethical Issues in Applied Psychology
HDP 1220H Introduction to School and Clinical Child Psychology
HDP 1234H Foundations of Cognitive Science
HDP 1236H Developmental Psychopathology
HDP 1237H Cognitive Development and Learning
HDP 1238H Special Topics in Human Development and Applied Psychology
HDP 1241H Outcomes of Early Education and Child Care
HDP 1256H Child Abuse: Intervention and Prevention
HDP 1259H Child and Family Relationships—Implications for Education
HDP 1260H Children, Psychology and the Law
HDP 1265H Advanced Topics in Social and Personality Development
HDP 1272H Play and Education
HDP 1279H Preventative Interventions for Children at Risk
HDP 1284H Psychology and Education of Children and Adolescents with Behaviour Disorders
HDP 1285H Psychology and Education of Children with Learning Disabilities
HDP 1287H Introduction to Applied Statistics
HDP 1288H Intermediate Statistics and Research Design
HDP 1289H Multivariate Analysis with Applications
HDP 1290H Causal Inference Methods for Quasi-Experimental Data
HDP 1291H Structural Equation Modeling
HDP 1292H Test Theory
HDP 1293H Applied Research Design and Data Analysis
HDP 1299H Language Acquisition and Development
HDP 2200Y Child Study: Observation, Evaluation, Reporting, and Research
HDP 2201H Childhood Education Seminar
HDP 2202H Childhood Education Seminar II: Advanced Teaching
HDP 2210Y Introduction to Curriculum I: Core Areas
HDP 2211H Theory and Curriculum I: Language and Literacy
HDP 2212H Theory and Curriculum II: Mathematics
HDP 2214H Introduction to Curriculum II: Special Areas
HDP 2220H Teaching Practicum
HDP 2221Y Advanced Teaching Practicum
HDP 2275H Technology for Adaptive Instruction and Special Education
HDP 2280H Introduction to Special Education and Adaptive Instruction
HDP 2283H Psychology and Education of Gifted Children and Adolescents
HDP 2287H Classroom-Based Counselling Approaches
HDP 2288H Reflective Teaching and Analysis of Instruction
HDP 2292H Assessment for Instruction
HDP 2293H Interpretation of Educational Research
HDP 2296H Reading and Writing Difficulties
HDP 3200H Research Proseminar in Human Development and Applied Psychology
HDP 3201H Qualitative Research Methods in Human Development and Applied Psychology
HDP 3203H Children's Theory of Mind
HDP 3204H Contemporary History and Systems in Human Development and Applied Psychology
HDP 3205H Social and Moral Development
HDP 3209H Psychology of Language and Literacy
HDP 3221H Cross-Cultural Perspectives on Children's Problems
HDP 3222Y Approaches to Psychotherapy Across the Lifespan
HDP 3224H Advanced Proactive Behavioural and Cognitive-Behavioural Interventions
HDP 3225H Developmental Trajectories and High Risk Environments
HDP 3226H Research Methods and Doctoral Thesis Preparation in Human Development and Applied Psychology
HDP 3227H Multi-Level Modelling in Social Scientific and Educational Research
HDP 3229H Cognition and Emotion in Development
HDP 3230H Understanding Narrative
HDP 3231H Psychodynamic Bases of Therapy
HDP 3238H Special Topics in Human Development and Applied Psychology
HDP 3240H Advanced Social and Emotional Assessment Techniques
HDP 3241H+ Seminar and Practicum in Assessment and Intervention with Children
HDP 3242Y0 Internship in School and Clinical Child Psychology
HDP 3255H Systemic Family Therapy
HDP 3282H The Psychology of Critical Thinking
HDP 3286H Developmental Neurobiology
HDP 3292H Advanced Psychoeducational Assessment and Psychodiagnosis
HDP 3297H Biological and Psychological Foundations of Low Incidence Disorders
HDP 5271Y Assessment and Programing for Reading and Writing Difficulties
HDP 5281H Research and Theories of Reading Disability
HDP 5284Y0 Assessment and Intervention in Multicultural/Bilingual Contexts
JDS 1233H Cognitive Development and Applications
JDS 1249H Social-emotional Development and Applications
JDS 3000H Advanced Methods in Developmental Science
JHC 1251H Reading in a Second Language
JPX 1001H Parenting: Multidisciplinary Perspectives

**Individual Reading and Research Courses**

HDP 2295H Individual Reading and Research in Adaptive Instruction and Special Education: Master’s Level
HDP 3252H Individual Reading and Research in Human Development and Applied Psychology: Doctoral Level

Courses which may continue over a program. The course is graded when completed.

+Extended course. For academic reasons, course work is extended into session following academic session in which course is offered.
ITEM 14.1

Admissions and Programs Committee Annual Report 2008–09

The Admissions and Programs (A&P) Committee is a standing committee of GEC. It has the power to waive or modify, in individual student cases, the application of an SGS regulation concerning admissions, registration or enrolment. The Committee also considers petitions from graduate units on exemption from cases of non-standard admissions, leaves of absence, course extension deadlines, grading, program completion time limits, and posthumous degrees. The committee reports to GEC annually.

See attached documents:

- 2008-2009 SGS Admissions & Programs Committee Report
2008-2009
School of Graduate Studies
ADMISSIONS & PROGRAMS COMMITTEE REPORT

Mandate:
The SGS Admissions & Programs Committee and its delegates, the SGS Vice-Deans and SGS Student Services Officers, are responsible for making decisions on various non-standard cases including admission cases, third program extension requests, requests for non-standard grade revisions, requests for second course extensions and requests for second candidacy extensions. This report does not include statistics on daily, standard files that are acted upon by the Student Services Officers.

Committee Membership:
Members of the 2008-2009 A&P Committee were:

SGS Vice-Deans
Elizabeth Cowper, Programs
Berry Smith, Students

Divisional Representatives
Elizabeth Harvey, ENG(Div. I)
Scot Wortley, CRI (Div.II)
Zhirui Wang, MSE (Div.III)
Linda Wilson-Pauwels, BMC (Div.IV)

Student Representative
Ivy Wang, CHE*
Cindy Bongard, EEB*

*Student members alternate attendance at the meetings.

ACTIVITY REPORT, SEPTEMBER 1, 2008 – AUGUST 31, 2009:
The Admissions and Programs Committee or its delegates dealt with a total of 787 cases in 2008-2009. This represents an increase of 30% from last year and an increase of 46% over the total 540 cases in 2006-2007. In this period we had an increase in activity in all four divisions. The largest increases took place in Divisions III and IV. We also had a 66% increase in cases for doctoral students. For the first time this year, we have separated master’s student cases into doctoral stream master’s and professional master’s categories. Of the total 787 cases, 378 (48%) cases were for professional master’s students. Of these 378 cases, 343 were for students in Division II. Division II professional master’s students account for 44% of all non-standard cases.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Division I</td>
<td>49</td>
<td>1618</td>
<td>3.0%</td>
<td>70</td>
<td>1610</td>
<td>4.3%</td>
</tr>
<tr>
<td>Division II</td>
<td>455</td>
<td>5440</td>
<td>8.4%</td>
<td>506¹</td>
<td>5664</td>
<td>8.9%</td>
</tr>
<tr>
<td>Division III</td>
<td>39</td>
<td>2497</td>
<td>1.6%</td>
<td>89</td>
<td>2530</td>
<td>3.5%</td>
</tr>
<tr>
<td>Division IV</td>
<td>61</td>
<td>3945</td>
<td>1.5%</td>
<td>122</td>
<td>3984</td>
<td>3.1%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>604</td>
<td>13,500</td>
<td>4.5%</td>
<td>787</td>
<td>13,788</td>
<td>5.7%</td>
</tr>
</tbody>
</table>

¹ Included in this figure are 58 EMBA cases that were dealt with by EMBA staff and 96 OISE M.Ed. Pilot Project cases.
Of the total 787 cases, 331 (42%) were admissions cases and 456 (58%) were programs cases. Programs cases increased from 339 last year to 456 this year. Although this is an increase, the actual ratio between programs cases and admissions cases has remained fairly even over the past two years. It is, though, a shift compared to previous years when programs cases accounted for approximately 65% of all cases. Admissions cases have been increasing over the past few years; we had 331 admissions cases last year, 263 the year before, 139 admissions cases in 2004-2005 and as few as 95 in 2003-2004. Between 2003-2004 and 2008-2009 admissions cases have increased by 248%. We will probably continue to see this trend in future admission cycles as we increase the overall graduate student population. Division II continues to have the largest volume of non-standard activity with 506 cases or 64% of all cases.

Of the 787 total cases, 756 (96%) were approved and 31 (4%) were refused. This year’s approval/refusal ratio is very consistent with the previous two years, but represents an increase in approval rates compared to five years ago when we approved 84% of all cases.

### Admissions: Non-Standard Admissions Case

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>10</td>
<td>1</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>II</td>
<td>184</td>
<td>28</td>
<td>242(^2)</td>
<td>21</td>
</tr>
<tr>
<td>III</td>
<td>20</td>
<td>2</td>
<td>36</td>
<td>2</td>
</tr>
<tr>
<td>IV</td>
<td>20</td>
<td>0</td>
<td>24</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>234(^2) (88%)</td>
<td>31 (12%)</td>
<td>307 (93%)</td>
<td>24 (7%)</td>
</tr>
</tbody>
</table>

Non-standard cases included applicants who do not meet minimum TOEFL/TWE requirements, or minimum degree or grade average requirements. In this report we have included data on applicants with European Bologna degrees\(^3\) and Canadian applied college bachelor’s degrees. We had 5 applicants with Bologna degrees and all 5 were approved. We had 6 applicants with Canadian

\(^2\) This figure includes the approved EMBA program cases and the approved M.Ed. Pilot Project cases.

\(^3\) Bologna degrees are normally three-year first degrees (bachelor’s degrees) from European Bologna signatories.
applied college bachelor’s degrees; 5 were approved and 1 was refused. Of these 11 applicants, 9 applied to Division II programs and 1 applied to a Division III program.

This year we approved 93% of non-standard admission cases and refused 7%. Our refusal rate decreased this year compared to last year – 12% refused in 2007-2008 compared to 7% this year. This is a significantly lower refusal rate compared to several years back; in previous years we had approved approximately 80% of non-standard admissions cases and refused 20%. There were a total of 8,546 admission offers made for the 2009-2010 academic year and of these 307 (3.6%) were non-standard admissions.

**Programs:**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>38</td>
<td>0</td>
<td>61</td>
<td>4</td>
</tr>
<tr>
<td>II</td>
<td>241</td>
<td>2</td>
<td>241</td>
<td>2</td>
</tr>
<tr>
<td>III</td>
<td>16</td>
<td>1</td>
<td>50</td>
<td>1</td>
</tr>
<tr>
<td>IV</td>
<td>40</td>
<td>1</td>
<td>97</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>335 (99%)</strong></td>
<td><strong>4 (1%)</strong></td>
<td><strong>449 (98.5%)</strong></td>
<td><strong>7 (1.5%)</strong></td>
</tr>
</tbody>
</table>

Programs cases include non-standard leaves, second course extensions, second candidacy extensions, non-standard transfer credit requests, etc. Of the total 787 cases, 456 were programs cases and of these 449 (98.5%) were approved and 7 (1.5%) were refused. Last year we had a very comparable approval/refusal ratio. As in admissions, we have increased our rate of approved programs cases each year over the past several years; in 2001-2002 we had a record 74% approval/26% refusal ratio in programs cases.

The 456 programs cases represent 3.3% of the total 13,788 registered students in the 2008-2009 academic year. This is a slight increase compared to last year’s 2.5%. Although admissions cases have increased quite significantly over the last several years, we continue to have more programs cases. We have seen another increase in grade revision and second course extension cases this year. Last year we had a total of 202 course extension/grade revision requests, while this year we had 249; this year, the majority of these cases were in Division II followed by Division III, then Division I. There are very few such cases in Division IV. Once again this year we dealt with requests for second candidacy extensions. We had 25 requests this year compared to 9 last year and 15 the year before that. Once again this year Division III had only 2 non-standard transfer credit requests. This is certainly reflective of the changes that were made in the Division III transfer credit practice a few years back. Division III had a significant increase in non-standard program transfers; there were 17 this year compared to 3 last year. Other programs activity was distributed evenly in the various categories.
PROGRESS REPORT FOR NON-STANDARD ADMISSIONS APPROVED FROM SEPTEMBER 1, 2007 TO AUGUST 31, 2008.

<table>
<thead>
<tr>
<th>Reason</th>
<th>A average in first year</th>
<th>B average in first year</th>
<th>Failed in first year</th>
<th>Deferred admission to 20099</th>
<th>Did not register</th>
<th>No Grade Available</th>
<th>Withdrew</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicant did not meet SGS minimum TOEFL/TWE requirement</td>
<td>22</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>44</td>
</tr>
<tr>
<td>Applicant did not have equivalent to 4 year degree (or masters degree if applicable)</td>
<td>55</td>
<td>11</td>
<td>4</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td>82</td>
</tr>
<tr>
<td>Applicant did not meet SGS minimum mid B or B+ requirement</td>
<td>50</td>
<td>27</td>
<td>1</td>
<td>1</td>
<td>16</td>
<td>1</td>
<td>1</td>
<td>97</td>
</tr>
<tr>
<td>Applicant had ungraded previous degree</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Flexible Time PhD requirements</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>TOTAL</td>
<td>135</td>
<td>48</td>
<td>1</td>
<td>5</td>
<td>41</td>
<td>2</td>
<td>4</td>
<td>236</td>
</tr>
</tbody>
</table>

The Student Services Officers of the School of Graduate Studies follow up on the progress of non-standard admits annually. Of the 236 applicants who were admitted during 2007-2008, 190 registered, 41 did not register and 5 deferred admission to the following year. Of the 190 who registered, grades were available for 184 students. Of these 184, 73% maintained an A average and 26% maintained a B average; the other 1% fell in the other categories as indicated in the chart above. We had one student who failed this year; this student had not met the minimum B or B+ admission requirement. Our applicant with an applied Bachelor’s degree from Grant MacEwan College achieved an A average in her first year of studies in the MBA program at the Rotman School of Management. Four students withdrew from their programs. Students who did not meet
the minimum mid-B or B+ average accounted for 97 (41%) of the total 236 accepted non-standard admits and of those for whom grades are available in this category, 50 students maintained an A average while 27 students maintained a B average. Applicants who did not meet TOEFL/TWE requirements accounted for 44 (19%) of the total admitted non-standard applicants. In this category, 22 students had an A average and 9 students had a B average. Of the 41 approved M.Ed. Pilot Project admits, 32 registered and of these 32, 31 students achieved an A average. Of the 35 admission cases directly approved by EMBA staff, 35 registered and 15 of these students achieved an A average. Although this year, the progress report shows that more non-standard admits had B averages than last year, the overall numbers still indicate strong performances by non-standard admits.
Item 14.2

Registration Statistics Annual Report 2009-10

SGS reports to GEC annually on registration statistics.

See document:

• *SGS Registration 2009-2010* (to be distributed at the meeting)