



**FOR APPROVAL**

ITEM 4 (d) – GOVERNING COUNCIL – June 27, 2013

**TO:** Planning and Budget Committee

**SPONSOR:** Gail Milgrom, Director, Campus and Facilities Planning

**CONTACT:** 416-978-5515

**DATE:** April 30, 2013 for May 15, 2013

**AGENDA ITEM: 8**

**ITEM IDENTIFICATION:**

Report of the Project Planning Committee for the Ramsay Wright Building Teaching Laboratories Upgrades

**JURISDICTIONAL INFORMATION:**

The Committee considers reports of project planning committees and recommends to the Academic Board approval in principle of projects (i.e. site, space plan, overall cost and sources of funds). Proposals for capital projects exceeding \$10 million must be considered by the appropriate Boards and Committees of Governing Council on the joint recommendation of the Vice President and Provost and the Vice President, University Operations. Normally, they will require approval of the Governing Council. Execution of such projects is approved by the Business Board.

**BACKGROUND:**

Providing the highest quality educational experience is at the core of the University of Toronto's academic mission. And access to modern laboratory space and equipment is a key contributor to the overall university experience for students in the rapidly developing field of life sciences.

While the current accommodations for teaching in the life sciences on the St. George Campus are in many ways exemplary, there remain some facilities that are technologically outdated relative to current standards. In particular, the laboratory teaching facilities in the Ramsay Wright Building are in need of upgraded services in order for them to continue to fulfill their academic mission.

A significant portion of teaching laboratories used by the Departments of Cell & Systems Biology (CSB) and Ecology & Evolutionary Biology (EEB) are currently located in the Ramsay Wright Building. Approximately 30% of all first year students who enter the Faculty of Arts and Science each year are enrolled in courses taught in Ramsay Wright laboratories. These labs have not been upgraded since the building was built in the late 1960s and, as a result, are equipped with outdated student benches, improper lighting and lack modern audio visual equipment, as well as reliable wired or wireless data connections. Most labs are not air conditioned and can be extremely uncomfortable for users during the summer and fall sessions.

One of the major technological limitations of the Ramsay Wright teaching labs is their lack of fume hoods. Fume hoods are critical for most CSB courses and specific lab protocols, and some EEB courses. Their absence severely limits what can be taught in courses held in Ramsay Wright labs. These facilities limits have ultimately constrained the teaching aspirations of two life sciences departments with very high undergraduate enrolments.

The Report of the Project Planning Committee was reviewed by the Vice-President and Provost and the Vice-President, University Operations at meetings of the Provost's Advisory Group, and the Executive Committee of CaPS (Capital Projects and Space Allocation Committee) and is being recommended for consideration.

## **HIGHLIGHTS:**

### **CSB/EEB Teaching Labs and Support**

The renovation of the Ramsay Wright teaching labs will provide modern teaching facilities for both CSB and EEB. The upgrades will include the addition of fume hoods in selected areas, updated finishes, new furniture (benching), new mechanical and lab services, modern audio-visual equipment and air-conditioning to two floors of the building.

Each of the departments has specific requirements for teaching. For example, the renovated Anatomy Lab for EEB teaching will have glass cases to display specimens to students. Several labs in each department will be large enough for a 30 student lab. These purpose-built labs will allow for more efficient scheduling and utilization by each department, resulting in using less overall area than suggested by the COU guidelines.

This project also addresses the problem of sharing the EEB/CSB labs at Earth Sciences by moving the majority of teaching lab activity to Ramsay Wright and allowing for the future consolidation of EEB research space in Earth Sciences. A related project outcome is the consolidation of Psychology research space on the 3<sup>rd</sup> floor of Ramsay Wright in an area close to the Psychology research facilities available in the adjacent Centre for Biological Timing & Cognition (CBTC).

A modeling exercise was undertaken to determine the impact of new, properly outfitted laboratories with sufficient fume hoods and how they would allow for increased utilization and a reduction in space allocated for teaching laboratories. The renovation of the teaching laboratories in Ramsay Wright and relocation of labs from Earth Sciences will enable approximately 907 nasm, including 652 nasm of teaching laboratory space (3 labs in Ramsay Wright and 4 labs in Earth Sciences) and 255 nasm in associate prep rooms, to be reallocated for other purposes. Overall the newly renovated teaching laboratories for the two disciplines will be at 64% of the space generated by the COU space standards when considering prime teaching lab and support space. If the specialized greenhouse, aquatic facility, metal shops and field storage are included in the total inventory then the departments will be at 78% of COU guidelines post-renovation.

Courses with extensive wait lists, planned additions to the curriculum and an expansion of an existing upper year team research project course which requires significant access to a high level teaching lab can now be accommodated. The new labs will allow for scheduling of labs and enrolment to increase in order to accommodate more students.

### **Psychology Research Labs**

The Psychology department will inhabit the 3<sup>rd</sup> floor area previously occupied by CSB teaching labs. This will allow the 3<sup>rd</sup> floor of Ramsay Wright to be almost fully occupied, with research activities in both Psychology and CSB that are heavily dependent on facilities in the adjacent CBTC. The labs will be fitted with new benches and lab services.

### **Student Activity Areas**

The area of vacant space (former library) on the west wing of the 2<sup>nd</sup> floor will be converted to a large student activity area. The space will be fitted with flexible furniture for student meeting and gathering, as well as some designated quiet study space. The area has many windows to allow for natural light. It will provide a much needed area to accommodate some of the thousands of students that attend undergraduate labs in Ramsay Wright.

### **Phasing**

The proposed upgrading of the Ramsay Wright teaching labs entails a renovation of the relevant areas over three phases. In order to minimize the disruption of teaching activities for all departments involved, the timelines in this project adhere to semester start and end dates.

The preparatory work for Phase 1 of the project includes the relocation of groups not associated with undergraduate CSB or EEB teaching away from the 2<sup>nd</sup> floor of Ramsay Wright. This relocation will free up the 2<sup>nd</sup> floor areas for the consolidation of space for CSB teaching facilities.

The bulk of Phase 1 of the project involves the renovation of 2,207 nasm of building area in Ramsay Wright. Phase 1 is projected to start January, 2014, at the earliest and is to be completed by August, 2014.

Phase 2 of the project involves the renovation of 1,184 nasm of building area with an earliest start date of September, 2014, with completion for April, 2015.

Phase 3, the final phase of the project, involves the renovation of 455 nasm of building area and a construction period of another 8 months, starting April, 2015. Also included are renovations to vacated space on the 3<sup>rd</sup> floor for Psychology department research labs and a teaching lab. Completion date for this work is targeted for December, 2015.

The total of all areas to be renovated over the three phases is 3,846 nasm (~7,800 gsm) and will be under construction for a period of approximately 2 years.

### **SCHEDULE:**

#### All Phases

- Governance Approval
- Consultant Selection – May 2013
- Design – June 2013 - November 2013
- Phase 1 Tender and Construction – December 2013 - August 15, 2014
- Phase 1 Occupancy – September, 2014
- Phase 2 Tender and Construction – August 2014 – April 15, 2015
- Phase 2 Occupancy – May, 2015
- Phase 3 Tender and Construction – April 2015 – December 1, 2015
- Phase 3 Occupancy – January, 2016

### **RECOMMENDATION:**

Be It Recommended to the Academic Board:

1. THAT the Project Planning Committee Report for the Ramsay Wright Building Teaching Laboratories Upgrades, dated April 29, 2013, be approved in principle; and
2. THAT the total project scope of approximately 7,800 gross square metres (approximately 3,846 nasm), be approved in principle, to be funded by the Faculty of Arts and Science, Graduate Expansion Funds and borrowing.

**Report of the Project Planning Committee  
for the Ramsay Wright Building  
Teaching Laboratories Upgrades**

April 29, 2013

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**Appendices:**

1. Space Utilization and COU Guideline Analysis

2. Functional Plan Space Program (test fit)

3. Asbestos Summary Material (available on request)

4. Room Specification Sheets (available on request)

5. Total Project Cost Estimate (available on request to limited distribution)

**Part A: Executive Summary**

Providing the highest quality educational experience is at the core of the University of Toronto's academic mission. And access to modern laboratory space and equipment is a key contributor to the overall university experience for students in the rapidly developing field of life sciences.

While the current accommodations for teaching in the life sciences on the St. George Campus are in many ways exemplary, there remain some facilities that are technologically outdated relative to current standards. In particular, the laboratory teaching facilities in the Ramsay Wright Building are in need of upgraded services in order for them to continue to fulfill their academic mission.

A significant portion of teaching laboratories used by the Departments of Cell & Systems Biology (CSB) and Ecology & Evolutionary Biology (EEB) are currently located in the Ramsay Wright Building. Approximately 30% of all first year students who enter the Faculty of Arts and Science each year are enrolled in courses taught in Ramsay Wright laboratories. These labs have not been upgraded since the building was built in the late 1960s and, as a result, are equipped with outdated student benches, improper lighting and lack modern audio visual equipment, as well as reliable wired or wireless data connections. Most labs are not air conditioned and can be extremely uncomfortable for users during the summer and fall sessions.

One of the major technological limitations of the Ramsay Wright teaching labs is their lack of fume hoods. Fume hoods are critical for most CSB courses and specific lab protocols, and some EEB courses. Their absence severely limits what can be taught in courses held in Ramsay Wright labs. These facilities limits have ultimately constrained the teaching aspirations of two life sciences departments with very high undergraduate enrolments.

This project calls for Ramsay Wright's undergraduate teaching labs to receive an overall general upgrading of fixtures and finishes including the addition of fume hoods in selected areas and air conditioning for two floors of the building. This work will result in each unit having dedicated, purpose-built teaching labs, as opposed to the current situation of sharing the same infrastructure, and will effectively increase available undergraduate teaching space (currently under-utilized) in Ramsay Wright.

Currently, courses with laboratory exercises that require fume hoods have been located at the Earth Sciences Centre. CSB and EEB are sharing the use of the Earth Sciences labs (alternating by semester) which requires equipment to be moved between buildings each semester. This project will address the problem of sharing the EEB/CSB labs at Earth Sciences by moving the majority of teaching lab activity to Ramsay Wright and allow for the future consolidation of EEB research space in Earth Sciences. This project will also allow for the consolidation of Psychology research space on the 3<sup>rd</sup> floor of Ramsay Wright in an area close to the Psychology research facilities available in the adjacent Centre for Biological Timing & Cognition (CBTC).

The proposed upgrading of the Ramsay Wright teaching labs entail a renovation of the relevant areas over three phases. In order to minimize the disruption of teaching activities for all departments involved, the timelines in this project adhere to semester start and end dates.

**Preparation for Phase 1**

The preparatory work for Phase 1 of the project includes the relocation of groups not associated with undergraduate CSB or EEB teaching away from the 2<sup>nd</sup> floor of Ramsay Wright. This relocation will free up the 2<sup>nd</sup> floor areas for the consolidation of space for the CSB teaching facilities.

**Phase 1**

The bulk of Phase 1 of the project involves the renovation of 2,207 nasm of building area in Ramsay Wright. Fume hoods will be added to the 2<sup>nd</sup> floor teaching labs, as well as air conditioning to the 1<sup>st</sup> and 2<sup>nd</sup> floors. Student Activity space will be created on the 2<sup>nd</sup> floor for undergraduate biology students. The EEB teaching lab (Rm. 013) and adjacent student lounge (Rm.010) will also be renovated during this phase. The construction of Phase 1 is projected to start January, 2014, at the earliest and is to be completed by August, 2014.

**Phase 2**

Phase 2 of the project involves the renovation of 1,184 nasm of building area including renovations to 1<sup>st</sup> floor labs at Ramsay Wright for EEB. These labs do not immediately need fume hoods but infrastructure for future installation of fume hoods will be considered. Phase 2 construction is projected for an earliest start date of September, 2014, for a period of 8 months with completion for April, 2015.

**Phase 3**

Phase 3 of the project involves the renovation of 455 nasm of building area and a construction period of another 8 months, starting April, 2015. This final phase includes the relocation of CSB teaching labs from the east portion of the 3<sup>rd</sup> floor of Ramsay Wright to the newly renovated 2<sup>nd</sup> floor teaching labs. Also included are renovations to vacated space on the 3<sup>rd</sup> floor for Psychology department research labs and a teaching lab. Completion date for this work is targeted for December, 2015.

The total of all areas to be renovated over the three phases is 3,846 nasm (~7,800 gsm) and will be under construction for a period of approximately 2 years.

**Part B: Project Background**

**B1. Membership**

Robert Baker, (Chair) Professor, Vice-Dean Research & Infrastructure, Faculty of Arts & Science  
Lucy Chung, Director of Infrastructure Planning, Faculty of Arts & Science  
Kim McLean, Chief Administrative Officer, Faculty of Arts & Science  
John Coleman (or designate) Professor, Chair, Department of Cell & Systems Biology  
Locke Rowe (or designate) Professor, Chair, Department of Ecology & Evolutionary Biology  
Jay Pratt (or designate) Professor, Chair Department of Psychology  
Deirdre Loughnan, undergraduate student, Department of Ecology & Evolutionary  
Erich Damm, graduate student, Department of Cell & Systems Biology  
Tamar Mamourian, Chief Administrative Officer, Department of Cell & Systems Biology  
Danielle Churchill, Facilities Designer, Faculty of Arts & Science  
George Phelps, Director, Project Development, Real Estate Operations  
Bruce Dodds, Director of Utilities & Building Operations, Facilities & Services  
Gail Milgrom, Director, Campus & Facilities Planning  
Alan Webb, Planner, Campus & Facilities Planning (Secretary)

**B2. Terms of Reference**

1. Make recommendations for a detailed space program and functional layout for: a) the teaching laboratories and associated prep rooms for the Department of Cell and Systems Biology and the Department of Ecology and Evolutionary Biology on floors B, 1 and 2 of the Ramsay Wright Laboratories; and b) the research space for the Department of Psychology on floor 3 of the Ramsay Wright Laboratories.
2. Identify the space program as it is related to the Faculty's existing and approved academic plan, taking into account the impact of approved and proposed program enhancements that are reflected in increasing faculty, student and staff complement.
3. Plan to realize maximum flexibility of space to permit future allocation as program needs change.
4. Demonstrate that the proposed space program will take into account the Council of Ontario Universities' and the University's own space standards.
5. Identify all deferred maintenance and items of infrastructure renewal for the Ramsay Wright Laboratories and their associated costs.
6. Identify a phased approach to the implementation of a comprehensive plan, including any staging that may be required.
7. Identify all secondary effects and impact on the delivery of academic programs during construction and the possible required relocation as required to implement the plan of existing units.
8. Identify equipment and moveable furnishings necessary to the project and their estimated cost.
9. Identify all data, networking and communication requirements and their related costs.



10. Identify all security, occupational health and safety and accessibility requirements and their related costs.
11. Identify all costs associated with transition during construction and secondary effects resulting from the realization of this project.
12. Determine a total project cost estimate (TPC) for the capital project including costs of implementation in phases if required, and also identifying all resource costs, including a projected increase to the annual operating cost.
13. Identify all sources of funding for capital and operating costs.
14. Complete report by April 19, 2013.

### **B3. Background Information**

Providing the highest quality educational experience is at the core of the University of Toronto's academic mission. And access to modern laboratory space and equipment is a key contributor to the overall university experience for students in the rapidly developing field of life sciences.

Thousands of students (~30% of all first year FAS students) are enrolled every year in Departments of Cell & Systems Biology (CSB), Ecology & Evolutionary Biology (EEB) and the Human Biology Program courses largely taught in the teaching labs located on the Basement, 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> Floors of the Ramsay Wright Building. The labs were built 50 years ago (only 10 years after the discovery of DNA) and, while some accommodations for teaching in the life sciences on the St. George Campus are appropriate, the life sciences have progressed dramatically over the past decades and many facilities are technologically outdated relative to current standards.

The labs have never been upgraded and, as a result, lack appropriate benching and seating, suitable lighting and, audio visual equipment as well as reliable wired or wireless data connections. Mechanical infrastructure is inadequate, the majority of labs are not air conditioned and can be extremely uncomfortable for users during summer and fall terms.

One of the more extreme technological limitations for Ramsay Wright teaching labs is the lack of fume hoods. Fume hoods are critical for most CSB courses and some EEB courses and their absence severely limits what can be taught in courses held in Ramsay Wright labs. Courses with laboratory exercises that require fume hoods, where possible, have been located at the Earth Sciences Centre (ESC) but, owing to the need for properly serviced labs, CSB and EEB share the use of Earth Sciences labs (alternating by semester) and therefore have to move all preparatory equipment and material and equipment used in the labs by the students from building to building between semesters. This is a two day process involving movers, additional technical staff, and ultimately, an inordinate draw on staff time. In other instances, when access to the more modern Earth Sciences labs is not possible, the scope of the lab exercises is significantly curtailed, with the resulting diminution of the lab experience for the students. These facilities limits have ultimately constrained the teaching aspirations of two departments with very high undergraduate enrolments.

The project's origins stem in part from May 2006, when the Planning and Budget Committee received terms of reference for a Project Planning Committee for Biological Sciences. The purpose of the Committee at that time was to recommend a comprehensive space plan that would accommodate two new departments: Cell and Systems Biology (CSB) and, Ecology and Evolutionary Biology (EEB) created through reorganization of the Departments of Botany and Zoology (located in the Earth Science Centre and the Ramsay Wright building) earlier that year. The Committee concluded that the construction of new facilities together with renovations to existing space was considered the best approach. Funding is now available to upgrade virtually all of the teaching laboratories in the Ramsay Wright Laboratories and to co-locate research laboratories and associated equipment of faculty members from CSB and the Department of Psychology who share common research interests and platforms.

#### **B4. Statement of Academic Plan**

With close to 50,000 students, the University of Toronto's St. George campus is the largest in Ontario. In response to the increased demand for university education, both undergraduate and graduate enrolment has expanded dramatically at the University of Toronto over the past decade. Since 2001, undergraduate enrolment on the St. George campus has expanded by close to 65% while graduate enrolment has grown a further 57%.

Enrolment growth in the University's largest Faculty –Arts and Science– has occurred disproportionately in the sciences. Over the past five years undergraduate enrolment on the St. George campus in life science programs has grown significantly. Growth has been particularly strong in Cell and Systems Biology; for example CSB's second year introductory course has seen a 45% increase in enrolment since 2001. Similarly, enrolment in life and biological sciences has also grown (27%) and graduate enrolment in CSB has more than doubled since 2004.

These increases in enrolment are linked to recent introductions of new programs in CSB and EEB that occurred soon after the 2006 reorganization of the biosciences in the Faculty of Arts and Science. Both units prepared comprehensive academic plans in 2010 and both indicated the pressing need for renewed teaching infrastructure. Following a comprehensive external review the Human Biology Programs have also gone through a period of rapid development and growth.

#### **Cell and Systems Biology**

In order to modernize undergraduate education and enrich the student experience, CSB introduced three new programs in 2007: Cell and Molecular Biology Major and Specialist, and Animal Physiology Major. These programs alone have seen enrolment rise to a combined 1,050 students. Total enrolment in all programs, including those shared with EEB, sits at 2,111 students. In addition, many students from other programs, including HMB in particular, fulfill their program requirements with CSB courses. Total course enrolment as of November, 2012, is 4,133.5 FCE.

As part of the FAS Curriculum Renewal process, CSB redesigned its foundational Cell and Molecular Biology course (formerly BIO250Y/BIO240H/241H) such that half was moved to the first year (BIO130H), while the other half remains at the second year level (BIO230H). The new format was introduced in 2010/11 and allows the unit to build pedagogically integrated approaches to undergraduate instruction in the molecular life sciences that continue from the 1st to the 4th year. Another foundational course, BIO252Y Animal Physiology, was reorganized into two half courses, BIO270H and BIO271H, with modernized labs. All of these foundational courses rely on space and facilities in teaching laboratories.

In addition, several CSB upper level courses routinely have large waiting lists, highlighting the need to increase enrolment capacity through a variety of mechanisms including more appropriate laboratory facilities. Since 2006, CSB has introduced 17 new courses to the undergraduate curriculum, 8 of which require teaching laboratories. This is in addition to the reorganization of pre-existing Zoology/Botany courses that were re-numbered (CSB), and in many instances, revamped with updated laboratory components.

#### **Ecology and Evolutionary Biology**

EEB teaches over 3,100 students enrolled in EEB courses, with approximately 1,900 entering students in its introductory course. EEB courses span a wide range of class sizes and venues; from a 1,900 student 1st year lecture course complete with fortnightly laboratories, to 15 student

field courses in the Amazon Rainforest, to single student research experiences. Over half of the EEB courses have hands on laboratory components that involve the use of teaching laboratories.

In 2009 the department carried out a comprehensive review of its undergraduate programs, the review led to a new vision of the unit's role in teaching in the University, a vision that led to a clear set of coherent objectives, a set of actions, and future plans.

Actions included a move toward 'H' courses, ranging from the very large first year course to 4th year seminar courses; which greatly increases flexibility for Specialists and Majors, and gives greater access to students from other programs (e.g. HMB). In cooperation with HMB, EEB introduced two new large courses, designed to bring ecology and evolution to a wider audience (The Ecology of Human Population Growth, and The Evolution of the Human Genome). The unit reinforced its commitment to small class research-based experiences, including use of laboratory sessions in large enrolment courses.

### **Psychology**

The Department of Psychology offers research-based BSc programs that focus on the experimental and biological approaches to the discipline rather than on a clinical approach to Psychology.

The behavioural neuroscience group in Psychology also teaches an undergraduate laboratory class in Ramsay Wright. This course, PSY399 (Psychobiology), has been limited to 20 students in the past due to space constraints in the building. As this group grows within the department, expanding the capacity of this course, and adding capacity for additional neuroscience laboratory courses, is a priority for the department.

### **Human Biology**

The Human Biology Program is a collaborative undertaking of the Faculty of Arts and Science (including CSB, EEB and Psychology) and the Faculty of Medicine. The multi-disciplinary programs integrate topics from the medical sciences, biological and social sciences, as well as the humanities. The Program has undergone significant renewal since 2007 and offers five undergraduate specialist programs and seven major programs to Arts & Science students. Over 3,000 students are enrolled in HMB programs.

The administrative home of the HMB program lies within EEB however both EEB and CSB provide HMB with access to teaching labs within their respective departmental space. The teaching of HMB courses within Ramsay Wright CSB/EEB space will continue to be accommodated to the existing level of activity.

**B5. Space Requirements**

As this project is focused on the renovation of teaching laboratories for the Departments of Cell Systems Biology and Ecology and Evolutionary Biology, as well as the provision of new research laboratory space for the Department of Psychology, the overview of existing space and analysis of facility requirements that follows will be therefore limited to these space types. However, a full analysis of the departmental space requirements was conducted, using the Council of Ontario Universities (COU) space guidelines, and is included in Appendix 1 for reference.

**CSB and EEB Undergraduate Teaching Laboratories**

The following sections are organized to provide information on CSB and EEB teaching laboratories:

- i. Existing Facilities**  
Inventory of the existing teaching laboratory facilities
- ii. Demand for Teaching Laboratories - CSB and EEB**  
Demand for those facilities based on courses with practical sections taught in 2011/12
- iii. Utilization of Existing Teaching Laboratories - CSB and EEB (and HMB)**  
Actual Utilization of the CSB and EEB teaching laboratories for 2011/12
- iv. COU Guidelines and Analysis**  
Analysis of the requirement for teaching laboratory space

**i. Existing Facilities**

The Departments of Cell Systems Biology and Ecology and Evolutionary Biology teaching laboratories are currently located in two Faculty of Arts & Science buildings on the St. George campus, the Ramsay Wright Laboratories and the Earth Sciences Centre. The units currently share teaching laboratory and support space in both buildings.

**Table 1.** Existing CSB and EEB Undergraduate Teaching Laboratories and Support Space (*prorated for shared labs*)

	<b>Ramsay Wright</b>	<b>Earth Science</b>	<b>Total</b>
	<b>Nasm</b>	<b>Nasm</b>	<b>Nasm</b>
<b>CSB</b>			
Teaching Labs	864	277	1141
Lab Support	546	267	813
Total	1410	544	1954
<b>EEB</b>			
Teaching Labs	1077	394	1471
Lab Support	638	301	939
Total	1716	694	2410
<b>Total</b>	<b>3126</b>	<b>1238</b>	<b>4364</b>

There are 6 undergraduate teaching labs in the Earth Sciences Centre and 20 undergraduate teaching labs in the Ramsay Wright Building with a total of 692 student laboratory stations. Two Ramsay Wright undergraduate teaching labs are inactive due to lack of services and therefore scheduling of labs is higher in Earth Sciences. The average teaching laboratory station sizes in the two buildings are similar but vary somewhat from room to room. The average for Earth Sciences is 3.53 nasm/station and the average for Ramsay Wright is 3.87 nasm/station.

Also included in any discussion of teaching laboratories are the associated rooms for preparation and storage, the support spaces related to the labs. There is slightly more of a variance for this category of space; 2.98 nasm of support space for every lab teaching station in the Earth Sciences and 2.36 nasm for those in the Ramsay Wright Building. The overall area per station is on average 6.31 nasm.

In the table that follows, the 7 teaching labs that are to be released as a result of this project have been shaded (ESC 2087/2088 has recently been converted to a research lab).

**Table 2.** CSB and EEB Undergraduate Teaching Laboratories

Room	Capacity	Area (nasm)	Area Per Station (nasm)
<b>Earth Sciences</b>			
ESC 1026	20	73.5	3.68
ESC 1027	30	99.8	3.33
ESC 1032	50	153.0	3.06
ESC 2087	30	116.6	3.89
ESC 3088	30	114.0	3.80
ESC 4076	30	113.7	3.79
<i>Avg Tch Stn</i>			3.53
Lab Support		567	2.98
<b>Subtotal</b>	<b>190</b>	<b>1,237.6</b>	<b>6.51</b>
<b>Ramsay Wright</b>			
RW 013	84	288.2	3.43
RW 102	24	83.0	3.46
RW 104	24	82.4	3.43
RW 122	24	83.0	3.46
RW 124	24	84.4	3.52
RW 125	24	84.4	3.52
RW 127	24	82.5	3.44
RW 128	24	83.0	3.46
RW 130	24	82.4	3.43
RW 131	24	82.4	3.43
RW 133	24	83.0	3.46
RW 203	20	83.0	4.15
RW 205	20	82.4	4.12
RW 208	24	82.5	3.44
RW 214	20	83	4.15
RW 216	20	82.4	4.12
RW 219	20	83	4.15
RW 309	18	134.6	7.48
RW 311	18	95.9	5.33
RW 313	18	95.9	5.33
<i>Avg Tch Stn</i>			3.87
Lab Support		1185	2.36
<b>Subtotal</b>	<b>502</b>	<b>3,126.4</b>	<b>6.23</b>
<b>Total</b>	<b>692</b>	<b>4364</b>	<b>6.31</b>

## ii. Demand for Teaching Laboratories - CSB and EEB

The total student enrolment for 2011/12, in practical sections of both departments, was 4,588 in the fall term and 4,787 in the winter term. This represents one teaching laboratory station for every 6.6 to 6.9 students enrolled.

The following tables list the courses with practical sections taught in 2011/12 with enrolment totals. The last few columns show the total number of weekly student contact hours (# students enrolled times the number of weekly hours of practical instruction), the COU space factor and the theoretical amount of space required to accommodate those courses in labs and all associated support space.

**Table 3.** EEB and CSB Fall 2011 Laboratory Courses

Course	Current Location	Weekly Practical hrs	Course Enrolment	Wkly. Student Contact Hours	COU space factor	Generated Area NASM
<b>EEB Laboratory Course Information - Fall 2011</b>						
BIO120H*	RW102	1.5	1824	2736	0.6	1642
	RW104	1.5				
	RW125	1.5				
	RW127	1.5				
	RW128	1.5				
	RW130	1.5				
	RW131	1.5				
	RW133	1.5				
EEB263Y	RW13	3.0	80	240	0.6	144
EEB266H	RW13	1.5	120	180	0.6	108
EEB268H	ES1027	1.5	90	135	0.6	81
	ES1032	1.5				
EEB321H	RW107	3.0	60	180	0.3	54
	RW109	3.0				
EEB323H	ES4076	2.0	50	100	0.6	60
EEB322H	RW208	3.0	80	240	0.6	144
EEB331H	ES3088	3.0	30	90	0.6	54
EEB337H	ES3088	3.0	30	90	0.6	54
EEB360H	ES3088	3.0	30	90	0.6	54
EEB382H	RW13	2.0	60	120	0.6	72
EEB388H	RW13	3.0	50	150	0.6	90
ENV234H	RW122	1.5	192	288	0.6	173
			2,696	4,639		2,729
<b>CSB Laboratory Course Information - Fall 2011</b>						
BIO 230H	ES1026	1.5	1195	1793	0.6	1076
	ES1027	1.5				
	ES1032	1.5				
BIO255H	ES1032	3.0	34	102	0.6	61
BIO270H	RW309	2.0	531	1062	0.6	637
	RW311	2.0				
	RW313	2.0				
CSB328H	RW203	2.0	83	166	0.6	100
	RW205					
CSB350H	ES3088	3.0	49	147	0.6	88
	ES4076	3.0				
			1,892	3,270		1962
<b>Total Fall 2011 EEB &amp; CSB</b>			<b>4,588</b>	<b>7,909</b>		<b>4691</b>

Note: Students in BIO120 and BIO230 meet in alternating weeks. EEB221 is held in the computer lab.

**Table 4.** EEB and CSB Winter 2012 Laboratory Courses

Course	Current Location	Weekly Practical hrs	Course Enrolment	Wkly. Student Contact Hours	COU space factor	Generated Area NASM
<b>EEB Laboratory Course Information - Winter 2012</b>						
BIO220H	ES1026	1.5	1440	2160	0.6	1296
	ES1027	1.5				
	ES1032	1.5				
	ES2087	1.5				
BIO251H	ES1027	1.5	180	270	0.6	162
	ES1032	1.5				
EEB225H	RW107	1.0	120	120	0.3	36
	RW109	1.0				
EEB263Y	RW013	3.0	80	240	0.6	144
EEB267H	RW013	1.5	140	210	0.6	126
ENV319H	RW122	3.0	70	210	0.6	126
	RW124	3.0				
EEB330H	ES3088	3.0	30	90	0.6	54
EEB340H	ES2087	3.0	35	105	0.6	63
EEB356H	ES3088	2.0	30	60	0.6	36
EEB365H	RW109	2.0	110	220	0.3	66
EEB384H	RW013	3.0	30	90	0.6	54
EEB386H	RW013	1.0	80	80	0.6	48
ENV334H	RW122	3.0	60	180	0.6	108
			2,405	4,035		2,319
<b>CSB Laboratory Course Information - Winter 2012</b>						
BIO130H	RW102	1.5	1703	2555	0.6	1533
	RW104	1.5				
	RW128	1.5				
	RW130	1.5				
	RW131	1.5				
	RW133	1.5				
BIO271H	RW309	2.0	486	972	0.6	583
	RW311	2.0				
	RW313	2.0				
CSB330H	RW311	3.0	36	108	0.6	65
	RW313	3.0				
CSB352H	RW107	1.0	102	102	0.3	31
	RW109	1.0				
	RW211	1.0				
CSB431H	RW203	2.0	35	70	0.6	42
	RW205	2.0				
CSB474H	ES4076	4.0	20	80	0.6	48
			2,382	3,887		2301
<b>Total Winter 2012 EEB &amp; CSB</b>			<b>4,787</b>	<b>7,922</b>		<b>4620</b>

Note: Students in BIO 130 and BIO 220 meet in alternating weeks. EEB225 and 365, and CSB352 are held in computer labs.

The current demand for teaching laboratories and support space, based on the COU guidelines, suggests that approximately 5,030 nasm are required (2,729 nasm for EEB + 2,301 nasm for CSB) compared to the 4,364 nasm existing. This will be discussed in more detail in the COU Guidelines and Analysis section.



### iii. Utilization of Existing Teaching Laboratories - CSB and EEB (and HMB)

Typically the undergraduate teaching activities of the two departments have seen alternating use of the more modern Earth Sciences Centre facilities by term, with CSB using the Earth Sciences labs during the Fall terms and EEB during the Winter terms.

Biology-related courses currently use the 18 functioning teaching labs in Ramsay Wright (out of 20) and the 5 remaining teaching labs in Earth Sciences (out of 6). Two Ramsay Wright undergraduate teaching labs are inactive due to lack of services. Courses that require fume hoods have been located temporarily at Earth Sciences but, owing to the need for properly serviced labs, CSB and EEB share the use of Earth Sciences labs (alternating by semester) and therefore have to move all preparatory equipment and equipment used in the labs by the students from building to building between semesters. The total weekly hours for each existing teaching lab used by CSB and EEB are presented in Table 5.

**Table 5. WEEKLY Teaching Lab Usage in Ramsay Wright and Earth Sciences Centre**

Location	Room	Fall 2011 (hrs.)				Fall Total (hrs.)	Winter 2012 (hrs.)		Winter Total (hrs.)
		CSB/EEB		HMB			CSB/EEB		
		Day	Eve	Day	Eve	Day	Eve	Day	Eve
Ramsay Wright	RW 013	11	6	6		23	13	5	18
Ramsay Wright	RW 102	12	3			15	15	6	21
Ramsay Wright	RW 104	12	3			15	15	6	21
Ramsay Wright	RW 122	12		3		15	12	3	15
Ramsay Wright	RW 124					0	3	3	6
Ramsay Wright	RW 125	12	3			15			0
Ramsay Wright	RW 127	12	3			15			0
Ramsay Wright	RW 128	12	3			15	15	6	21
Ramsay Wright	RW 130	12	3			15	15	6	21
Ramsay Wright	RW 131	12	3			15	15	6	21
Ramsay Wright	RW 133	12	3			15	15	6	21
Ramsay Wright	RW 203	6				6	2		2
Ramsay Wright	RW 205	4		3		7	2		2
Ramsay Wright	RW 208	12				12			0
Ramsay Wright	RW 214					0			0
Ramsay Wright	RW 216					0			0
Ramsay Wright	RW 219			9		9			0
Ramsay Wright	RW 309	15				15	15		15
Ramsay Wright	RW 311	15				15	21		21
Ramsay Wright	RW 313	15				15	21		21
<b>Subtotal Ramsay Wright</b>		<b>186</b>	<b>30</b>	<b>21</b>	<b>0</b>	<b>237</b>	<b>179</b>	<b>47</b>	<b>226</b>
Earth Science	ESC 1026	18	6			24	15	3	18
Earth Science	ESC 1027	21	6			27	18	6	24
Earth Science	ESC 1032	24	9			33	18	6	24
Earth Science	ESC 2087					0	21	3	24
Earth Science	ESC 3088	11				11			0
Earth Science	ESC 4076	10	1			11	5		5
<b>Subtotal Earth Sciences</b>		<b>84</b>	<b>22</b>	<b>0</b>	<b>0</b>	<b>106</b>	<b>77</b>	<b>18</b>	<b>95</b>
<b>Total</b>		<b>270</b>	<b>52</b>	<b>21</b>	<b>0</b>	<b>343</b>	<b>256</b>	<b>65</b>	<b>321</b>

The average booking total for Earth Sciences labs, in the fall term, is 21.2 hours per week and for Ramsay Wright is 13.2 hours per week, excluding the non-functioning labs. The lack of fume hoods in the Ramsay Wright teaching laboratories have resulted in low utilization. (Refer to Section iv. for details.)

Students clearly prefer laboratories during the day as many commute and, owing to reduced TTC and Go Train service in the evening, those in evening sessions may not arrive home until well after 10:00 PM. New scheduling will reflect this preference.

#### iv. COU Guidelines and Analysis

The use of the Ontario Council of Universities guidelines for determining the amount of teaching laboratory and support space required has, recently, been under scrutiny by the University. There are various opinions that would place the standards as too rich or as not flexible enough.

The space standard is based on a number of assumptions – that on average, disciplines like biology, chemistry, zoology have similar overall laboratory space requirements, and that the “standard” is meant to encompass activity of first and second year students as well as upper year students, and to provide for scheduled and unscheduled activity, i.e. supervised instruction and the time necessary for independent practice and set up and take down activities. The standard addresses both the “teaching labs” themselves and all the support spaces required to service those labs. The “driver” or input measure for determining the overall space requirement for a department or faculty’s teaching laboratories is the number of weekly student lab contact hours which is the sum of the product of the number of students enrolled in every course by the number of hours a week they receive regularly scheduled instruction.

The components of the COU standard are for Biology type laboratories are:

- 8.1 nasm allowance per teaching station for both within the lab and in related support space
- 18 hour per week minimum for scheduled instructional use which allows the remaining hours to be used for set up and changeover of experiments and for individual student practice and experimentation
- 75% of the stations being occupied when the room is in use

Using the data presented previously, and comparing the assumptions underlying the COU space standard and the current practices for CSB and EEB resulted in the following:

- The existing area of teaching laboratory per station space, including support space, for CSB and EEB is 6.55 nasm, considerably less than the COU of 8.1 nasm.
- The utilization of the existing array of teaching labs (functioning ones only) is 21.2 hours per week for Earth Sciences while labs in Ramsay Wright are at 13.2 hours per week. 13 labs in the winter met or exceeded the benchmark of 18 hours per week and 4 in the fall. Seven labs in the winter term and 4 labs in the fall were not in service at all.
- Depending on the term, 97% or 80% of the stations are being occupied when the room is in use, well over the 75% COU standard.
- EEB and CSB generate 5,030 nasm using the COU formula versus their current 4,364 nasm, a difference of 666 nasm.

#### The New Labs

A modeling exercise was undertaken to determine the impact of the new updated properly outfitted laboratories with sufficient fume hoods and how they would allow for increased utilization and a reduction in space allocated for teaching laboratories.

The renovation of the teaching laboratories in Ramsay Wright and relocation of labs from Earth Sciences will enable approximately 907 nasm, including 652 nasm of teaching laboratory space (3 labs in Ramsay Wright and 4 labs in Earth Sciences) and 255 nasm in associate prep rooms, to

be reallocated for other purposes. As part of this project, the vacated space on the third floor of Ramsay Wright will be allocated for Psychology research activities (approximately 400 nasm). The additional areas identified for reallocation, the Earth Sciences teaching labs, will be repurposed as part of a separate project. The future plan for these Earth Sciences labs is not addressed in this report.

CSB and EEB hold unique space requirements for the delivery of their programs, beyond standard lab support space, and these are included in the table below. These unique facilities include greenhouse space in both Ramsay Wright and Earth Sciences. Wood and metal shops as well as supply stores are found in Ramsay Wright that support both undergraduate teaching and research for CSB. EEB is required to have space for large field equipment storage for undergraduate courses and is located in Ramsay Wright.

**Table 6.** CSB & EEB - Comparison of Existing, COU and Proposed Teaching Lab Space (nasm)

		Existing			COU Generated	Proposed Post-Renovation		
		RW	ESC	Total		RW	ESC	Total
CSB	Teaching Labs	864	277	1,141		877	171	1,048
	Lab Support	350	130	480		339	52	391
	<i>Subtotal</i>	<i>1,215</i>	<i>407</i>	<i>1,622</i>	<i>2,301</i>	<i>1,216</i>	<i>222</i>	<i>1,439</i>
	Greenhouses		137	137			137	137
	Aquatic	18		18		18		18
	Stores, Wood /Metal Shops	178		178		178		178
	CSB Total	1,410	544	1,954		1,412	359	1,771
EEB	Teaching Labs	1,077	394	1,471		1,142	57	1,199
	Lab Support	409	164	573		562	17	579
	<i>Subtotal</i>	<i>1,486</i>	<i>558</i>	<i>2,044</i>	<i>2,729</i>	<i>1,704</i>	<i>74</i>	<i>1,778</i>
	Greenhouses	78	137	214		78	137	214
	Field Storage	151		151		151		151
	EEB Total	1,716	694	2,410		1,933	211	2,144
	<b>Total</b>	<b>3,126</b>	<b>1,238</b>	<b>4,364</b>	<b>5,030</b>	<b>3,345</b>	<b>570</b>	<b>3,915</b>

\*Note: Totals include departmental space in Ramsay Wright & Earth Sciences  
Proposed Post-Renovation totals include Test Fit renovated areas and existing, unrenovated departmental areas that are to remain active following project renovations

Overall the newly renovated teaching laboratories for the two disciplines will be at 64% of the space generated by the COU standard when considering prime teaching lab and support space. If the specialized greenhouse, aquatic facility, metal shops and field storage are included in the total inventory then the departments will be at 78% of COU post renovation. As a result of this project, the overall number of teaching labs and instructional stations will be reduced and the efficiency increased.

The following considerations will have an impact on the utilization of the new teaching laboratories:

#### Concurrent Sessions

First-year BIO course sections are currently taught in 6-8 labs at one time to accommodate the high number of students enrolled. This will continue to be the case with the new lab layout,

except where in some cases where the new labs accommodate 30 people and the number of concurrent sessions will be reduced.

#### Wait Lists

Courses such as BIO 270H and BIO271H; CSB 330H and CSB 350H have extensive wait lists which could be met in part by additional lab space. There are also planned additions to the curriculum including a new 300H level Animal Physiology course (to complement the heavily subscribed BIO 270H and BIO 271H offerings) and an expansion of an existing upper year (400 level) team research project course (CSB 491H) which requires significant access to a high level teaching lab. The new labs will allow for scheduling of labs and enrolment to increase slightly in order to accommodate more students.

#### Conflicting Schedules

Popular first-year courses taken by Life Science students (BIO120H, BIO130H, CHM138H, CHM139H, MAT135H, MAT136H, PHY131H, PHY132H, and PSY100H) all have day sections with lectures between 9 AM and 1 PM. Thus daytime laboratories in these science courses are offered in the afternoon, to avoid conflicts. As such, it is not always possible to schedule labs at these times due to student timetable conflicts.

#### Third and Fourth Level Courses

Third and fourth level students in CSB/EEB are enrolled in lab courses that require unscheduled drop in time to work on individual experiments/projects. The equipment used for these higher level courses is specialized and therefore there is a requirement for specialized labs, separate from the general first and second year labs.

Examples of these courses include CSB 330H (Techniques in Cell and Molecular Biology), CSB 350H (Laboratory in Molecular Plant Biology), CSB 491H (Team-based research- Research in Cell and Molecular Biology), EEB 322H (Behaviour and Behaviour Ecology), EEB331H (Intro to the Fungi), and EEB356H (Biology of Insects). These labs do not use the typical 3 hour block of laboratory time, and in many instances, require the students to return to the lab to continue or complete work outside of the scheduled 4 or 5 hour block. Or if they do have 3 hour labs, students are also required to come into the lab space to work on independent projects and experiments.

#### Lab Turnover

Lab set up and take down by technicians can take a number of hours, particularly in very large courses such as the first and second year BIO courses, and this must be factored into the designated hours of lab use. In addition, it is not often practical (nor efficient use of technician time) to remove the set-up for a specific lab running multiple, simultaneous sections over several consecutive days over a two-week period, setup a new lab for another course on a single available time slot, and then re-establish the earlier lab set-up (although on rare occasions this is necessary to accommodate another course that requires specialized space or equipment). This means that there are significant limitations on running different courses within the same lab over a consecutive set of days.

#### **Summary of Space Requirements – Psychology**

Having recently vacated space in the One Spadina building, Psychology is currently accommodated in approximately 4,726 nasm across two buildings, Sidney Smith Hall and Ramsay Wright (which includes Psychology's CBTC facility). There is 1,992 nasm of research

laboratory and support space in Sidney Smith and 1,307 nasm in Ramsay Wright for a total of 3,299 nasm.

The Department of Psychology is a life-science based research and teaching with broad strengths in cognition and neuroscience. The department essentially contains three research groups: (a) social cognition, (b) cognitive neuroscience, and (b) behavioural neuroscience. The former two groups are contained in Sidney Smith Hall, while the behavioural neuroscience group has both research and teaching laboratory space in Ramsay Wright. The neuroscientists in this group use both behavioural (e.g., electrophysiology) and genetic approaches to examine the relationship between minds and brains. Research topics included determining the neuronal circuits that modulate anxiety, how long-term memories exist in networks of neurons, and the neurochemistry that underlies cognitive functions such as attention and learning.

Students in the department are encouraged to combine classroom instruction with laboratory experience, and improving the very limited departmental teaching laboratory space in Ramsay Wright is a priority for the department.

**Table 7.** Psychology Existing Research and Teaching Lab Space to COU Allocation

	<b>Current Space Inventory</b>	<b>COU Analysis</b>
<b>Use (COU Category)</b>	<b>NASMS</b>	<b>NASMS</b>
Research Labs & Support Space (3.0)	3299	3435
Teaching Labs & Support Space (2.0)	41	30

There are 6 of the 28 research Faculty in Wet Labs (Neurobiology Research) which are comparable in area requirements to Biology Research Labs (with a COU space factor of 45 nasm/FTE). The remainder of the research faculty space is generated at the customary 30 nasm/FTE.

See Appendix 1 for a detailed COU analysis.

### **Summary of Space Requirements – Human Biology Program**

The Human Biology Program (HMB) will gain the availability of upgraded CSB/EEB teaching laboratories in Ramsay Wright for course bookings.

HMB's space current allocation of 153 nasm at New College in Wetmore Hall is primarily to accommodate the program's administrative functions. Reflecting the program's interdisciplinary nature, current HMB teaching activities take place in a range of spaces on campus, including course bookings in EEB and CSB teaching labs in Ramsay Wright.

The Human Biology Program is a collaborative undertaking of the Faculty of Arts and Science and the Faculty of Medicine. The Program offers five undergraduate specialist programs and seven major programs to Arts & Science students.

The Human Biology programs are available to students entering their second year of study. The multi-disciplinary programs integrate topics from the medical sciences, biological and social sciences, as well as the humanities. The goal of each Human Biology program is to provide a broad education focused on an area of biological science relevant to humans. Students will

receive a solid foundation in life science courses together with insight from the humanities and social sciences.

There are multiple Specialist programs and a variety of Major programs. Each program enables students to study specific aspects of human biology. Students can combine a Human Biology Major program with other Science, Social Sciences or Humanities Major and/or Minor programs. Students who later wish to specialize may be able to enter the related Specialist program.

**Table 8.** HMB Fall 2011 Laboratory Courses held in Ramsay Wright

Course	Current Location	Weekly Practical hrs	Course Enrolment	Wkly. Student Contact Hours	COU space factor	Generated Area NASM
<b>HMB Laboratory Course Information - Fall 2011</b>						
HMB302H	RW013	3.0				
	RW122	3.0				
	RW205	3.0	160	480	0.6	288
	RW219	3.0				
			160	480		288

## Part C: Project Description

### C1. Vision Statement

The Faculty of Arts and Science envisions educating students to be strong analytical, critical and creative thinkers who are well prepared for immediate careers in the workforce, or for additional accreditation through graduate and professional studies. We are very proud of our success in these areas. Nevertheless, we are aware of some issues related to the student experience, in particular, the 2008 NSSE survey revealed that we lag behind our Canadian G13 peers in areas such as ‘active and collaborative learning’, and in ‘enriching educational experiences’, areas that are linked to the quality and availability of laboratory teaching in the life sciences.

Demographic forecasts and our own data indicate that demand for undergraduate spaces in the life sciences in the Faculty of Arts & Science will remain high for some years to come and we are convinced that improving the student experience in our teaching labs in the life sciences is critical to maintaining our ability to attract top students and provide them with appropriate experiential platforms for their development. Renovations to our teaching laboratories will not only provide access to modern techniques, the laboratory sessions provide an ideal opportunity for high quality, small class experience for even the largest first year courses. Improved laboratories should help enhance the level of student engagement and sense of community, especially for the very large proportion of our students who commute to campus.

In order for the Faculty to best serve our students in the life sciences, and to best train the biologists of the future at the level of rigor and involvement associated with the University of Toronto, we must provide access to safe, welcoming and efficient laboratories equipped with the most recent scientific equipment and instrumentation and designed for the most appropriate pedagogy.

Our vision includes:

- Dedicated, contiguous space reserved for undergraduate teaching laboratories and their associated support areas. The experience of entry-level undergraduates will be enhanced by having centralized, readily recognizable teaching laboratories. Centralization will provide for efficiencies in use of equipment and technical help, and improve staff comfort and allow them to provide a higher level of service.
- Laboratories and support areas that are safe, welcoming areas designed so that each individual teaching laboratory can host at a minimum two (and where required three) laboratory sessions on any given 9AM-9PM time slot.
- Laboratories located as close as possible to the ground floor, and away from lecture halls and research laboratories, to ease the movement of many hundreds of students and minimize the disruption on lectures and research.
- An arrangement of benching and infrastructure that, wherever possible, is flexible and allows for engagement of the instructor with the entire class as well as for small group, collaborative interactions and solitary work.
- Access to the internet at each workstation that will allow for submission of in class work; access to protocols, background searches, instruction/demonstration through digital technologies, etc.
- Provision of some specialized laboratory space and infrastructure for upper level classes.
- Access to safe, welcoming and effective student study and lounge space.

## **C2. Space Program and Functional Plan**

The proposed renovations to the Ramsay Wright Building will allow for a number of functional improvements to the respective departments' pedagogical missions and create efficiencies of operations through consolidation of program.

The project will renovate 10 teaching labs on the 2<sup>nd</sup> floor of Ramsay Wright and equip the labs with fume hoods. Additionally, 10 labs will be renovated on the 1<sup>st</sup> floor and 1 lab in the basement level of Ramsay Wright for a total of 21 newly renovated labs at Ramsay Wright. The majority of teaching can then be done in Ramsay Wright once improvements have been made.

Three existing teaching labs in Ramsay Wright will be released on the 3<sup>rd</sup> floor for use by the Department of Psychology.

Four of the six labs that are now heavily used in Earth Sciences will be repurposed (one has already been done) as part of a separate project. The future plan for Earth Sciences teaching labs is not addressed in this report.

The two labs to remain in Earth Sciences cannot be accommodated in Ramsay Wright and will serve as specialized teaching labs.

This project will allow an opportunity to provide much needed student amenity space within the Ramsay Wright building. In particular, a portion of the former library area on the second floor

could be repurposed for a student study area and lounge to accommodate some of the high volume of EEB, CSB and HMB students using the building's teaching labs on a daily basis.

A related benefit to the rationalized redistribution of program in Ramsay Wright is the relocation of CSB teaching space from the third floor, allowing for a fit out specific to Psychology research needs.

Where the second floor of Ramsay Wright currently accommodates shared teaching labs, research space and vacant areas (former departmental library), the renovation will create a floor of contiguous CSB teaching facilities properly equipped to the specific needs of the courses taught. Likewise the renovation to the first floor of Ramsay Wright will allow for consolidation of EEB departmental space with upgraded teaching laboratory facilities.

### **Proposed Test Fit**

The test fit drawings (Appendix 2) show many of the existing walls and general layout to remain as is. An open plan that can accommodate several lab sections will be considered during the design phase of this project to determine if there are efficiencies to be gained. This type of open plan has been successful for other science labs at the University of Toronto. However, the opportunity for small groups of students to interact with teaching assistants is important to the overall experience of biology labs and should be maintained in the design of the lab space.

Owing to the nature of the building layout and infrastructure at Ramsay Wright, there may be challenges to creating open areas and consideration will be made for disruption to Ramsay Wright building occupants with ongoing research and operations.

### **Phasing**

The Ramsay Wright teaching laboratories renovations will be phased over 2 years. The various stages of renovation will be scheduled where possible to take advantage of semester start and end dates in order to minimize disruption to teaching.

The preparatory work for Phase 1 of the project includes a renovation and the relocation of groups not associated with undergraduate CSB, EEB or HMB teaching away from the 2<sup>nd</sup> floor of Ramsay Wright. This relocation will free up the 2<sup>nd</sup> floor areas for the consolidation of space for the CSB teaching facilities.

Preparation work in advance of the renovations includes the relocation of EEB research labs and a Psychology Teaching/Research lab. The preparatory work must be completed by January, 2014.

Phase 1 of the project involves the renovation of 2,207 nasm of building area. Fume hoods will be added to the 2<sup>nd</sup> floor teaching labs, as well as air conditioning to the 1<sup>st</sup> and 2<sup>nd</sup> floors. Student Activity space will be created on the 2<sup>nd</sup> floor for undergraduate biology students. The EEB teaching lab (Rm. 013) and adjacent student lounge (Rm.010) will also be renovated during this phase.

Teaching labs that are normally held on the 2<sup>nd</sup> floor of Ramsay Wright will be temporarily relocated to the 1<sup>st</sup> floor with some activities going to Earth Sciences. Other possibilities of temporary teaching will also be explored.

The construction of Phase 1 is projected for January, 2014, at the earliest running until August, 2014.



Phase 2 of the project involves the renovation of 1,184 nasm of building area. Work includes the temporary relocation of teaching labs normally scheduled on the 1<sup>st</sup> floor of Ramsay Wright to newly renovated teaching labs on the 2<sup>nd</sup> floor as well as Earth Sciences teaching labs. This phase includes renovations to 1<sup>st</sup> floor labs at Ramsay Wright for EEB. Phase 2 construction is projected for September, 2014, at the earliest running until April, 2015.

Phase 3 of the project will renovate of 455 nasm of building area on the 3<sup>rd</sup> floor. This final phase includes the relocation of CSB teaching labs from the east portion of the 3<sup>rd</sup> floor of Ramsay Wright to the newly renovated 2<sup>nd</sup> floor teaching labs. Also included are renovations to vacated space on the 3<sup>rd</sup> floor for Psychology department research. Phase 3 will begin at the earliest April, 2015, and run for 8 months.

## **Design Improvements**

### CSB/EEB Teaching Labs and Support

The renovation of Ramsay Wright teaching labs will provide modern teaching facilities for both CSB and EEB. The upgrades will include updated finishes, new furniture (benching), new mechanical and lab services and modern audiovisual equipment.

The addition of fume hoods will be the major upgrade for CSB. One fume hood will be available per lab and found on the perimeter of the room where students can access it during the lab sessions. Fume hoods will also be necessary in prep areas.

Each of the departments has specific requirements for teaching. For example, the renovated Anatomy lab (Rm.013) for EEB teaching will have glass cases to display specimens to students.

The labs will have new perimeter fixed benches with sinks and services, as necessary for the types of labs taught. The center student benches will be flexible in EEB 1<sup>st</sup> floor and lab Room 013, if possible, to provide an opportunity for reconfiguration. The typical layout of labs will be groups of four students working together, and a total of 24 students per lab. Several labs in each department will be large enough for a 30 student lab.

Updated audiovisual equipment will be an important part of the design including ceiling mounted projectors, projection screens and whiteboards will be incorporated into the design. Opportunities for integration of computers for student work during the lab will also be explored.

### Psychology Research Labs

The Psychology department will inhabit the 3<sup>rd</sup> floor area previously occupied by CSB teaching labs. This will allow the 3<sup>rd</sup> floor of Ramsay Wright to be almost fully occupied with research activities in both Psychology and CSB that are heavily dependent on facilities in the adjacent CBTC. Six neurobiology wet labs will be created for Psychology faculty that are currently occupying limited facilities in the basement floor. One Psychology teaching lab will be relocated to the same area on the 3<sup>rd</sup> floor. The labs will be fitted with new benches and lab services.

Student Activity Areas

The area of vacant space (former library) on the west wing of the 2<sup>nd</sup> floor will be converted to a large student activity area. This space will be fitted with flexible furniture for student meeting and gathering, as well as some designated quiet study space. The area has many windows to allow for natural light. It will provide a much needed area to accommodate some of the thousands of students that attend undergraduate labs.

In addition to the dedicated student activity space, fixed corridor seating will be explored to accommodate students waiting for lab times.

**Table 9.** CSB Ramsay Wright Proposed Space Program (based on Test Fit)

Usage	Phase	Location	Capacity	Area (nasm)	Quantity	Total (nasm)
<b>Undergrad Teaching Labs</b>						
Laboratory 30 seat	1	2nd Floor	30	92	6	552
Laboratory 24 seat	1	2nd Floor	24	81	4	324
<b>Sub-total</b>			<b>176</b>			<b>876</b>
<b>Laboratory Support</b>						
Teaching Lab Refresh	1	2nd Floor		20	2	40
Teaching Laboratory Prep	1	2nd Floor		98	2	196
Teaching Laboratory Prep	1	2nd Floor		44	1	44
Storage / Equipment	1	2nd Floor		30	1	30
<b>Sub-total</b>						<b>310</b>
<b>Lab Technician Offices &amp; Support</b>						
Lab Technician Offices/Work area/Storage	1	2nd Floor		99	1	99
<b>Lecturers' Offices</b>						
Lecturers' Offices	1	2nd Floor		11	6	66
Waiting Area	1	2nd Floor		23	1	23
<b>Sub-total</b>						<b>89</b>
<b>Student Activity Space*</b>						
Lounge/Study area	1	2nd Floor		48	2	96
<b>Total</b>						<b>1,470</b>

\*Student Activity Space shared 50% by CSB and EEB

**Table 10.** EEB Ramsay Wright Program Space Program (based on Test Fit)

Usage	Phase	Location	Capacity	Area (nasm)	Quantity	Total (nasm)
<b>Undergrad Teaching Labs</b>						
Laboratory 30 seat	2	1st Floor	30	93	3	279
Laboratory 24 Seat	2	1st Floor	24	82	7	574
Biodiversity Laboratory (large)	1	Basement	80	288	1	288
<b>Sub-total</b>			<b>338</b>			<b>1,141</b>
<b>Laboratory Support</b>						
Teaching Lab Refresh	2	1st Floor		20	3	60
Teaching Laboratory Prep	2	1st Floor		76	2	152
Biodiversity Teaching Lab Prep	1	Basement		75	2	150
<b>Sub-total</b>						<b>362</b>
<b>Lab Technicians Offices</b>						
Lab Technicians Office	2	1st Floor		11	6	66
Waiting Area	2	1st Floor		23	1	23
<b>Sub-total</b>						<b>89</b>
<b>Student Activity Space*</b>						
Lounge/Study area	1	2nd Floor		48	2	96
<b>Total</b>						<b>1,688</b>

\*Student Activity Space shared 50% by CSB and EEB

**Table 11.** Psychology Ramsay Wright Space Program (based on Test Fit)

Usage	Phase	Location	Capacity	Area (nasm)	Quantity	Total (nasm)
<b>Research Laboratory</b>						
Laboratory	3	3rd Floor		65	6	390
Laboratory (Shared use)	3	3rd Floor		32.5	1	32.5
<b>Sub-total</b>						<b>423</b>
<b>Undergrad Teaching Labs</b>						
Laboratory (Shared use)	3	3rd Floor	20	32.5	1	32.5
<b>Total</b>						<b>455</b>

### **C3. Building Considerations**

#### **Accessibility**

The University of Toronto is committed to ensuring that its buildings and services are accessible to persons with disabilities. Compliance with the University's Barrier Free Accessibility Design Standards is required for all new construction and renovation projects at the St. George campus. Design teams are required to submit the checklist to the University at 75% completion of the Design Development.

A final version of the Proposed Accessible Built Environment Standard (Ontario Building Code elements) will be released for public review in December 2012 or January 2013. Once legislated, it will apply to new projects, major retrofits, common space and circulation areas, and change in use.

For renovation projects, particularly of older buildings, there may be some recommendations that are very difficult or impossible to implement. However, design teams must provide written explanation in the event of non-compliance.

The requirements for this project include push-button activated door openers on laboratory corridor access doors and at least one barrier-free student station per teaching lab.

#### **Safety and Security**

An access control system will be required to control entry to teaching labs and prep rooms.

#### **Sustainability – Construction/Renovation**

Design and construction must be carried out in accordance with all applicable environmental, health and safety legislation and University of Toronto policies and standards.

The upgraded Mechanical HVAC infrastructure of the affected floors of Ramsay Wright will allow the use of low-velocity, variable-flow fume hoods and generally improved efficiency of mechanical ventilation.

#### **Sustainability – Laboratory Operation**

The proposed renovation must address the sustainability objectives outlined in the University of Toronto Environmental Protection Policy:

##### Fundamental Principles

- Meet and where possible exceed environmental standards, regulation, and guidelines.
- Meet and, where reasonably possible, exceed compliance with applicable federal, provincial and local environmental regulations and other requirements to which the University subscribes.
- Operate so as to minimize negative impacts on the environment.
- Adopt practices that reflect the conservation and wise use of natural resources.
- Respect biodiversity.

##### Specific Objectives

- Minimize the use of energy, water and other resources, through efficient design, management and practice.

- Minimize waste generation and actively manage the impact of waste, emissions, & effluents generated by University activities.
- Minimize noise and odour pollution from University activities.
- Manage the use of chemicals or toxic substances in accordance with regulatory requirements and established environmental practices, including scientific research practices.
- Include biodiversity and environmental concerns in planning and landscape decisions and minimize negative impacts of University activities on biodiversity and natural spaces.

**Background - Existing Building Condition**

The general scope of the project is that most of the first and second floors will be renovated into teaching labs, including the addition of fume hoods. A smaller area on the third floor will become research labs for psychology. Current HVAC systems in these areas will not be adequate either in function or reliability – neither of the first and second floors is air conditioned for example – so it is assumed that a major retrofit of the mechanical systems is anticipated.

The significance of the condition of the existing building depends on the purposes to be made of them and the extent to which the spaces will be renovated and systems retrofitted. Usually the deficiencies noted by F&S are those which we consider necessary to treat for the success of the anticipated renovations and/or are recommended at this time because the renovation offers an opportunity for the work which might otherwise not be available in the future. However, the dynamic nature of a research building makes it likely that sometime in the near future, the remaining floors will also be renovated or repurposed. It is essential that the design team for this project remember this fact and design so that pathways for future ducts to the penthouse are not blocked and required capacity for power or other services is not under estimated. Moreover, it is important to understand the challenges inherent in this building – even those that do not directly affect the floors being renovated – so that all plans that follow from this project, will take these into considerations. It is highly recommended that an overall schematic plan for the building be developed now so that this and each subsequent renovation adhere to that schematic plan.

It should also be remembered that Ramsay Wright is in the second highest tier of energy usage per unit area and Ramsay Wright is tied as the largest user of water per unit area of all the buildings on campus. Any changes planned for this building should make as a priority reduction of these expensive resources.

As of the writing of this report, an energy audit for the building is being conducted by a specialized consultant. Any items identified for improvement should be considered for inclusion in the renovation project.

**Designated Substances in Building Materials**

Asbestos-containing sprayed fireproofing is present on structural beams in basement Room 13 included in the project. Asbestos-containing sprayed fireproofing is present in areas [Room 1003 & 108K] that are adjacent to the current project locations. Other asbestos-containing materials within the project area include vinyl floor tiles, insulation on mechanical systems, acoustic transite panels, transite fume hood panels and drywall joint compounds.

Please see the attached high-level summary (in Appendix) based on a more detailed survey that will be available to the team planning the renovation work. Prior to planning any renovation or demolition project a pre-construction survey must be carried out.

A major mold remediation took place in 2005, when there was considerable leakage of condensation from the chilled water lines onto the ceiling tiles. It appears that there have been further instances of sporadic leakage and discolouration of tiles since then, which have been dealt with on a one-off basis. Depending on the scope of the planned renovations, there may be an opportunity to remove the ceiling and effect a more thorough treatment.

Laboratory decontamination, mercury assessment etc. will be required prior to work.

### **Heating, Ventilation and Air Conditioning Systems**

When the building was constructed in the mid-1960s, it was not an uncommon practice to air condition research areas which operated year-round, but not air condition teaching or administrative areas. The major lecture rooms have been retrofitted with air conditioning but neither the fan that serves the corridors on the first and second floors (AHU#6) and the fan that supplies the northwest common area in the basement (AHU#10) have provision for air conditioning. New rooftop units could be located on the low roof above the loading dock on the south side of the building and ducted into the building above a dropped ceiling. Once the new units and distribution system are in place, the old units and ducts serving the area can be removed, providing routing space for new fume hood system to get to the high roof.

The perimeter heating units are connected to the heating water system using dielectric couplings to prevent corrosion from galvanic action. These couplings are in poor condition and in danger of failing one at a time. Failures in the past have resulted in floods and water damage. (Pre-existing galvanized plugs on copper piping have since been removed.)

The valves and controls that regulate the heating system temperature for the building are old. New pneumatic actuators cannot fit on the old valves, requiring replacement of the valves as well.

The disconnects and switchgear for the motor control centres that operate the pumps and fans are old and in poor condition. They should be replaced to ensure reliability of the systems they serve.

Dampers and damper controls that regulate the air flow in the building are old, and frequently unreliable, resulting in air quality complaints. Filters become quickly clogged and ducts become coated with animal hair, reducing the ventilation effectiveness. The perception of stuffiness in the building is exacerbated by odours from animals and their bedding materials when they are transported through the building using public elevators. Some thought should be given in the new configuration to how to improve on this by laying out routing for animals and cages to avoid public areas.

The condition of the building envelope prevents any mechanical humidification of the ventilation air in the winter.

The building's HVAC system is controlled locally, using an obsolete pneumatic system. It is not controlled by the University's Central Control and Monitoring System, nor any other proprietary remote system. A direct digital control system should be installed for this renovation which can then be expanded to the rest of the building as more areas are renewed.

### **Fume Hood Systems**

Nuisance vibrations have been experienced by sensitive equipment on the 6th floor, likely because the 7th floor holds 50 fans for the building's fume hoods. At present, tests are being

conducted to ascertain whether this is indeed the source, and to indicate possible corrective measures that could be taken.

A further 22 fans are located on the roof where they are exposed to the elements and as a result, are in very poor condition.

Fume hood systems are not variable volume-type, meaning they throw out the same volume of expensive conditioned air whether they are open or closed. This uses a lot of energy.

### **Water Systems**

The water system feeding the aquatic area is filtered using activated charcoal. The units are grossly oversized, requiring large amounts of water for backwashing. The cost for periodic change outs of the charcoal and anthriphilt would be more than replacement with new units sized properly. Also, the valves and controls associated with this process are old and leaking and require replacement. Alternatively, a water recycling system similar to the one used by the University of Ottawa (which uses 88% less water) could be considered for a retrofit of the Ramsay Wright.

Despite the fact that the reverse osmosis water system has been recently upgraded, if it is estimated that the load will increase then the system must be checked for its ability to meet the new load.

### **Main Electrical Supply**

The normal power supply is fed from the Central Station at Russell and Huron via the University's 4,160 volt Loop #7, which also feeds Sidney Smith hall. Although the loop feeders were upgraded, the new estimated loads from the CBTC building have used up the spare capacity, although because the building is not yet running at full capacity, there is no empirical data to substantiate this.

If renovations to the Ramsay Wright building result in substantial increases to the current loads there are two options available to provide more capacity:

Option 1 – Disconnect the building from the University's 4,160 volt Loop 7 and connect it directly to the Toronto Hydro infrastructure running up St. George Street. This will require a new 13,800 volt substation and replacement of the existing transformers with ones having a 13,800 volt primary.

Option 2 – Disconnect Sidney Smith Hall from the University's 4,160 volt Loop 7 and connect directly to Toronto Hydro's 13,800 volt grid. This will release the capacity for the Ramsay Wright. However, a new 13,800 volt substation for Sidney Smith will be required. The main Sidney Smith transformers are already being replaced with equipment having dual 4,160 and 13,800 volt primaries as part of a PCB removal project. However, a separate transformer to serve the chillers which operate at 4,160 volts will be required.

In addition to the issue of feeder capacity, transformer T3 which supplies 600V power, is running with a peak close to its capacity. An upgrade of this transformer will be needed if more power is taken from the supply. The two 120/208 V transformer main breakers are obsolete and are currently being replaced.

**Emergency Power**

Emergency power is provided to Ramsay Wright, Sidney Smith and the CBTC by a single 450kW diesel generator operating at 600 volts. The generator has been sized to supply only enough power for life safety equipment (such as emergency lighting, EXIT signs, the fire alarm panel, sprinklers and fire pumps) and equipment required to prevent damage to the building from a prolonged power failure (such as sump pumps). In addition, the city water booster pump is on emergency power, and so water will be available throughout the building at normal pressures. The de-chlorinator for the aquatic area, as well as the pumps and bubblers and the bilge pump that handles the overflow are all on emergency power. The heating pumps for the greenhouse are also supplied. There is no spare capacity available for any other research equipment.

**Building Electrical Distribution**

Ground fault protection is inadequate in the animal facilities. The wiring should be replaced in any area where wash down procedures or aquatics research occurs. As well, the electrical supply to rooms containing a large concentration of laboratory equipment should be reviewed.

**Fire Alarm System**

The fire alarm system for this building was upgraded circa 1998. As such, it is a currently supported model (Chubb/Edwards EST-3) that is capable of expansion or addition of devices.

**Fire Suppression (Sprinkler System)**

The building is presently only equipped with sprinklers below grade. The Ontario Building Code now requires sprinklers in this type of occupancy (major renovation or new construction). The initial “main” sprinkler riser and system (including fire pump) should be sized to cover all areas, so that subsequent planned renovations can be sprinklered and connected to the main riser in accordance with the overall building plan.

**Requirements for Laboratories**

Teaching labs should be designed to meet the requirements of Part 4 of the Ontario Fire Code, with particular attention being given to fire separations and ventilation. Since lab use often changes from its originally intended function, it is recommended that all potential lab spaces are designed to meet requirements of OFC Part 4 for labs.

**Building Envelope**

Exterior cladding should be checked for soundness.

Single glazed windows are beyond useful life. Replacement with double glazed units would improve occupant comfort and help save energy cost for the building.

Significant sections of the roof are beyond useful life. Replacement is scheduled within the next couple of years. Some of the roof areas were replacement in 2001.



**Laboratories - Plumbing/ Furniture/Lighting**

Existing lab sinks are polypropylene. They are in bad shape and require replacement. Gooseneck faucets and the fixture backflow preventers should also be replaced if the sinks are changed. Reverse osmosis water dispensers also require replacement.

**Elevators**

There are one freight and two passenger elevators in the building. They are original equipment with virtually no upgrades; however, they are all in good condition and parts are readily available. Longer term plans for the building should include upgrades of the cars and controls for accessibility.

The existing lab lighting fixtures have no “down light” reflectors. Energy is wasted lighting the ceiling.

Teaching lab benches can be in poor shape due to Luxo lamp fixture burns. The fixtures were left on and resting on the bench tops. The fixtures have been removed but some counter tops remain.

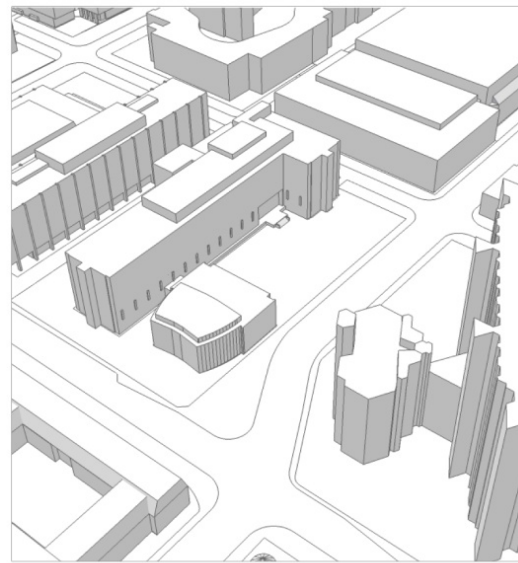
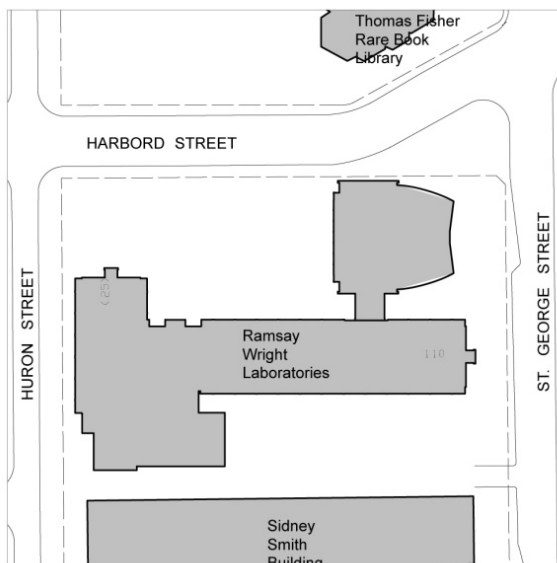
**C4. Site Considerations**

The University of Toronto’s St. George Campus Master Plan (June, 2011) includes a proposed development envelope (Site D) as an addition to the Ramsay Wright Building. This development would require the demolition of the existing lecture theatre pavilion at the northeast corner of the site.

The proposed Ramsay Wright Teaching Laboratories Upgrades will not adversely affect the development potential of this site.

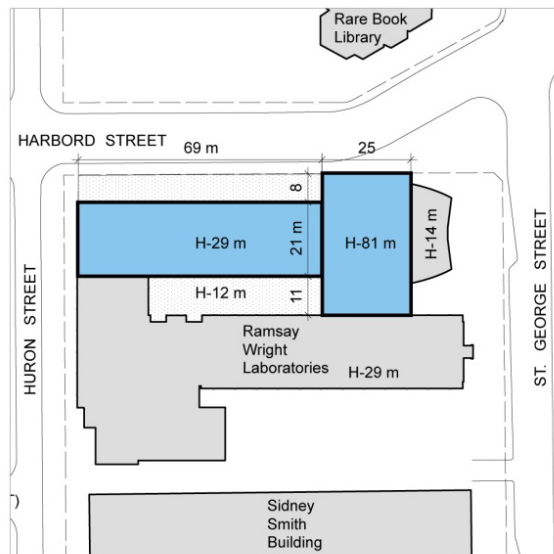
**Site Context**

Site D is located directly north of the Ramsay Wright Laboratories building on Harbord Street in the block bounded by St. George Street and Huron Street. Recognizing the prominence of the site at the centre of campus, and its adjacency to the most robust of campus buildings (Robarts Library), a significant envelope has been proposed in this location.



Southwest view

A 7-storey development envelope allows for the continuation of existing program matching the existing Ramsay Wright Laboratories building in height and floor level. The envelope extends north to bring the main address and building entry to the street, and provides an opportunity to enliven the streetscape with programming at ground level. The envelope anticipates an atrium/winter garden connection between the new structure and the existing Ramsay Wright building.



A tower is proposed at the eastern edge of the site. The tower is situated such that it minimizes shadowing to the green space immediately north along Harbord Street, while providing a structure of landmark significance at this important location on campus. The existing single level lecture theatre pavilion located at the intersection of St. George and Harbord Streets could be demolished to accomplish this envelope, or maintained as a podium.

#### Secondary Effects of Site Development

- disruption to existing occupants during construction and tie-in of structure
- demolition of pavilion will require relocation of classroom facilities

#### Servicing

- to be expanded in existing location

#### Height and Massing

- proposed base matches existing building height
- site proposes a landmark tower visible from Harbord, and St. George Streets
- development envelope massing minimizes shadow impacts on open space surrounding Roberts Library north of Harbord Street.

#### C5. Secondary Effects

While all attempts must be made to minimize disruptions to building occupants during the project, OSM rooms 142, 143, 229 could be adversely affected during construction.

Teaching lab scheduling will be affected by construction. Teaching labs that are normally held on the 2<sup>nd</sup> floor of Ramsay Wright will be temporarily relocated to the 1<sup>st</sup> floor of Ramsay Wright

with some activities going to Earth Sciences. Other possibilities of temporary teaching will also be explored.

#### C6. Staging

- Psychology teaching lab will move to the 3<sup>rd</sup> floor proposed Psychology space but will be staged on 1<sup>st</sup> floor of Ramsay Wright during renovations.

#### C7. Schedule

##### All Phases

- Governance Approval
- Consultant Selection – May 2013
- Schematic Design – June 2013 - August 2013
- Design Development & Contract Drawings – September 2013 - November 2013

##### Phase 1

- Tender and Award – December 2013
- Mobilization and Construction – January 2014 – August 15, 2014
- Commissioning and Moving – August 15, 2014

##### Phase 2

- Tender and Award – August 2014
- Mobilization and Construction – September 2014 – April 15, 2015
- Commissioning and Moving – April 15, 2015 - April 30, 2015

##### Phase 3

- Tender and Award – April 2015
- Mobilization and Construction – May 1, 2015 – December 1, 2015
- Commissioning and Moving – December 1- December 31, 2015
- Full Operational Occupancy by division – January 2016

#### Part D: Recommendations

Be It Recommended to the Academic Board:

1. THAT the Project Planning Committee Report for the Ramsay Wright Building Teaching Laboratories Upgrades, dated April 29, 2013, be approved in principle; and
2. THAT the total project scope of approximately 7,800 gross square metres (approximately 3,846 nasm), be approved in principle, to be funded by the Faculty of Arts and Science, Graduate Expansion Funds and borrowing.

**APPENDICES:**

- 1. Space Utilization and COU Guideline Analysis**
- 2. Functional Plan Space Program (Test Fit)**
- 3. Asbestos Summary Material** (available on request)
- 4. Room Specification Sheets** (available on request)
- 5. Total Project Cost Estimate** (available on request to limited distribution)

**Appendix 1: Space Utilization and COU Guideline Analysis****CSB & EEB Current Space by Building**

<b>Department of Cell Systems Biology (CSB)</b>	
<b>Building Location</b>	<b>nasm</b>
Ramsay Wright Laboratories	6132
Earth Sciences Centre	3468
<b>Grand Total</b>	<b>9600</b>

<b>Department of Ecology and Evolutionary Biology (EEB)</b>	
<b>Building Location</b>	<b>nasm</b>
Ramsay Wright Laboratories	4495
Earth Sciences Centre	3344
<b>Grand Total</b>	<b>7838</b>

**Summary of Space Requirements – Cell & Systems Biology**Occupant Profile

The Department of Cell and Systems Biology (CSB) is a large and diverse department that provides a wide variety of offerings in cell biology, genomics, molecular biology and bioinformatics, animal and plant developmental biology, and physiology.

CSB offers over 50 courses covering topics such as genetics, neurophysiology, introductory virology, eukaryotic gene expression, computational genomics and bioinformatics and plant-microorganism interactions. The Department's foundation courses in cell, molecular and developmental biology, and physiology provide fundamental concepts in each area along with essential skills in modern laboratory techniques. As students move into upper-level courses, they encounter courses that are more specialized and provide training in advanced concepts and state-of-the-art techniques in research, including specific lab-based techniques courses in molecular and cell biology. The 400-level courses often have small enrolments allowing for a more personal experience. Many of these courses are seminar based which allows students to present research data, actively participate in discussions that are fundamental to their studies and evaluate the strengths and weaknesses of different experimental approaches. Students are also encouraged to conduct their own research through CSB independent project courses where they work one-on-one in a professor's laboratory. These courses develop students' abilities in evaluating data and critical thinking.

Departmental courses are arranged into a number of academic programs: Animal Physiology, Cell and Molecular Biology, and Developmental Biology. These programs provide students with a comprehensive education in these areas of specialization. In addition, the Department contributes to the interdepartmental specialist program in Bioinformatics and Computational Biology. CSB also offer programs in Biology jointly with the Department of Ecology and Evolutionary Biology and Genome Biology jointly with EEB, the Department of Biochemistry, and the Department of Computer Science.

**CSB – Comparison of Current, COU Allocated and Proposed Space**

	<b>Current Space Inventory</b>	<b>COU Analysis</b>	<b>Proposed Space</b>
<b>Use (COU Category)</b>	<b>NASMS</b>	<b>NASMS</b>	<b>NASMS</b>
Teaching Labs & Support Space (2.0)	1954	2301	1771
Research Labs & Support Space (3.0)	5732	5760	5732
Academic Offices (4.1)	544	449	581
Research Office/Project Space (4.2)		189	
Graduate Student Space (4.3)	309	708	309
Departmental Admin & Support Staff (4.4)	243	559	319
Office Support Space (4.5)	423	476	430
<b>SUBTOTAL</b>	<b>9205</b>	<b>10441</b>	<b>9142</b>
Classroom Facilities (1.0)	153	0	153
Library Facilities & Campus Study (5.0)	18	0	18
Common Use & Student Activity (14.0)	102	0	198
Assembly & Exhibition (15.0)		0	
Inactive Space (19.0)	121		84
<b>TOTAL</b>	<b>9600</b>	<b>10441</b>	<b>9596</b>

**Cell and Systems Biology – COU Input Analysis**

**A Academic Offices**

4.1 (FTE Faculty + 15%) x 13 NASMs

FTE Faculty	30	1.15	Quotient	13	equals	449	A
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**B Research Offices/Project Space**

4.2 (FTE PDFs + FTE Research Associates + FTE Non-Academic Staff, requiring offices, paid from research funding) x 13 nasms  
(students are counted below)

FTE PDFs	17						
FTE Research Associates	6						
FTE Non-Academic Staff (research)	6						
Sum	29		Quotient	6.5	equals	189	B

**C Graduate Student Space**

4.3 FTE Grads x 4 NASMs (A & S 75% only)

FTE Grads (based on f/t grad students)	177		Quotient	4	equals	708	
						708	C

**D Departmental Administrative and Support Staff Offices**

4.4 FTE Non-Academic (requiring office space) x 13 NASMs

FTE Non-Academic	43		Quotient	13	equals	559	D
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**E Office Support Space**

4.5 (A + B + C + D) \* 25%

	1904						
	0						
	476						E

**F Research Laboratories and Support Space**

3.0 (FTE Faculty + (0.5 FTE Grads + 0.5 PDFs + 0.5 FTE Research Associates)) x Space Factor for Group

FTE Faculty	28						
FTE Grads	88.5						
FTE PDFs	8.5						
FTE Research Associates	3		Space Factor*				
sum	128			45	equals	5760	F

**G Teaching Laboratories and Support Space**

2.0 # Scheduled Laboratory Weekly Student Contact Hours x Space Factor for Group

# hours	3.887		Space Factor*	0.6	equals	2301	G
							0.3 for computer labs

**TOTAL AGGREGATE SPACE GENERATED**      10441

**Summary of Space Requirements – Ecology & Evolutionary Biology**

Occupant Profile

The Department of Ecology & Evolutionary Biology (EEB) is one of the largest departments of its kind in North America, with internationally renowned and award-winning faculty. EEB is engaged in research and scholarship in diverse sub-disciplines within ecology and evolutionary biology. The Department offers several undergraduate programs and over 55 courses, including independent projects, fourth-year seminars, and field courses. Graduate students may enroll in both MSc and PhD programs and study with graduate program faculty on the St. George, Mississauga and Scarborough campuses of the University, and at the Royal Ontario Museum.

Successful science combines both “curiosity-driven” and “solution-driven” research, and EEB has practitioners of both. The Department has four strategic research foci: evolutionary genetics and genomics, quantitative ecology, and reproductive systems biology, and a fourth in systematics, centered on EEB faculty at the Royal Ontario Museum.

Ecologists and evolutionists address the central questions of the origin, maintenance and organization of biodiversity. The Department’s faculty members teach, study and consult on all aspects of earth’s organismal diversity, from genome to ecosystem, encompassing the range of plant, animal and microbial species.

The faculty members’ goal is to continue building on their excellence in teaching, discovery and innovation in the basic sciences of ecology and evolution, developing the new Department of Ecology and Evolutionary Biology as the top research and training program in Canada, indeed among the best in the world, and to take advantage of opportunities for interdisciplinary synergies within and outside the University.

**EEB – Comparison of Current, COU Allocated and Proposed Space**

	<b>Current Space Inventory</b>	<b>COU Analysis</b>	<b>Proposed Space</b>
<b>Use (COU Category)</b>	<b>NASMS</b>	<b>NASMS</b>	<b>NASMS</b>
Teaching Labs & Support Space (2.0)	2410	2729	2144
Research Labs & Support Space (3.0)	3819	4410	3869
Academic Offices (4.1)	406	344	346
Research Office/Project Space (4.2)	13	137	13
Graduate Student Space (4.3)	332	532	332
Departmental Admin & Support Staff(4.4)	189	247	230
Office Support Space (4.5)	247	315	278
<b>SUBTOTAL</b>	<b>7416</b>	<b>8714</b>	<b>7212</b>
Classroom Facilities (1.0)	153	0	153
Library Facilities & Campus Study 5.0)	99	0	99
Common Use & Student Activity (14.0)	135	0	211
Assembly & Exhibition (15.0)		0	
Inactive (19.5)	35		35
<b>TOTAL</b>	<b>7838</b>	<b>8714</b>	<b>7710</b>

**Ecology & Evolutionary Biology – COU Input Analysis**



**A Academic Offices**

4.1 (FTE Faculty + 15%) x 13 NASMs

Faculty	23	1.15	13	Quotient equals	344	A
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**B Research Offices/Project Space**

4.2 (FTE PDFs + FTE Research Associates + FTE Non-Academic Staff, requiring offices, paid from research funding) x 13 nasm  
(students are counted below)

FTE PDFs	19					
FTE Research Associates	2					
FTE Non- Academic Staff (research)				Quotient		
Sum	21		6.5	equals	137	B

**C Graduate Student Space**

4.3 FTE Grads x 4 NASMs (A & S 75% only)

FTE Grads (based on f/t grad students)	133		4	Quotient equals	532	
					532	C

**D Departmental Administrative and Support Staff Offices**

4.4 FTE Non-Academic (requiring office space) x 13 NASMs

FTE Non-Academic	19		13	Quotient equals	247	D
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**E Office Support Space**

4.5 (A + B + C + D) \* 25%

	1259	
	0	
	315	E

**F Research Laboratories and Support Space**

3.0 (FTE Faculty + (0.5 FTE Grads + 0.5 PDFs + 0.5 FTE Research Associates)) x Space Factor for Group

FTE Faculty	21					
FTE Grads	66.5					
FTE PDFs	9.5					
FTE Research Associates	1			Space Factor*		
sum	98		45	equals	4410	F

**G Teaching Laboratories and Support Space**

2.0 # Scheduled Laboratory Weekly Student Contact Hours x Space Factor for Group

# hours	4,639		0.6	Space Factor* equals	2729	G
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.3 for computer labs

**TOTAL AGGREGATE SPACE GENERATED**      8714

**Summary of Space Requirements – Psychology**

**Psychology – Comparison of Current, COU Allocated and Proposed Space**

	<b>Current Space Inventory</b>	<b>COU Analysis</b>	<b>Proposed Space</b>
<b>Use (COU Category)</b>	<b>nasm</b>	<b>nasm</b>	<b>nasm</b>
Teaching Labs & Support Space (2.0)	41	30	41
Research Labs & Support Space (3.0)	3,299	3,435	3,699
Academic Offices (4.1)	638	419	638
Research Office/Project Space (4.2)	27	111	27
Graduate Student Space (4.3)	64	572	64
Departmental Admin & Support Staff(4.4)	125	143	125
Office Support Space (4.5)	123	311	123
<b>SUBTOTAL</b>	<b>4,317</b>	<b>5,020</b>	<b>4,717</b>
Classroom Facilities (1.0)	188		188
Library Facilities & Campus Study 5.0)			
Common Use & Student Activity (14.0)	43		43
Assembly & Exhibition (15.0)			
Inactive (19.5)	178		89
<b>TOTAL</b>	<b>4,726</b>	<b>5,020</b>	<b>5,037</b>

\*Note: Graduate student space is comparatively low and research space high due to Psychology’s method of accommodating grad students within research lab space.

**Psychology – Teaching Laboratories Usage and Space Summary**

<b>Course</b>	<b>Current Location</b>	<b>Weekly Practical hrs</b>	<b>Course Enrolment</b>	<b>Wkly. Student Contact Hours</b>	<b>COU space factor</b>	<b>Generated Area NASM</b>
<b>EEB Laboratory Course Information - Fall 2011</b>						
PSY399H	217	3.0	20	60	0.5	30

**Psychology – COU Input Analysis**

**A Academic Offices**  
 4.1 (FTE Faculty + 15%) x 13 NASMs

Faculty	28	1.15	13	Quotient equals	419	<b>A</b>
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**B Research Offices/Project Space**  
 4.2 (FTE PDFs + FTE Research Associates + FTE Non-Academic Staff, requiring offices, paid from research funding) x 13 nasM  
 (students are counted below)

FTE PDFs	9	Sum	6.5	59		
FTE Research Associates		Sum	13			
FTE Non- Academic Staff (research)	4	Sum	13	52		
				equals	111	<b>B</b>

**C Graduate Student Space**  
 4.3 FTE Grads x 4 NASMs (A & S 75% only)

FTE Grads (based on f/t grad students)	143	4	Quotient equals	572	
				572	<b>C</b>

**D Departmental Administrative and Support Staff Offices**  
 4.4 FTE Non-Academic (requiring office space) x 13 NASMs

FTE Non-Academic	11	13	Quotient equals	143	<b>D</b>
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**E Office Support Space**  
 4.5 (A + B + C + D) \* 25%

	1,244	
	0	
	311	<b>E</b>

**F Research Laboratories and Support Space**  
 3.0 (FTE Faculty + (0.5 FTE Grads + 0.5 PDFs + 0.5 FTE Research Associates)) x Space Factor for Group

FTE Faculty	22		
FTE Grads	56.5		
FTE PDFs	4.5		
FTE Research Associates	0		
sum	83	30	Space Factor* equals 2,490 <b>F</b>

**Research Laboratories and Support Space (Neurobiology Faculty)**  
 (FTE Faculty + (0.5 FTE Grads + 0.5 PDFs + 0.5 FTE Research Associates)) x Space Factor for Group

FTE Faculty	6		
FTE Grads	15		
FTE PDFs	0		
FTE Research Associates	0		
sum	21	45	Space Factor* equals 945 <b>F</b>

**G Teaching Laboratories and Support Space**  
 2.0 # Scheduled Laboratory Weekly Student Contact Hours x Space Factor for Group

# hours	60	0.5	Space Factor* equals	30	<b>G</b>
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**TOTAL AGGREGATE SPACE GENERATED** 5,020

## Human Biology Program - Teaching Laboratories Usage and Space Summary

Course	Current Location	Weekly Practical hrs	Course Enrolment	Wkly. Student Contact Hours	COU space factor	Generated Area NASM
<b>HMB Laboratory Course Information - Winter 2012</b>						
HMB202H	MS2182	1.0	354	354	0.6	212
	MS2184	1.0				
	MS2283	1.0				
	MS2287	1.0				
HMB311H	MS2180	3.0	40	120	0.6	72
	MS2281	3.0				
HMB312H	MS2180	3.0	77	231	0.6	139
	MS2178	3.0				
	MS2281	3.0				
	MS2283	3.0				
HMB320H	MS1162	1.0	103	137	0.6	82
	MS1164	1.0				
		24.0	574	842		505
<b>HMB Laboratory Course Information - Fall 2011</b>						
HMB302H	RW013	3.0	160	480	0.6	288
	RW122	3.0				
	RW205	3.0				
	RW219	3.0				
HMB310H	MS2277	3.0	41	62	0.6	37
	MS2378	3.0				
HMB314H	MS2280	3.0	76	114	0.6	68
	MS2281	3.0				
	MS2379	3.0				
	MS2381	3.0				
HMB489H	MS3379	6.0	16	24	0.6	14
		36.0	293	680		408

Appendix 2: Functional Plan Space Program (test fit)

