UNIVERSITY OF TORONTO

Proposal for a Graduate M.Sc. and Ph.D. Program in Ecology and Evolutionary Biology

Department of Ecology and Evolutionary Biology

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1 Executive Summary

The Department of Ecology and Evolutionary Biology (EEB) was established on July 1, 2006 following a reorganization of the Departments of Botany and Zoology. For decades these departments have run very successful graduate programs that attract the best students from around the world. The tradition of graduate education in the fields of Botany and Zoology and their many subdisciplines is a long and successful one at the University. Bringing together professors and students with common interests in ecology and evolutionary biology will produce a stronger and more cohesive community of scholars.

The EEB graduate program will focus strongly on PhD students. The MSc program will be funded for one year while doctoral students will be funded for years 1-4 or 1-5 depending on whether candidates enter with or without a master's degree. Transfer from the MSc program into the PhD will be possible for students demonstrating excellence in research. The program should have positive impacts on graduate activities in cognate divisions because it offers new opportunities that are available to many University of Toronto students. Feedback from the Departments of Anthropology, Cell and Systems Biology, Chemical Engineering, Geography and Geology as well as the Centre for Environment and the Faculty of Forestry has been generally supportive with indications that some EEB courses will be of interest to other departments as will the possibility of developing collaborative programs.

Since EEB has resulted from a reorganization of two previously existing departments, the resources required for the new department and its graduate program are in place. A process for reallocating these resources between EEB and CSB is ongoing and includes consideration of the buildings in which the departments will be housed, faculty and student offices, labs and all the required laboratory equipment and support. Computing facilities are in hand as are more general resources such as the library.

2 Academic

2.1 Description and rationale for the proposal

2.1.1 Description of proposed program

The Departments of Botany and Zoology have existed for many years at the University of Toronto and were recently reorganized into the Departments of Ecology and Evolutionary Biology and Cell and Systems Biology in order to create more effective groupings of professors and students with common research interests and infrastructure requirements. The new departments were established on July 1, 2006. The establishment of the new departments requires the development of the new graduate program as described in this brief. Until this program is developed, the old graduate programs in Zoology and Plant and Microbial Biology (formerly Botany) will continue to be administered by EEB. EEB faculty and students are still largely in the offices and labs they occupied before July 1 and hence are split between two buildings – the Ramsay Wright Zoology Labs and the Earth Sciences Centre. However plans are already being made to renovate these two buildings so that EEB faculty and students will ultimately be housed in a single location.

There will be two graduate programs in Ecology and Evolutionary Biology. The MSc program leads to the degree of Master of Science while the PhD program leads to the degree of Doctor of Philosophy. These programs are available to graduate students on all three campuses of the University of Toronto. Students will be able to complete both degrees in Ecology and Evolutionary Biology and may also enrol in some collaborative programs in which Ecology and Evolutionary Biology participates (Biomedical Toxicology, MSc and PhD; Environmental Studies, MSc and PhD; Proteomics and Bioinformatics, PhD).

2.1.2 Rationale for proposal

Master's program:

The MSc is a 12-month program intended to provide the student with an opportunity to engage in supervised research and to provide professors with an opportunity to judge the student's research potential. Students undertake a project as part of ongoing research activities in the laboratory with the student having principal responsibility for completing the project and contributing to the publication of a scientific paper. This program will prepare students to enrol in advanced graduate degree programs and to seek a wide variety of employment in organizations such as government or private labs requiring research experience. These objectives will be achieved by requiring students to take a graduate course, attend departmental research seminars, and to write and defend a thesis.

PhD program:

The primary objective of the PhD program is to prepare candidates for a career in advanced research and teaching. These students will engage in an independent research program for which the design and implementation is their responsibility. Graduates are expected to have broad knowledge in Ecology and Evolutionary Biology, to be capable of designing, funding, and executing highly competitive research programs, and to have extensive experience in communicating research results through primary publications and conference presentations. This program will prepare students to receive advanced postdoctoral training, and to seek employment at universities and government and private organizations requiring individuals with advanced scientific training. These objectives will be achieved by requiring students to take graduate courses, pass an appraisal exam at which mastery of concepts in the research field and a written research report are judged, give two public presentations of their research to the whole department, and to submit a thesis and defend it at a final oral examination held by the School of Graduate Studies.

There are many graduate programs in Ecology and Evolutionary Biology in the United States (e.g., Princeton University, The University of Arizona, University of California Irvine, Cornell, Yale) but as far as is known the new EEB program will be unique in Canada. Its uniqueness compared to the US programs is difficult to identify other than to say that EEB has an exceptionally talented professoriate that attracts top graduate students from around the world and can offer the facilities and academic interactions found only at large, research-intensive universities such as Toronto.

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

The Department of Evolutionary Biology and the Department of Cell and Systems Biology are new departments resulting from the reorganization of the old Departments of Botany and Zoology. All of the EEB graduate students are currently registered in the graduate programs in Zoology and Plant and Microbial Biology (formerly Botany). EEB is committed to "grandparenting" these programs until the last student has graduated or until the last student has transferred to a new EEB graduate program once it is established. While it is necessary to develop a new EEB graduate program, high quality graduate education in the fields of ecology and evolutionary biology has existed at the University for many decades in the previous Botany and Zoology departments. The new program will contain some unique features and procedures, but it will draw heavily from the strong traditions established in Botany and Zoology.

2.3 Projected student demand

Table 1

PROJECTED INTAKE AND ENROLMENTS
Master's (M) and Doctoral (D) Programs

YEAR	FULL-TIME				TOTAL ENROLMENT	
	Intake		Enrolments			
	M	D	M	D	M	D
2008/09	14	17	19	71	33	88
2009/10	15	19	21	78	36	97
2010/11	17	21	23	86	40	107
2011/12	18	23	26	95	44	118
2012/13	20	26	28	104	48	130
2013/14	22	28	31	115	53	143
2014/15	22	28	31	115	53	143

In the past, ecology and evolutionary biology students enrolled in both the old Departments of Botany and Zoology through the existing degree programs. Enrolment targets varied considerably over the past seven years however graduate enrolments in both departments remained about the same or grew modestly.

Average yearly attrition rates (transfers from MSc to PhD, withdrawals, graduations) from the past seven years calculated for both Botany and Zoology graduate programs are assumed, and a 10% annual increase in enrolment in both the MSc and PhD programs applied. This rate of increase is in line with projected faculty appointments and expected increases in external grant support as faculty members increase in scientific stature. The steady state is projected to be reached by 2013/14.

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

Because the Department of Ecology and Evolutionary Biology is not a new unit but rather involves a redistribution of existing faculty, students and resources from the previous Departments of Botany and Zoology, the proposed EEB graduate program will not have any impacts other than a considerable enhancement of the quality of graduate educational opportunities in the fields of ecology and evolutionary biology.

2.5 Evidence of consultation with other affected divisions

A document outlining the proposed EEB graduate program approved by EEB faculty was circulated to the Departments of Anthropology, Cell and Systems Biology. Chemical Engineering, Geography, Geology, the Faculty of Forestry and the Centre for Environment. In each case comments were requested on the proposal, particularly if overlap with existing programs was detected. Responses were received from all units, were supportive of the program and saw no overlap or conflicts.

2.6 Appropriateness of the name and designation of the new program

The fields of ecology and evolutionary biology are well established areas of research and graduate training in academic circles.

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

2.7.1 Program description and requirements

Master's Program

Admission regulations
Applicants are accepted under the general regulations of the School of Graduate Studies. A four-year University of Toronto bachelor's degree or its equivalent from a recognized university is required. Applicants must have an average grade equivalent to a University of Toronto B+ or better in the last year of the bachelor's degree as well as an average grade of at least a B in the previous year. Students will not be admitted until they have made arrangements for a research supervisor by contacting professors in the Department.

Program regulations
The duration of the M.Sc. program is one year. Students must complete a 0.5 full-course equivalent (FCE) graduate course chosen from the Courses of Instruction (the Faculty Research Course is recommended). A thesis is completed under the direction of the student's supervisor, assisted by an advisory committee, and defended at a departmental oral examination.

A supervisory committee of the supervisor plus two other professors meets within a month or so of first registration to discuss research plans. A second meeting of the supervisory committee will take place 8 – 9 months after registration to review progress and make any recommendations for completion of the degree. The student must prepare a written progress report for this meeting. MSc students must demonstrate competence in independent research would normally author or co-author research results for primary publication.

PhD Program

Admission regulations
Applicants are accepted under the general regulations of the School of Graduate Studies. Students will not be admitted until they have made arrangements for a research supervisor by contacting professors in the Department. There are three routes of entry to the Ph.D. program:

1 Applicants already holding an M.Sc. degree or its equivalent from a recognized university with an average equivalent to at least a University of Toronto A- during the M.Sc. and an average of at least B+ in the last year of the bachelor's program may be accepted.
2 Applicants may be accepted first into the M.Sc. program from a bachelor's program and, conditional upon evidence of research excellence as judged by the thesis supervisory committee, may transfer into the Ph.D. program.
3 Exceptional applicants may be accepted for direct entry into the Ph.D. with a B.Sc. degree or equivalent, an average grade equivalent to a University of Toronto A- or better in courses in ecology and evolutionary biology and evidence of research potential.

Program regulations
The duration of the Ph.D. program is four years (in exceptional cases five years if entering without an M.Sc. degree). Students must complete two FCE graduate courses chosen from the Courses of Instruction (1.5 FCE for students entering with an M.Sc.). Students transferring into the Ph.D. from the M.Sc. may apply 0.5 FCE graduate courses towards the PhD course requirement. All students are examined 18 months into the program on both their mastery of concepts in ecology and evolutionary biology and a submitted research proposal. Students must deliver two public seminars in the Department on their thesis research, and must submit a thesis and defend it at an oral examination conducted by the School of Graduate Studies.

Exceptional students may transfer from the MSc program by demonstrating research excellence at the second meeting of the MSc advisory committee held 8 – 9 months after registration. These students would register for the PhD program at the beginning of their second year of graduate studies.

Exceptional students admitted to the PhD program without an MSc degree will be admitted into a five-year program and will be required to complete coursework equivalent to the Master's program in addition to the PhD course requirements.

All PhD students are expected to complete an original independent research program that makes substantial and innovative contributions to their field of research. It is expected that PhD candidates will publish a number of primary scientific papers based on their research.

A supervisory committee comprising the supervisor and two other EEB faculty members meets shortly after September registration to evaluate the student's background and research plans, and meets at least once per year after that to review the student's progress. The student must prepare written progress reports for these meetings. The appraisal examination held no later than 18 months following registration consists of a public part during which the candidate gives a seminar on the thesis work to the whole department and an *in camera* part. During the *in camera* phase the student would be expected to demonstrate senior undergraduate competence in general biological principles, mastery of fundamental ecological and evolutionary concepts, advanced expertise in their research specialization, and to defend a strong research proposal. A final supervisory committee meeting would be held approximately three months before the final oral exam to ensure the student is prepared for the final exam held according to School of Graduate Studies regulations. All students would be expected to present a second departmental seminar on their thesis research during the six month period before the final oral examination.

2.7.2 Course titles/numbers

Table 2 lists the graduate courses offered during each of the past three years with the enrolments. Undergraduate students are not permitted to enrol in graduate courses except those offered below for joint undergraduate/graduate credit.

TABLE 2

Courses Offered to Graduate Students in the Past Three years (G = graduate, UG = undergraduate registrants, 0 = offered but no enrolment, N/A = not offered)				
Course	**Faculty member(s) responsible**	**2004-05**	**2005-06**	**2006-07**
***BOT1328H Physiological Ecology**	R. F. Sage	3G	N/A	N/A
BOT1700H Seminar	S. Barrett, M. Campbell, D. S. Guttman, P. Kotanen	7G	4G	0G
JBF1436H For. Landscape Ecology	T. J. Carleton	N/A	4G	N/A
***JBZ1472H Computational Genomics & Bioinformatics**	D. S. Guttman	5G/24U	6G/26U	10G/38U
JZB1459H Population Genetics	A. Agrawal	10G	0G	N/A
JZB1520H	P. A. Abrams, A. Agrawal, A. Cutter, L. Rowe,	0G	10G	9G

Courses Offered to Graduate Students in the Past Three years (G = graduate, UG = undergraduate registrants, 0 = offered but no enrolment, N/A = not offered)				
Course	**Faculty member(s) responsible**	**2004-05**	**2005-06**	**2006-07**
Evolutionary Ecology	B. Shuter, J. Stinchcombe			
***JZB1521H** **Molecular Evolution**	A. Baker, D. Irwin	6G/35UG	2G/41UG	6G/40UG
ZOO1000H **Advanced Biostatistics**	M.-J. Fortin	0G	21G	N/A
ZOO1002H **Adv. Sem. & Reading Course**	Various	27G	17G	22G
ZOO1002Y **Advanced Research and Reading**	Various	1G	1G	1G
***ZOO1004Y** **Vert. Palaeontology**	R. Reisz	3G/27UG	1G/30UG	2G/60UG
ZOO1005H **Spatial Statistics In Landscape Analysis**	M.-J. Fortin	3G	0G	10G
ZOO1006H **Recent Advances in Integrative Physiology**	L. Buck	7G	11G	7G
***ZOO1013H** **Limnology**	H. Cyr, A. Zimmerman	3G/11UG	0G/0UG	6G/5UG
ZOO1022H **Advanced Molecular Evolution**	B. Chang	0G	6G	N/A
ZOO1040H **Multivariate Analysis in Biology**	D. A. Jackson	19G	N/A	N/A
ZOO1462H **Phylogenet Systemat**	D. C. Darling, R. W. Murphy	2G	0G	N/A
ZOO1500H **Conceptual Problems in Eco/Evo**	A. Agrawal, N. C. Collins, D. Jackson, N. Lester, H. Rodd, B. Shuter, J. Thomson	16G	16G	18G
***ZOO1505H** **Develop of Evolution Thought**	D. Brooks et al.	3G	0G	N/A
ZOO1511Y **Systematic Entomology**	D. C. Darling	N/A	N/A	1G
ZOO2217H **Animal Sound & Vibration**	A. Manson	1G	6G	N/A

* Indicates a joint graduate/undergraduate course.

Table 2 shows that a wide variety of graduate courses have been offered in the Departments of Botany and Zoology over the past three years. Enrolments have varied considerably among years and among courses. Many have had low enrolment and only a few have had consistently high enrolment.

EEB faculty members or ROM scientists holding University appointments teach the majority of graduate courses taken by EEB graduate students. Cross-appointed professors offer very few courses and these are primarily courses in other departments that our graduate students may occasionally take.

The new EEB graduate program will include only a moderate number of graduate courses covering the major EEB topic areas. They will be offered on a predictable, rotating schedule to ensure that both students and faculty can plan ahead. The frequency with which the various courses will be offered reflects a balance between the number of courses that EEB faculty can offer in a given year and the provision of a comprehensive range of choices to the students. Faculty teaching assignments in the courses would be determined by the Department Chair in consultation with the Chairs at UTM and UTSc. While the course titles are meant to indicate the general topic area, it is understood that the precise information presented will vary among years and professors and to a degree student interests. Some courses may be co-listed with an undergraduate course but the majority of courses will be "pure" graduate courses.

Note: All courses are 0.5 FCE.

1) Faculty Research Course (offered annually)
   This course is meant to be an opportunity for faculty to present their research programs to graduate students and for the students to learn about the research in EEB. Each professor would contribute one or two weeks of lecture or discussion. The course could be held in an informal setting and students would receive a letter grade based on quality of participation and submitted reports.

2) Methods/Topic Courses
   a. Philosophy and Methods (offered every 2 years) [introduces students to the formalities and techniques of scientific research]
   b. Ecology (offered every 2 years) [e.g. "Conservation biology", "Modelling"]
   c. Evolution (offered every 2 years) [e.g. "Systematics", "Phylogenetics"]
   d. Advanced Statistics (offered every 2 years)
   e. Multivariate Statistics (offered every 2 years)
   f. Spatial Statistics (offered every 3 years)
   g. Behaviour (offered every 3 years)
   h. Population Genetics (offered every 3 years)

3) Seminar Courses
   a. Special Topics in Ecology (offered every 2 years) - topic can vary to suit interests of faculty/students – e.g. "Classic papers in community ecology", "Seminar in invasion ecology"]
   b. Special Topics in Evolution (offered every 2 years) - e.g. "Seminar in the evolution of virulence"]
   c. Special Topics in Integrative Biology (every 2 years) - e.g. "Seminar in hormones and behaviour"]

4) Elective Credit – can be taken from any department/program at the University, including but not limited to CSB, Forestry, Geography, Geology, Mathematics, Statistics and courses sponsored by the Centre for the Analysis of Genome Evolution And Function, with approval of supervisory committee and graduate office).

2.7.3 Faculty members

Table 3 lists the faculty members involved in the graduate program, identifies their field affiliation and indicates gender, and expected retirements in the next seven years.

TABLE 3

Faculty Members by Field						
				Fields		
Faculty Name & Rank	**M/F**	**Home Unit[1]**	**Supervisory Privileges[2]**	**Ecology**	**Evolution**	**Integrative Biology**
Category 1[3]						
Abrams, Peter – Professor	M	EEB	Full	X		
Agrawal, Aneil – Assistant	M	EEB	Full		X	
Anderson, James – Professor	M	UTM[4] Biology	Full		X	
Andrade, Maydianne – Associate	F	UTSc[5] Life Sciences	Full		X	
Baker, Robert – Professor	M	EEB	Full	X		
Barrett, Spencer – Professor	M	EEB	Full		X	
Boonstra, Rudy – Professor	M	UTSc Life Sciences	Full	X		
Brooks, Dan – Professor	M	EEB	Full		X	
Chang, Belinda – Assistant	F	EEB/CSB	Full			X
Collins, Nick – Associate	M	UTM Biology	Full	X		
Cutter, Asher – Assistant	M	EEB	Full		X	
Cyr, Helene – Associate	F	EEB	Full	X		
Eckenwalder, James – Associate	M	EEB	Full			X
Fortin, Marie-Josee – Professor	F	EEB	Full	X		
Fullard, James – Professor	M	UTM Biology	Full			X
Fulthorpe, Roberta – Associate	F	UTSc Life Sciences	Full			X
Gibo, David – Associate	M	UTM Biology	Full		X	
Gross, Mart – Professor	M	EEB	Full		X	
Gwynne, Darryl – Professor	M	UTM Biology	Full		X	
Jackson, Don – Professor	M	EEB	Full	X		
Kohn, Linda – Professor	F	UTM Biology	Full			X
Kotanen, Peter – Associate	M	UTM Biology	Full	X		
Kronzucker, Herbert – Associate	M	UTSc Life Sciences	Full			X
Levine, Joel – Assistant	M	UTM Biology	Full			X
Lovejoy, Nathan – Assistant	M	UTSc Life Sciences	Full		X	
Manne, Lisa – Assistant	F	UTSc Life Sciences	Full	X		

Faculty Members by Field						
				Fields		
Faculty Name & Rank	**M/F**	**Home Unit[1]**	**Supervisory Privileges[2]**	**Ecology**	**Evolution**	**Integrative Biology**
Mason, Andrew – Associate	M	UTSc Life Sciences	Full			X
McLennan, Deborah - Associate	F	EEB	Full		X	
Reisz, Robert – Professor	M	UTM Biology	Full		X	
Rising, Jim – Professor	M	EEB	Full	X		
Rodd, Helen – Associate	F	EEB	Full		X	
Rowe, Locke – Professor	M	EEB	Full		X	
Sage, Rowan – Professor	M	EEB	Full			X
Sage, Tammy – Assistant	F	EEB	Full			X
Sokolowski, Marla – Professor	F	UTM Biology	Full			X
Sprules, Gary – Professor	M	UTM Biology	Full	X		
Stefanovic, Sasa – Assistant	M	UTM Biology	Full			X
Stinchcombe, John – Assistant	M	EEB	Full		X	
Thomson, James – Professor	M	EEB	Full		X	
Wagner, Helene – Assistant	F	UTM Biology	Full	X		
Weis, Art – Professor	M	EEB	Full	X		
Williams, Dudley – Professor	M	UTSc Life Sciences	Full	X		
Zimmerman, Anne – Professor	F	EEB	Full	X		
Category 2						
Baker, Alan J. – Professor	M	ROM[6]	Full		X	
Calder, Dale R. – Associate		ROM	Full		X	
Caron, Jean-Bertrand – Assistant	M	ROM	Associate		X	
Currie, D – Associate	M	ROM	Full		X	
Darling, Chris – Associate	M	ROM	Full		X	
Dickinson, Tim – Associate	M	ROM	Full	X		
Engstrom, Mark – Associate	M	ROM	Full		X	
Healy, Claire – Assistant	F	ROM	Associate		X	
Moncalvo, Jean-Marc – Assistant	M	ROM	Full		X	
Murphy, R.W. – Professor	M	ROM	Full		X	
Winterbottom, R. – Professor	M	ROM	Full		X	

Faculty Members by Field						
				Fields		
Faculty Name & Rank	**M/F**	**Home Unit[1]**	**Supervisory Privileges[2]**	**Ecology**	**Evolution**	**Integrative Biology**
Category 3						
Arhonditsis, George – Assistant	M	UTSc	Full	X		
Buck, Les – Associate	M	CSB[7]	Full			X
Campbell, Malcolm – Associate	M	CSB	Full			X
Carleton, Terry – Associate	M	Forestry	Full	X		
Guttman, David – Associate	M	CSB/EEB	Full			X
Irwin, David – Professor	M	Laboratory Medicine and Pathobiology	Full			X
Smith, Sandy – Professor	F	Forestry	Full	X		
Thomas, Sean – Associate	M	Forestry	Full	X		
Wittnich, Carin – Professor	F	Dept. of Surgery	Associate			X
***Category* 4**						
Dengler, Nancy – Emeritus Professor	F	EEB	Full			X
Harvey, Harold – Emeritus Professor	M	EEB	Full	X		
Johnson, Timothy B. – Adjunct	M	OMNR[8]	Associate	X		
Jefferies, Robert – Emeritus Professor	M	EEB	Full	X		
Lester, Nigel P. – Adjunct	M	OMNR	Associate	X		
Mandrak, Nicholas – Adjunct	M	DFO[9]	Associate	X		
McAndrews, Jock – Emeritus	M	ROM	Full			X
Minns, Charles K. – Adjunct	M	DFO	Associate	X		
Morris, G.K. – Emeritus Professor	M	UTM Biology	Full			X
Ridgway, Mark – Adjunct	M	OMNR	Associate	X		
Shuter, Brian – Adjunct	M	OMNR	Associate	X		
***Category* 5**						
Evans, D. – Assistant	M	ROM	Associate		X	
Fitzpatrick, M. – Assistant	M	UTSc Life Sciences	Full			X
Short, S. – Assistant	M	UTM Biology	Full			X
TBA (Theoretical Biologist; current search)		UTM Biology		X		
TBA (Ichthyologist; current search)		ROM			X	
TBA (Plant Ecologist; 2008 approved		EEB		X		

Faculty Members by Field						
				Fields		
Faculty Name & Rank	**M/F**	**Home Unit[1]**	**Supervisory Privileges[2]**	**Ecology**	**Evolution**	**Integrative Biology**
position)						
TBA (Community Ecologist; 2008 approved position)		UTSc Life Sciences		X		

The University of Toronto does not have mandatory retirement. Professors can begin a three-year phased retirement as early as age 57 for retirement at age 60, or can retire any time after age 60. There are seven faculty members who will be eligible for retirement at age 65 during the coming seven-year period. Only one has indicated an intention to retire during the next six years.

[1] This is the budget unit paying the salary: department, school, research centre or institute, or other.
[2] Full = full supervisory privileges, Associate = co-supervisions only
[3] Category 1: tenured or tenure-track core faculty members whose graduate involvement is exclusively in the graduate program under review. For this purpose the master and doctoral streams of a program are considered as a single program. Membership in the graduate program, not the home unit, is the defining issue.
Category 2: non-tenure-track core faculty members whose graduate involvement is exclusively in the graduate program under review.
Category 3: 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.
Category 4: other core faculty: this category may include emeritus professors with supervisory privileges and persons appointed from government laboratories or industry as adjunct professors. Please explain who would fall into this category at your institution.
Category 5: faculty appointed but who have not yet arrived at the University, searches underway, positions approved for the future.
[4] University of Toronto Mississauga
[5] University of Toronto Scarborough
[6] Royal Ontario Museum
[7] Cell and Systems Biology
[8] Ontario Ministry of Natural Resources
[9] Department of Fisheries & Oceans (Government of Canada)

There are 74 people with graduate appointments in the Department of Ecology and Evolutionary Biology. Of these, 43 are core faculty members located in the Department (Category 1 only, Table 3) - 13 at the Mississauga Campus, 7 at the Scarborough Campus and the remaining 22 at the St. George Campus. It is a bit difficult to compare these numbers to the situation at the time of the last OCGS reviews since the departmental structure has changed. Nevertheless there has been a net increase of about 5 core faculty positions in ecology and evolutionary biology since the last review – 10 professors were hired across all three campuses and five retired.

There are eleven scientists at the Royal Ontario Museum who have Status-Only appointments in EEB (Category 2). Appointment letters for these positions stating the duration and conditions of the appointment are given to appointees and are on file in the Department. The chair will conduct annual reviews of the appointments following University regulations. ROM scientists are initially given Associate Membership in the Graduate Faculty in EEB (can only co-supervise PhD students) but are typically given Full Membership before long. They are able to apply for research grants. They greatly extend the expertise of the Department through their curatorial work and research in a variety of systematic, taxonomic and paleontological areas.

Nine professors hold primary graduate appointments in departments as diverse as Forestry, Cell and Systems Biology, Geography and Medicine (Category 3). These professors contribute principally by supervising or co-supervising EEB students in these fields of

research.

A unique group of six aquatic scientists from nearby provincial (Ontario Ministry of Natural Resources) and federal (Department of Fisheries and Oceans) have appointments as Adjunct Professors in EEB (Category 4). The Chair conducts annual reviews of the appointments following University regulations. These scientists are given Associate Membership in the Graduate Faculty in EEB and may be co-investigators on research grants held by full-time faculty members. They can co-supervise students, have access to University library and computing resources, may have an office at the University and may teach graduate courses. In return they typically provide substantial portions of the annual stipend for the students they co-supervise. This arrangement has worked extremely well; the number of graduate students in aquatic ecology has increased considerably and students are attracted to the somewhat more applied problems they research. The remaining five faculty members in see Category 4 are core EEB emeritus professors who are still actively supervising graduate students.

Seven faculty positions in EEB have just recently been filled, are currently being searched, or have been approved for the future (Category 5). Two positions have been approved for 2008 - a plant ecologist position at the St. George Campus and a community ecologist position at the Scarborough campus. At the Mississauga Campus a Microbial Ecologist search has just been successfully completed (Dr. Steven Short), and a search is currently underway for a Theoretical Biologist (see Appendix 2). At the Scarborough Campus an Evolutionary Behavioural Geneticist has just been hired (Dr. Mark Fitzpatrick). At the Royal Ontario Museum (ROM) a Vertebrate Paleontologist has recently been appointed (Dr. David Evans) and an Ichthyology position is currently being searched (see Appendix 3). All of these new appointments are well within the financial and physical resources of EEB.

The University uses a five-year “complement planning” process to determine the size of the professoriate in the departments. At the last OCGS review the old Departments of Botany and Zoology had submitted complement plans but the new departments resulting from reorganization have not yet done so. Nevertheless the Dean of the Faculty of Arts and Science has clearly indicated that EEB will not lose any ecology/evolution positions awarded to the old departments, and this in combination with enrolment and faculty growth at the Mississauga and Scarborough campuses are strong indicators of future growth in EEB graduate faculty.

3 Students

3.1 Student affairs and services

All students will be governed by the usual practices, procedures and regulations of the School of Graduate Studies and the University of Toronto and students will have access to all the usual student services. Students who will be involved in field research will be governed by School of Graduate Studies and University regulations affecting such activities.

3.2 Student conduct and discipline

All EEB graduate students will be governed by the usual policies and regulations of the School of Graduate Studies and the University of Toronto.

3.3 Student registration and information systems

All usual registration and enrolment procedures will apply for EEB students.

Appendix 1 – Report of University Librarian

BACKGROUND

The University of Toronto libraries provide a rich resource for the support of graduate study in the field of ecology and evolutionary biology. While there is a specific literature that focuses on ecology and evolutionary biology which we collect extensively, the research collection in this area is enhanced by its location in a university library system which through its collections and acquisitions policy supports research and teaching in all areas of the biological, health, physical, social and behavioural sciences and the humanities. The increasingly cross-disciplinary nature of much of the research in the life sciences means that it is extremely difficult to draw firm boundaries around an area or speciality.

DESCRIPTION OF THE COLLECTION

Monographs

The Library's holdings related to ecology and evolutionary biology specifically, and the life sciences more generally, have been built up in a systematic way since 1966 when Dealer Selection Orders were established and librarians employed to monitor the plans and to actively and systematically select research materials that fall outside the plans.

Research material supporting the ecology and evolutionary biology program comes from a wide range of subject areas across the life sciences including the plant sciences, animal sciences, molecular biology, genetics, genomics, cell biology, cytology, developmental biology, systems biology, bioinformatics, proteomics, the neurosciences, biotechnology and evolutionary biology.

In the life sciences, as in other areas of the collection, it is the policy of the Library to acquire a single copy of all books published in English that are considered to be of research value. This includes the proceedings of conferences and symposia, technical handbooks and reference tools in addition to research monographs. The cross-disciplinary nature of research in ecology and evolutionary biology makes a simple evaluation of the Library's holdings difficult. However, the 2001 edition of the North American Title Count [1] can be useful in comparing the University of Toronto's holdings with that of other similar institutions.

Books that relate to all areas of biology and natural history are classed by the Library of Congress within the call number range *QH*. Within this range, the University of Toronto Library, with 19,554 titles, ranked sixth of sixty-one libraries in the survey. When compared only to other academic libraries in the survey the Library ranked fifth.

Books that discuss zoology in all its aspects are classed by the Library of Congress in the call number *QL*. In this range the University of Toronto Library, with 19,646 titles ranked eighth. When measured against other academic libraries, the University of Toronto Library would take the seventh position in the survey.

Books relating to microbiology are classed by the Library of Congress in the range *QR* and by the National Library of Medicine in *QW*. In a count of libraries using either classification system the University of Toronto Library, with 5,194 titles ranked fifth. When measured against other academic libraries the University of Toronto Library would take the third position.

Books discussing plant sciences are classed by the Library of Congress in *QK*. In a count of books in this range the University of Toronto Library with 11,373 titles ranked thirteenth of sixty-one libraries. Among academic libraries the University of Toronto Library ranked twelfth.

The currency of the collection is also important. There have been ongoing improvements in the library's

1 *North American Title Count, 2001*. Chicago: American Library Association.

ability to get English language materials to the shelves quickly, and at present there is not a backlog for books in the life sciences.

Journals

The journal holdings of the University of Toronto Library are substantial. However, like all North American libraries we are experiencing great difficulty in keeping up with the rising cost of serial subscriptions. From 1986 until the past few years we were able to buy few new titles. During the 1990's the Library, in consultation with faculty, actually cancelled subscriptions equal in cost to approximately 10% of the total serials budget. However the situation has improved significantly during the past several years due to the Library's holdings of electronic journals. At the present time over 33,000 such journals are available to students and staff at the university. Many of these are new to the Library's holdings.

The most recent statistics compiled by the Library show the total number of journal subscriptions currently held in the life and health sciences is 3,140[2]. A check of the ISI journal citation reports (2005)[3] (JCR) can often provide some insight into the strength of the Library's holdings in particular disciplines. In the category "Evolutionary Biology," the University of Toronto Library holds all of the top twenty-five journals as ranked by Impact Factor. All of these journals are available electronically to staff and students.

Journals relating to animal behaviour are placed by ISI in the subject category "Behavioural Sciences." In this category the University of Toronto Library holds all the top twenty-five journals as ranked by impact factor. Of these, twenty-four are held electronically.

In the subject category "Cell Biology," the University of Toronto Library holds twenty-four of the top twenty-five journals ranked by Impact Factor. All twenty-four journals held by the Library are available online for staff and students at the University.

In the subject category "Biochemistry and Molecular Biology," the University of Toronto Library holds all the top twenty-five journals ranked by Impact Factor. Of these journals, twenty-two are available electronically to staff and students.

In the category "Developmental Biology," the University of Toronto Library holds all the top twenty-five journals ranked by Impact Factor. Of these, twenty-one are available online to staff and students.

In the subject category "Biology," the University of Toronto Library holds twenty-four of the top twenty-five journals ranked by Impact Factor. All twenty-four are available online to staff and students.

In the subject category "Zoology" the Library holds all the top twenty-five journals ranked by Impact Factor; each of these is available online to staff and students.

Electronic Resources

The electronic information services at the University of Toronto Library have been evolving since 1987, when the first online catalogue was mounted[4]. 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 up until the 1980's were searched by trained intermediaries. Beginning in the late 1980's CD-ROM's and networked databases widened the access of electronic databases to the end-user to perform his or her own searches. In 1991 the Library added seven H.W. Wilson periodical index databases to its electronic network. Today the Library offers over 350 periodical index databases through a variety of information systems to all members of the University of Toronto community. Some of these indexes allow users to search and retrieve citations to journal articles

2 University of Toronto Library. Annual statistics, May1, 2004 – April 30, 2005. Toronto: The Library, 2005

3 *Science Citation Index Journal Citation Reports, 2004.* Philadelphia: Institute for Scientific Information, 2005.

4 Clinton, Peter. From Felix to the digital library and beyond. UTLibrary news, winter 1997/98, p. 2-3.

and then to display the full text of that article electronically. Specialists in ecology and evolutionary biology will find the following databases of interest: Science Citation Index; Biosis Previews; Biological Sciences; Faculty of 1,000 Biology; Zoological Records Plus; Entomology Abstracts; Cab Abstracts; Animal Behaviour Abstracts; Scopus; Medline; ISI Conference Proceedings; and Proquest Digital Dissertations.

As mentioned earlier the Library also offers links to 15,000 electronic journals to the University of Toronto community via the Library's web pages. Some 60% of these journals have the full text of their articles available for viewing, printing, and in some cases emailing, by University of Toronto staff and students.

The Library is also committed to building a collection of electronic books in appropriate subject areas and has recently purchased a comprehensive collection of ebooks published by Springer from 2005 through 2007. As with electronic journals, these books are available online to all staff and students at the University.

SUPPORTING COLLECTIONS

Although the main life sciences collections are housed in the Gerstein Science Information Centre and the Noranda Earth Sciences Centre, graduate students in ecology and evolutionary biology can also make use of the large collection of life sciences materials held by the Library of the Royal Ontario Museum. Among other areas the Library collects books and journals related to botany, entomology, herpetology, ichthyology, invertebrate zoology, mammalogy, mycology, ornithology,

REFERENCE SERVICES

Given the cross-disciplinary nature of much of the research in the life sciences, and the increasing importance of electronic resources, including the World Wide Web, it is important to recognise that the reference and instructional services offered by the Library play a key role both in making our own collections accessible and in facilitating access to the national and international information networks. The Library is increasingly playing an important role in the linking of teaching and research in the university.

Reference services offered at the Noranda Earth Sciences Centre include help in searching the collection, the verification of citations, training in the use of databases and electronic journals, the searching of online and print union list files to locate materials not available on campus, and the handling of interlibrary loans. For some locations, e.g. CISTI, it is now possible to process transactions electronically thereby decreasing the time required to fill requests.

BUDGET AND COMMITMENT

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 acquisitions budget from rising costs and to maintain this protected status. This present financial policy allows the Library to maintain its current purchasing levels for publications relevant to ecology and evolutionary biology ensures continued support for the program.