



**UNIVERSITY OF TORONTO**  
**FACULTY OF MEDICINE**

**PROPOSAL TO ESTABLISH THE DONNELLY CENTRE FOR CELLULAR &  
BIOMOLECULAR RESEARCH AS AN EXTRA-DEPARTMENTAL UNIT (EDU-A)**  
**April 22, 2010**

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**Summary of the proposed unit**

It is clear that continued progress in medicine and health research is dependent upon the integration of technology, expertise, and thought from diverse disciplines. This new theoretical architecture presents a challenge which can be addressed through creation of dedicated interdisciplinary centres. The University of Toronto has addressed this challenge through the establishment of the Donnelly Centre, a unique centre in which investigators from the Faculties of Medicine, Pharmacy, Applied Science & Engineering, and Arts & Science are brought together in an open, think-tank environment. The Donnelly Centre is mandated to stimulate novel interactions at the interface of biology, chemistry, engineering and computer science in order to develop and apply new technologies for approaching the most challenging biological problems in the post-genomic era. The Centre officially opened in 2005 and houses 32 principal investigators and their research groups (~400 staff), relocated from various academic units or hired through external recruitment. The Donnelly Centre has established an effective administrative team, a clear governance structure including a Director, and an Executive Committee and a unique research and education mandate. The Faculty of Medicine recommends that the development of the Donnelly Centre as a world-leading centre for interdisciplinary biomedical research, will be best achieved by a streamlined administrative structure that allows primary appointments within the Centre and has a consolidated financial model.

**Description of the unit**

○ **Mandates; rationale for formation; academic goals**

The Donnelly Centre for Cellular and Biomolecular Research (the Donnelly Centre) [<http://www.thedonnellycentre.utoronto.ca>] is an interdisciplinary biomedical research Institute on the St. George campus. The Centre officially opened in 2005:

The fundamental mandate of the Donnelly Centre is to create a research environment that encourages the integration of biology, computer science, mathematics, engineering and chemistry and that spans leading areas of biomedical research. When fully occupied, the Centre will house approximately 35 Principal Investigators and their teams of trainees, students and scientists. This scientific community of approximately 500 students, postdoctoral fellows, research technicians, visiting scientists and scholars interact in stunning open-concept laboratories and meeting spaces distributed over 10 floors in a research tower that is said to symbolize the dazzling potential of the post-genomic era. The laboratory floors total ~200 000 square feet – each floor will house between 3-5 investigators and their teams (depending on team

size and infrastructure needs) and includes several large support rooms for shared equipment as well as informal meeting spaces. Laboratory benches are modular and flexible and can be readily adapted to the needs of engineers, computational or molecular biologists. The building is designed to inspire and foster interdisciplinary collegiality, with space that provides maximum functionality and flexibility.

The principle academic mandate of the Donnelly Centre is to offer a unique research and training environment at the interface of disciplines relevant to human biology. The Centre's Executive committee has developed a governance and recruitment plan. Faculty members whose research encompasses leading areas of biomedical research defined by three broad platforms have been recruited to the Donnelly Centre from the University of Toronto community:

- Integrative Biology (Functional genomics; Proteomics; Bioinformatics; Systems biology; Chemical biology and chemical genomics; Structural biology)
- Bioengineering and Functional Imaging (Regenerative medicine, technological developments in cell & tissue imaging; high throughput cell biology)
- Models of Disease (Stem cell biology; Model organisms; Animal models of human disease)

Immediate research aims are to build significant strength in the following research areas:

1. Chemical genetics (high throughput screening of compounds and other bioactive reagents for biological analysis).
2. High throughput cell biology (large-scale RNAi-based screens in mammalian cell systems, genome-wide screening approaches in model organisms).
3. Enabling technologies (imaging of cellular processes, automation, microfluidics).
4. Systems biology (mathematical modeling of dynamic biological processes, including signal transduction pathways, developmental biology, gene regulatory networks; metabolomics; functional genomics; computational and quantitative biology).

The first group of faculty members was recruited from University of Toronto faculty whose research activities aligned with the Centre mandate and research platforms. Donnelly Centre faculty members are expected to develop new collaborative research projects that define the current 'cutting edge' of biomedical research, which we view as a moving target – we envision an evolving research enterprise whose goals in five years may bear little resemblance to those we can imagine today. Recruitment of faculty members external to the University is ongoing. One of the key goals of the Donnelly Centre is to stimulate joint recruitment involving units at the University that have not traditionally interacted. In the past several years, the Centre has been involved in several joint recruitments with departments in the Faculties of Medicine, Applied Science & Engineering, Arts & Science (Computer Science, Chemistry and Physics) and Pharmacy.

The Centre has undergone two external reviews since its establishment, most recently in 2009. The report was reported to the Committee on Academic Policy and Programs on March 2, 2010. The report described the Donnelly Centre as “probably the most pre-eminent institution in the world dedicated to the development and application of technologies for quantitative high-throughput biology at various scales and levels”. The reviewers noted the success of the Centre's model, highlighting its success in recruiting outstanding faculty as particularly

remarkable. The reviewers strongly encouraged the Centre be established as an EDU-A so that primary faculty appointments could be made by the Centre and the teaching mission of the unit could evolve.

### **Units/departments/divisions involved**

The Donnelly Centre was created as a joint endeavour of the Faculties of Medicine, Applied Science and Engineering, and Pharmacy. The evolving priorities for individual Faculties and Departments have altered participation in the Donnelly Centre and agreements have been revised to reflect current building occupancy and projected future involvement in the Centre. Under the terms of revised agreement, the Faculties of Medicine and Applied Science and Engineering will be known as the “Partners” or “partner Faculties”. The Faculties of Pharmacy and Arts & Science will be “Associate partners”. Associate partners will have input into governance and will have faculty members occupying space in the Donnelly Centre.

Donnelly Centre occupants include faculty members from the following academic units and external recruitment is ongoing:

#### Faculty of Medicine:

- Banting & Best Department of Medical Research (BDDMR)
- Department of Biochemistry
- Department of Molecular Genetics
- Department of Surgery

#### Institute of Biomaterials & Biomedical Engineering (IBBME)

#### Faculty of Applied Science & Engineering:

- Department of Chemical Engineering & Applied Chemistry
- Edward S. Rogers Department of Electrical and Computer Engineering

#### Leslie Dan Faculty of Pharmacy

#### Faculty of Arts & Science:

- Department of Computer Science
- Department of Chemistry
- Department of Physics

### **Broad mandate/scope of research**

The principle academic mandate of the Donnelly Centre is to offer a unique research and training environment at the interface of disciplines relevant to human biology. Immediate research aims are to build significant strength in the following research areas through external recruitment:

5. Chemical genetics (high throughput screening of compounds and other bioactive reagents for biological analysis).

6. High throughput cell biology (large-scale RNAi-based screens in mammalian cell systems, genome-wide screening approaches in model organisms).
7. Enabling technologies (imaging of cellular processes, automation, microfluidics).
8. Systems biology (mathematical modeling of dynamic biological processes, including signal transduction pathways, developmental biology, gene regulatory networks; metabolomics; functional genomics; computational and quantitative biology).

## Teaching / Programs

The Donnelly Centre has a significant graduate education mandate. The fluid environment of the Centre will encourage graduate students to approach biological problems in new ways by stimulating unconventional interactions among disciplines including medicine, pharmacy, engineering, chemistry, computer science, proteomics, and functional genomics. The Donnelly Centre environment provides strong interdisciplinary training for graduate students enrolled in programs with which Centre faculty members are associated:

Molecular Genetics

Biochemistry

Collaborative Program in Genome Biology & Bioinformatics (Medicine/Arts & Science)

Chemistry

Computer Science

Physics

Biomedical Engineering

Electrical & Computer Engineering

Chemical Engineering & Applied Chemistry

Pharmaceutical Sciences (Pharmacy)

Together, these programs enroll more than 2,000 MSc/MASc/PhD students. Donnelly Centre faculty members are actively engaged investigators in these programs.

The Donnelly Centre teaching mandate involves working collaboratively with cognate departments to enhance both undergraduate and graduate recruitment in interdisciplinary biomedical research. Opportunities abound, for example, Chemistry has vigorously pursued expansion of expertise where molecular science interfaces with human biology, including biomarker research, lab-on-a-chip, medicinal chemistry, and advanced spectroscopy. Undergraduate specialist programs in biological chemistry have similarly exploded with a trebling of majors in the past three years. Computer Science continues to recruit in computational biology.

The Donnelly Centre will continue to attract students in diverse disciplines and provide opportunities for co-supervision by investigators with complementary expertise under one roof. The Centre plans to develop programs that will provide cross-training opportunities that do not currently exist on a formal level - for example, mechanisms to recruit and cross-train engineers and computer scientists in genomics & proteomics at the graduate and PDF levels. Collaborative undergraduate and graduate programs will be developed with interested units. The infrastructure in the Donnelly Centre means that it is in a unique position to train students in the follow areas, broadly defined as “Integrative & Systems Biology”:

- [1] Protein interaction mapping (two-hybrid; domain-mapping using phage display; systematic mapping of physical protein interaction networks by mass spectrometry)
- [2] Loss-of-function screening and phenogenomics (using si/shRNAs in mammalian cells or genetic reagents in model organisms)
- [3] Small molecular screening [in yeast, worms, flies and mammalian cells]
- [4] Transcriptional regulatory networks [ChIP-chip; Chip-SEQ; expression profiling, nucleosome profiling, protein microarrays]
- [5] Stem Cell Biology
- [6] Computational analysis of complex datasets

The Centre has launched public outreach programs, to expose high school students and interested members of the public to cutting-edge biomedical research and there are plans to enhance public outreach programs in the future and the programs will include public lectures and lab open houses/research days.

## **Director**

As an EDU:A unit, the Director will be appointed as per the *Policy on the Appointment of Academic Administrators* and with the following responsibilities:

- The Director will select and/or agree to all Centre members in consultation with the Donnelly Centre Executive Committee, relevant advisory and search committees and appropriate Chairs.
- The Director will recruit new Donnelly Centre faculty in cooperation and consultation with appropriate Chairs and with the advice of search committees; start-up and relocation expenses will be established cooperatively by the relevant Chair and the Director.
- The Director will allocate and re-allocate all research space in the Centre, advised by the Donnelly Centre Executive Committee.
- In the event, probably rare, that a Centre member's performance falls short of expectations, the Director and the relevant Chair will work together to relocate the faculty member into Department space for the purpose of realigning their academic activities.
- The Director will give opinions to the appropriate Chairs regarding decisions on progress through- the-ranks and make recommendations to the Chairs for merit remuneration from the Centre Director including the analysis of continual multi-year strategic and financial planning of the Donnelly Centre.

The Director reports to the Dean of the Faculty of Medicine.

## **Centre Executive Committee**

An Executive Committee will consist of the Deans of the Partner Faculties or their designates, as appropriate, the Deans of the Associate Partner Faculties (or delegates), and the Director of the Donnelly Centre, ex officio. Membership may be expanded, at the advice of the Deans of the partner and associate partner Faculties, to include leaders of affiliated research units who are active participants in the Donnelly Centre, up to a maximum of 7 members

The role of the Executive is to advise the Director of the Donnelly Centre on the following matters:

- Policy regarding allocation and re-allocation of space and resources among and within the Donnelly Centre programmes and members.
- Policy regarding allocation of new appointments.
- Management of support services and other infrastructure.
- Teaching and training of young scientists.
- New research initiatives.

## **Planning and Budget**

The original Memorandum of Understanding among the Faculties of Medicine, Applied Science and Engineering and Pharmacy was signed in 2007 and addressed issues of governance and administration. Revised agreements have been agreed upon by the four participating Faculties with regard to financing the mortgage, funding the occupancy costs and sharing the proceeds from fund raising. All the commitments to the Director are being met.

Agreements have been revised to reflect the active participation of the Faculty of Arts & Science (as an Associate Partner) and a reduced role for the Leslie Dan Faculty of Pharmacy which has identified other priorities. The overall financial plans for operation and maintenance of the Centre have been discussed and agreed to by all participating units. Funding for salary and benefit costs of occupants (ie. faculty members and their staff) will be the direct responsibilities of the respective Faculties. Other costs such as administrative compensation and overhead will be apportioned as agreed upon by participating units.

The EDU-A status will allow faculty member primary appointments directly to the Donnelly Centre, if appropriate. Faculty appointed directly to the Donnelly Centre will also hold cross-appointments in relevant teaching departments. These tenured faculty members are reviewed annually for their academic performance by the Director of the Donnelly Centre and the relevant Department Chair who will take into account the contributions to teaching.

Faculty of Applied Science & Engineering (FASE) appointments for existing FASE faculty in the Donnelly Centre will not be primary appointments to the Centre. FASE will, in all instances of Donnelly Centre cross-appointments, ensure that new faculty members belong to an existing Engineering department, or to IBBME. These appointments will have Engineering as the primary appointment. Unless there is a mutually agreed upon recruitment initiative, Medicine will not accept any Applied Science and Engineering joint appointments to the Donnelly Centre.

There are no resource implications for the University's operating budget resulting from this proposal.