UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING

Catalogue of Advancement Priorities

May 1, 2009

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Section 1.0 - Executive Summary

Engineers play a fundamental role in advancing human development. Globalization is linking people and economies across geographic space and time in ways they have never been linked before. In the face of this new reality, there is a need to develop a new educational paradigm that prepares engineers to work across cultures and disciplines in an unprecedented collaborative manner. With its depth of research and international perspective, the Faculty of Applied Science and Engineering at the University of Toronto will nurture a new generation of engineers – technically strong and globally adept – to address some of the most pressing and complex issues of our time.

This document outlines the Faculty of Applied Science and Engineering's philanthropic plan to financially support the following efforts:

1. Attract and engage a diverse, talented and creative body of undergraduate students in a manner that prepares them to assume leadership positions in the global economy;
2. Be a magnet for the best and the brightest engineering undergraduate and graduate students from around the world whose contributions will further strengthen our diversity and global perspective;
3. Recruit and retain an internationally renowned faculty, characterized by the quality of their teaching, the significance of their research, and caliber of the honours and funding they secure;
4. Be recognized internationally for the intellectual innovation, collaborative approach, and creativity of our educational and research programs, specifically in the areas of bioengineering, nanoengineering, energy and sustainability, and information communications and technology;
5. Create new and enhance existing facilities that reflects the aspirations and quality of our students and faculty.

Building for our Future

Attracting and empowering the finest faculty, staff, and students depends on the Faculty's ability to provide an environment that fosters creativity and inspires twenty-first-Century learning and discovery.

Success in our mission requires the eminent minds to undertake these endeavours. Endowing chairs within the four key areas of research will be a first step in securing our place among the world's leading research centres and providing our students with faculty mentors. Scholarships are also fundamental to our ability to attract the most talented students from Canada around the world.

Finally, our success in pursuing new areas of engineering innovation has created the need for specialized work areas, more laboratories and new kinds of classrooms. Our historic buildings, designed for the academic needs of the nineteenth century, need to be updated to accommodate contemporary learning technology and multi-disciplinary research that will assist faculty bring whole new dimensions of sight and sound to their lessons and research. Most of our academic buildings need to be designed to move students and faculty out of their disciplinary silos and into common areas that encourage collaboration. New buildings and the thoughtful renovation of our cherished spaces will also provide faculty, undergraduate and graduate students with powerful incentives to choose the University of Toronto.

SECTION 2.0 - OVERVIEW

During the Campaign, the Faculty witnessed tremendous success, raising approximately $125 million against a target of $65 million, which translated in $245 million with matching funds from government and the corporate sector. Since the Campaign, the Faculty has raised over $27 million.

In 2004, the Faculty produced a Strategic Plan for the period 2004-2010. Shortly thereafter, the Departments, Institutes and Divisions within the Faculty were asked to submit their fundraising priorities to the Advancement office for compilation in a Catalogue of Funding Priorities. The resulting document, produced in February 2005, was the last approved list of Faculty priorities on record.

Since the creation of this document, the environment has changed and the Catalogue of Funding Priorities requires updating to align with the current academic mission of the Faculty. During a Faculty Retreat in the fall of 2007, the Faculty under the leadership of the newly appointed Dean identified specific research intensive themes and strategic directions that serve as the foundation for its academic priorities.

Beginning in FY 2008/2009, the Faculty of Applied Science and Engineering's advancement priorities will be focused on the following six primary areas:

- Student Experience
- Globalization
- Bioengineering
- Energy, Environment and Sustainability
- Information Communications and Technology
- Nanoengineering

Highlights of the Faculty of Applied Science and Engineering

- Among the top ten engineering schools in the world and number one in Canada as determined by the Times Higher Education-QS World University Ranking and the U.S. News & World Report.
- Home to over to 4,500 undergraduate and 1,500 graduate students.
- Boasts a community of close to 40,000 living alumni who can found in manufacturing, transportation, the resource industry, biotechnology, communications, law, finance and the healthcare system, to name a few.
- Our faculty received, in the 2007-2008 academic year, over $60 million in research funding – a record year and received over 138 awards for our teaching and research excellence.

A Note About Capital Projects

The capital project values were provided by the Chairs associated with the specific projects. The Mining Building Attic and the Structural Testing Facility have undergone Governing Council Approval. Several projects have more thorough estimates, which have been developed as part of a grant application. Others are simply estimates based on similar projects. All will go through the proper process. This includes assessing the full cost of the project, approvals from all boards and committees, as well as DUA approval for naming and recognition opportunities.

Section 3.0 - Enriching the Student Experience

A university education is a life-changing opportunity that provides unlimited exposure to intellectual discovery and opportunity for personal growth. University of Toronto Applied Science and Engineering graduates are sought after and renowned for their solid technical skills. The Faculty is committed to providing a learning environment that will foster creativity, independent thinking, collaboration, and personal development.

TRANSFORMATIONAL OPPORTUNITIES

Naming of the Faculty of Applied Science and Engineering

$100 million endowment

The Faculty of Applied Science and Engineering is considered one of the top Engineering schools in the world. In 2008 we were ranked No. 1 in Canada and No. 10 in the world (Times Higher Education QS/US New and World Report), up from 11th in 2007. Funds associated for the naming would be used for capital and operational improvements across the Faculty, the establishment of special initiatives, professorships and student scholarships.

Naming of Departments, Divisions and Institutes

$25 million endowment each

The Faculty is home to five Departments (Chemical Engineering, Civil Engineering, the Edward S. Rogers Sr. Department of Electrical and Computer Engineering, Materials Science & Engineering, and Mechanical & Industrial Engineering), two Divisions (Engineering Science, and Environmental Engineering and Energy Systems), and two Institutes (Institute of Biomaterials & Biomedical Engineering and Institute for Aerospace Studies). With the exception of the Edward S. Rogers Sr. Department of Electrical and Computer Engineering and the Lassonde Institute, all of these units are available to be named. Funds from such namings will support capital and operational improvements, establishment of new programs, professorships and student scholarships for the respective units.

SCHOLARSHIPS, AWARDS, AND FELLOWSHIPS

Undergraduate, Academic-Merit Based Scholarships

$10 million endowment or min. $2,000 annual/student

To attract the very best students from across Canada and around the world, the Faculty is seeking private support for student aid. Merit based scholarships can be awarded based on academic excellence, outstanding leadership skills or to students from groups that are under-represented in the Faculty. Scholarships can also be directed within any of the Faculty's nine undergraduate programs.

Graduate Scholarships & Awards

$10 million endowment or $10,000 annual/student

Top quality of graduate students is critical to the success of the research enterprise within the Faculty. Recruiting and retaining outstanding graduate students is challenging, especially when competing with top engineering schools around the world. These scholarships will provide the funding packages required to attract the best and the brightest graduate students to the Faculty.

Undergraduate Research Fellowships

$2 million endowment or $5,000 annual/student

Through this program, undergraduate students from all engineering disciplines will have an opportunity to join established research groups led by faculty at the University of Toronto and other leading research institutions. This experience enables students to gain an understanding of the research process and provide them with hands-on experience during their undergraduate years. It also enables them to take part in vibrant research activities that have impact in our society.

Women in Engineering Admission Scholarships

$1.5 million endowment or $5,000 annual/student

Application of female students to engineering has decreased in recent years. Scholarships offer great incentives for young women to study at the leading Engineering School in Canada and mentor with top female engineers – over the last two years over 50% of the new hires at the Faculty have been females. Such an environment would empower young women to choose a professional career in engineering, thereby enriching our school and our profession.

Engineering Leaders of Tomorrow Awards

$125,000 endowed or $5,000 annual/student

The Awards would recognize current undergraduate and graduate students who have shown the potential to become outstanding leaders. This potential may be demonstrated in a number of ways, including participation in student councils or clubs, community organizations, cultural groups, athletics or through volunteering or community work. Recipients should have the ability to inspire others to action and to excellence.

CHAIRS

Chair in Engineering Leadership Development

$3 million endowment or $1 expendable (over 5 years)

The Chair would support an Engineering Leadership Development Professor who would serve as an instructor of APS501: Leadership and Leading in Groups and Organizations and contribute to other courses including APS111/112: Engineering Strategies and Practice. The Chair will also provide pedagogical and curriculum support to the Engineering Leaders of Tomorrow program. The Chair holder may be a senior executive from the business world who holds the position on a partial appointment basis.

CAPITAL PROJECTS

Materials Science and Engineering First Year Laboratories

$2 million capital

A recent external review of the Materials Science & Engineering Department highlighted the unfortunate state of the first year laboratories. There is a pressing need to renovate and upgrade existing undergraduate laboratory space to accommodate the growing number of students and to offer hands-on labs, which would significantly enhance the learning experience. Renovations would include replacement of lab benching and fistures, new finishes, flooring and lighting. These labs are used by all first year students and include several laboratories in the Wallberg Building (WB41-52 and PT 66, 67, 67A, 162.)

Structural Testing Laboratories

$1 million capital

This project involves the expansion of the Structural Testing Laboratories located in the Sandford Fleming and Galbraith buildings. It will be completed by February 2009. When completed, this project will boast equipment, unique to Toronto and Canada, and will re-establish its position as a leading testing laboratory in North America.

Student Club Spaces

$500,000 capital

Student clubs are excellent ways for students to enhance their experience at Skule™, broaden their technical knowledge and learn valuable teamwork and communication skills. Skule™ clubs includes our award winning Formula SAE Team – First Place winners in the Formula Student Racing Competition in the UK – Concrete Canoe, Skule™ Nite, Blue Sky Solar Race Team and many others. To date, these clubs have worked in a variety of ill-suite rooms that were made available on a temporary basis to the design teams. A dedicated facility, equipped with the proper tools, machinery

and supplies would enrich the experience for our students. At the moment, these clubs are housed in Haultain and the Engineering Annex, as well as temporary spaces at 245 College Street. These spaces are not ones where the Faculty wants to invest in renovation. The goal would be to locate these clubs in one space, but a space has yet to be identified.

Undergraduate Laboratories

$500,000 capital per space

In order to enhance student experience and attract world-class students to the Faculty, there is a constant need to create, renew and upgrade our existing teaching and research facilities and computer laboratories. By preserving, upgrading and equipping laboratories, the Faculty will provide the environment and tools required for our researchers, teachers and students to excel. The Faculty is in the process of assessing the quality of the spaces within the various buildings it occupies. This assessment will help determine the sequence of upgrades required and the specific funding requirements for each space.

Undergraduate Study Rooms

$300,000 capital per space

The Faculty is home to over 4,500 undergraduate students and there is an urgent need for space in which students can study and work in teams. A number of Departments, particularly the Edward S. Rogers Sr. Department of Electrical and Computer Engineering and Materials Science and Engineering need a room designated for these purposes The Faculty is in the process of assessing the quality of the spaces within the various buildings it occupies. This assessment will help determine the sequence of upgrades required and the specific funding requirements for each space.

Department Seminar/Graduate Classroom

$250,000 capital per space

One of the Faculty's strategic priorities is to increase the number of graduate students in the coming years. This decision impacts the need for classrooms designated for graduate seminars and courses. At present, many Departments only have a conference room for meetings. Space is required to conduct graduate courses, special seminars and group activities.

PROGRAMS

Engineering Leaders of Tomorrow

$1 million expendable (over 5 years)

The goal of this faculty-wide program is to provide an engineering education that is a lifelong foundation for transformational leaders and outstanding citizens. This program aims to develop skills and abilities among students that go beyond the technical skills. Funds will be used to support the programs annual operation that includes a wide-variety of programming, such as lectures, seminars, and workshops.

Sponsorship for Student Teams, Clubs or Competition

$1 million expendable (over 5 years)

Many current clubs and teams (Solar Car, Mechatronics Club, Robotics Club, National Society for Black Engineers, Formula SAE, Electrical Vehicle Club, Eco CAR, etc.) operate under a scattered set of funding. An endowment would provide sustainable funding to support clubs and teams that are at the heart of the student experience at the Faculty of Applied Science and Engineering.

Student Development Initiatives

$100,000 expendable (over 5 years)

The transition into a university environment can be challenging for some students. The Faculty of Applied Science and Engineering wants to ensure that all students have access to valuable programs that will help them achieve success in their academic careers. Some of these programs connect upper year students with first year students or facilitate mentorship with faculty members. Other programs

coordinate study groups run by upper year students for younger peers, helping them adjust to the university environment.

Section 4.0 – Globalization

Today's engineers are faced with enormously complex problems and extraordinary opportunities. Globalization of the workplace, rapid engineering advances, cross-border migrations and new approaches to problem-solving are challenging engineers in ways that were unheard of when Skule was first established in 1873.

Solving the world's imminent problems requires leadership. New and evolving technologies often have powerful national and international consequences. Inter-disciplinary and global work teams are increasingly becoming commonplace. To be successful in this environment, engineers must not only obtain strong engineering foundations, they must also develop a broad and international perspective. Their training must involve cross-cultural experiences, collaborations with a variety of disciplines – within and beyond engineering – and a solid foundation of technical skills to analyze problems, implement solutions, and most importantly, create innovative technologies. Along with these skills, they must also possess a comprehensive ethical perspective and a deep commitment to the common good.

Our engineering graduates will have to compete and collaborate with engineers across the world. The diversity amongst the student body is part of the unique character of the Faculty and the University. The Faculty plans to build on this distinct quality by further internationalizing our community through engaging international exchanges with other universities, exposing our students to visiting scholars from around the globe, and providing international work experience.

TRANSFORMATIONAL OPPORTUNITIES

Centre for Global Engineering and Sustainable Technologies

$5 million endowed

The Centre will harness the Faculty's activities on global engineering, particularly in the area of international development. Key activities and goals of the Centre will include training engineers in global engineering approaches and the design of appropriate and sustainable technologies, serving as a resource in the development of a global perspective in the Faculty's academic and research program, acting as a focal point of some of the outreach and communications for a variety of programs and serving as a prominent example of how engineers address the world's most pressing problems.

CHAIRS & FACULTY EXCELLENCE

Chair in Globalization

$3 million endowed or $1 million expendable (over 5 years)

The process of incorporating the theme of globalization into the curriculum will require leadership and a champion. This Professor will lead the development of specialized courses and complementary study courses, as well as incorporate global sustainability through the technical curriculum.

Visiting Professors

$1 million endowed or $500,000 expendable (over 5 years)

To strengthen the internationalization of the educational experience for engineering students, the Faculty welcomes educators from abroad. The objective is to enable distinguished academics to spend between three months to one year at the University of Toronto, primarily to enhance the skills of academic staff, our students and facilitate an exchange of ideas.

Visiting Scholars

$250,000 endowed or $10,000 expendable

This program will provide an opportunity for an internationally renowned researcher to visit the Faculty. The scholar will provide lectures to the academic community and perhaps the general public. It will also be an opportunity for students to hear from a renowned researcher, exposing them to a wider range of ideas and perspectives.

SCHOLARSHIPS, AWARDS, AND FELLOWSHIPS

International Travel Awards

$1.5 million endowment or up to $5,000 annual/student

The purpose of the award is to give deserving undergraduate students the opportunity to broaden their international horizons while they hone their technical skills. It will enable undergraduate students the opportunity to participate in international study or work experience by assisting with travel or educational expenses while participating in the international experience.

PROGRAMS

Global Engineering Program (In Development)

$500,000 expendable (over 5 years)

Modeled after a highly successful program at Purdue University, this proposed four-year program will provide students with a two semester global design project within a multi-national design team, with two internships (one local and overseas), and one semester of studying abroad at an affiliated university. Students in the program are prepared for their experience starting from their first summer at UofT through language courses and special orientation sessions. This new program will tie in well with the Faculty's pending Globalization Minor.

International Exchange Program (In Development)

$500,000 expendable (over 5 years)

This program will leverage the successful record of the Faculty's Professional Experience Year (PEY), enhancing it with an increase in international PEY placements. Many of today's leading companies greatly value international experience. Our students, after completing this program, will gain unique and valuable experience.

International Summit on Urban/Global Sustainability

$150,000 expendable

The Faculty's Department of Civil Engineering will host a summit every 3-4 years, inviting experts from around the globe to discuss the most pressing issues concerning the world's urban centres. The summit would put the international spotlight on the University and Canada as taking the lead in this critical area. Each summit could focus on a specific problem, resulting in a published Summit Manuscript that captures the flow of thought and inspiration from international perspectives.

Section 5.0 - Research Priorities

Research at the Faculty of Applied Science and Engineering at the University of Toronto will strengthen Canada's ability to compete in the global economy that increasingly relies on new ideas, new processes and new technologies. We are connecting the brightest minds from a myriad of engineering disciplines and from all points of the world to address issues that concern a global society. The Faculty of Applied Science and Engineering will draw upon its resources, talent and creativity to build engineering programs that continue to stand among the best in the world.

Success in this pursuit will depend largely on our ability to attract brilliant and creative people and provide them with an environment that leads to innovation and discovery. To that end, the Faculty has identified four areas where we can capitalize on our existing strengths and play key leadership roles in a manner that will be truly transformational in nature. The following areas are:

- Bioengineering
- Energy, Environment & Sustainability
- Information Communications & Technology
- Nanoengineering

TRANSFORMATIONAL OPPORTUNITIES

Research Opportunities Fund
$5 million endowment
This endowed fund will give researchers access to short-term funding to pursue a variety of research opportunities. The funds could be used for travel, proposal development, matching funds, or other activities that advance innovative research at the Faculty of Applied Science and Engineering.

Section 5.01 - Bioengineering

The Faculty is uniquely positioned to harness the power of engineering approaches to diagnose, treat and prevent disease. Located in the heart of downtown Toronto, adjacent to its largest research hospitals and in partnership with other University of Toronto Faculties, our researchers are applying the tools of engineering to the disciplines of biology, medicine and healthcare.

CHAIRS

Chair in Biomaterials
$3 million endowed or $1 million expendable (over 5 years)
Biomaterials engineering integrates engineering fundamentals in materials science with principles of cell biology, chemistry and physiology to aid in the design and development of materials used in the production of medical devices. These devices are designed to perform, augment or replace some natural function. For example, heart valves, artificial hips, contact lenses and dental implants all rely on biomaterials for their proper function. Additionally, biomaterials play key roles in understanding the physiology of healthy and diseased tissue, and developing new methods to treat or detect disease.

Chair in Biomechanics
$3 million endowed or $1 million expendable (over 5 years)
The study of biomechanics ranges from the inner workings of a cell to the movement and development of limbs, to the mechanical properties of soft tissue, and bones. Biomechanical engineers are able to advance the field of tissue engineering, develop improved treatments for a wide array of injuries, and

create products that are ergonomically designed to promote good health and well being of those who use them.

Chair in Healthcare Engineering
$3 million endowed or $1 million expendable (over 5 years)
The potential for increased efficiency in the delivery of healthcare services, and corresponding reduction of costs, is enormous. Healthcare engineering seeks to replace silos with a broad system view and coordinate people, departments, and institutions to make optimal use of limited resources and taxpayer dollars. Furthermore, research in this area will improve the safety, quality, efficiency, and cost of medical diagnostic and treatment protocols and devices. This research will not only transform the present state of healthcare operations, but also educate professionals to sustain it.

Chair in Microfluidics
$3 million endowed or $1 million expendable (over 5 years)
Microfluidics has facilitated major biochemical application advancements in point-of-care diagnostics, and drug discovery. There are numerous potential applications in biotechnology, pharmaceuticals, the life sciences, public health, and agriculture. Microfluidic lab-on-a-chip (LOC) technologies represent a revolution in laboratory experimentation, bringing the benefits of miniaturization, integration, and automation to many research-based industries.

Chair in Molecular Imaging
$3 million endowed or $1 million expendable (over 5 years)
Using processes such as spectroscopy and microscopy, researchers at the Faculty enable us to see biological and chemical processes that occur at the molecular level. By seeing things at these tiny sizes (a molecule is about 100,000 times smaller than a strand of hair) offers science the next step - to be able to manipulate atoms and molecules to make stronger materials or control the pathways of disease. This research may ultimately help address how the body responds to new drugs and therapies.

Chair in Pediatric Rehabilitation Engineering
$3 million endowed or $1 million expendable (over 5 years)
Children with disabilities and their parents face extraordinary challenges. Children whose disabilities prevent them from speaking or moving, make everyday a guessing game as parents try to decipher their needs. Researchers at the Faculty are training a computer chip to decode a child's brain signals and breathing patterns, allowing them to activate electronic speech or household devices simply by thinking about them or taking a deep breath.

Chairs in Stem Cell Bioengineering
$3 million or $1 million expendable (over 5 years) each
The Faculty is home to world leaders in stem cell bioengineering. This emerging field aims to heal or regenerate damaged or nonfunctioning organs and tissues by applying bioengineering to stem cell research. Results from this research could lead to new techniques for stem cell therapies, including tissue and cellular engineering, gene therapy, and organ transplantation.

Chair in Tissue Engineering
$3 million endowed or $1 million expendable (over 5 years)
The Faculty is home to internationally recognized leaders in tissue engineering. Our engineers envision a world where transplant patients do not wait for a donor or where burn victims leave the hospital without disfiguring scars. They use innovative technology to engineer implant materials that can grow, reshape, or change their function as the body requires. These materials sense their surroundings, respond in an appropriate fashion and provide the basis for regeneration.

CAPITAL PROJECTS

Collaborative Biomedical MEMS Fabrication Facility
$3 million capital
The MEMS Fabrication Facility will be a collaborative effort, available to researchers in universities, industry, and government laboratories. University of Toronto Engineering was the first Canadian program to offer a mechatronics specialty, and have aggressively recruited innovative, expert faculty to advance these concepts. This lab space was recently renovated and funds would be used to upgrade and supply the space with state-of-the-art equipment.

Biomedical Engineering Laboratory
$500,000 capital
Used by students from all engineering departments, this facility will allow our students to specialize in biomedical topics as part of their accredited undergraduate programs. The Faculty's long-standing affiliation with the University Health Network will ensure students tackle relevant and pressing issues within the medical research community. Graduates of the biomedical engineering program will be fully qualified to continue in graduate studies on topics such as human factors, artificial limbs, implants, mobility devices, kinesiology, and biosensors. Space for this undergraduate teaching laboratory has yet to be identified.

Section 5.02 - Energy, Environment & Sustainability

Developing sustainable energy systems is a global challenge faced by all nations and their responses to this challenge will determine in large part their economic and political future. Our planet has finite resources, and its growing population currently consumes them at a rate that cannot be sustained. Widely reported warnings have emphasized the need to develop new sources of energy and prevent or reverse the degradation of the environment.

All modern innovations, including nanoengineering, bioengineering, and cyber technology offer promising approaches to address these critical issues. University of Toronto Engineers are developing practical, sustainable solutions that fit the environment, its people and the culture as well. Great opportunities reside within the Faculty that will set itself apart from others in Canada and position itself among the leaders in the world.

CHAIRS

Chair in Bioprocessing
$3 million endowed or $1 million expendable (over 5 years)
The Faculty currently has four professors working in the area of utilizing micro-organisms to degrade pollutants in soils, air and water. The research is multi-disciplinary, drawing on the fields of chemical/biochemical engineering, microbiology, proteomics and genomics. The next generation of these technologies can provide new solutions to environmental biotransformation, production of biofuels, and new bioproducts.

Chair in Energy Systems
$3 million endowed or $1 million expendable (over 5 years)
The existing electric power systems were designed, constructed, maintained, and largely operated based on technology and demands in the 1950s to the 1970s. The last fifteen years have brought about major changes in the electric power industry, such as market liberalization and re-regulation; the legacy issues, policy and regulatory constraints, and potential economical ramifications have largely prevented evolution of the electric power systems to be responsive to the existing energy and climate change needs.

Chair in Sustainable Energy
$3 million endowed or $1 million expendable (over 5 years)
Our planet is in need of clean and renewable sources of energy such as wind, solar, geothermal, and tidal. Truly sustainable development, however, will require clever integration of renewable energy technologies into existing infrastructure, along with vastly improved efficiencies in non-renewable energy use. The Faculty has considerable expertise and strength in this area, but it is spread out among several departments. An endowed chair could help to build a more structured and collaborative structure to our work.

Chair in Sustainable Energy in Chemical Processing
$3 million endowed or $1 million expendable (over 5 years)
With depleting global energy and material supplies and increased concerns regarding global warming, there are enormous opportunities in manufacturing industries to minimize energy consumption and to re-use and recover energy and chemical resources within industrial processes. The Faculty has internationally renowned engineers working in areas of chemical and energy recovery in various industries.

Chair in Sustainable Flight
$3 million endowed or $1 million expendable (over 5 years)
The current contribution from civil aviation is estimated at roughly 3.5% of all man-made greenhouse gas emissions with an impact two to four times greater as a result of the altitude at which aircraft emissions occur. Research undertaken by the Chair in Sustainable Flight will be directed toward reducing the contribution of aviation to climate change.

Chair in Urban Sustainability
$3 million endowed or $1 million expendable (over 5 years)
In twenty-first-Century North America, not only open space but also other issues of sustainability – such as potable water and carbon footprints – have become crucial elements in the quality of life in the city and surrounding environment. This chair would undertake research focusing on the pressing issues concerning our urban centres.

CAPITAL PROJECTS

Experimental Facilities for Research in Sustainable Flight
$3 million capital
Two particular experimental facilities would have a great impact on our sustainable flight research initiative a major wind tunnel facility for studying ultra-low-drag aircraft concepts, including active flow controland a gas turbine engine/combustion facility for studying low-emissions high-efficiency engine concepts, to be located in the current machine shop at UTIAS (Downsview). This would involve the subdivision of the current machine shop to create a gas turbine/high pressure facility as well as a new building or addition of approximately 3,000 sq ft to house a new wind tunnel. The construction of the wind tunnel would be dependent on the results of a current CFI proposal.

BioZone
$1 million capital
Through this transformation gift, the research and office spaces for BioZone will be established. Plans call for the centre be located on the third floor of the Wallberg Building. This space requires significant renovation to best serve the aims of BioZone and its users. In addition, new research equipment is needed to build critical experimental and analytical infrastructure.

Gull Lake Camp Sustainable Development

$1 million capital or $100,000 annually

Survey Camp at Gull Lake is a remote-site course for Civil Engineering undergraduate students. It is unique among engineering schools in Canada and continues to play an important role in fulfilling the need for practical studies. The property at Gull Lake is currently under utilized and the buildings on the property are in need of major renovations. The Faculty is exploring options to ensure that it remains an integral part of the curriculum, including developing a conference and research facilities for energy and building technologies. At minimum, the annual maintenance cost would be approximately $100,000. The Faculty is in the process of assembling more detailed plans for the development of the Gull Lake site.

Sustainable Flight Technology Demonstrator

$1 million capital

As part of the Sustainable Flight Initiative, the Faculty plans to undertake the development of an unmanned aerial vehicle (UAV) as a test bed for the new concepts and ideas under development for aircraft with reduced environmental impact. Applications of this research could lead to a highly modular solar powered UAV that will enable practical demonstration of many of the new technologies we have currently under development. Funds would be used to purchase research equipment and renovate space to accommodate the demonstrator.

Section 5.03 - Information Communications and Technology

Information technology, the convergence of computing and communications technologies has had an enormous impact on all aspects of life in the developed world. It will have even more impact in both the developed and developing world in the 21st century. The internet and information technologies have infiltrated nearly every aspect of today's life. Powered by the unprecedented and continuing advances in microelectronics and photonics, the power and capacity of our expanding information infrastructure has risen exponentially while simultaneously becoming more affordable. At least for the foreseeable future, the exponential pace of technology improvement is likely to continue. With national economy, education, national security and safety critically depending on a networked information infrastructure, securing information and information infrastructures has become a key challenge.

CHAIRS

Chair in Broadband Networks

$3 million endowed or $1 million expendable (over 5 years)

Demand for services like video on demand, 3G wireless services and web 2.0 applications has continued to grow since the telecom bubble burst in 2001, to the point where networks are reaching their capacity limits. Building on existing research strengths in the Faculty in both hardware (photonics, electronics and EM) and networks (communications and engineering), the Chair in Broadband Networks will develop the next generation of communications systems. This research is highly relevant to the Canadian telecommunications sector and the chair holder will actively engage with industrial partners.

Chair in Information Security

$3 million endowed or $1 million expendable (over 5 years)

The world has witnessed unprecedented interest and activity in safety and security technologies. The emergence of secure electronic transactions, biometric passports, smart access cards, and electronic surveillance are indicators of the growing security trends. The new challenges and trends have fostered the emergence of Information Security as a new field of study that explores the interaction between human behaviour and security technologies and policies.

Chair in Mechatronics
$3 million endowed or $1 million expendable (over 5 years)
The fields of mechanical engineering and electrical engineering have grown closer together over the past few decades, as mechanical and electrical components are increasingly integrated together into engineering systems. The Faculty has experienced rapid growth in this area, after initiating an undergraduate mechatronics option in the late 1990's. Research in the field of mechatronics has many applications to the biomedical and sustainable energy fields.

Chair in Software Systems
$3 million endowed or $1 million expendable (over 5 years)
Software and software systems lie at the root of all important enterprise and within every existing technological device we make use of today. The creation of software is an extraordinary complex process that is becoming ever more complex as the world interconnects itself through networks. As we ask thousands of computers to support every human activity, it is essential to have academic research in this field.

Chair in Nanoelectrical Engineering
$3 million endowed or $1 million expendable (over 5 years)
Microelectronics is at the heart of the current information technology revolution. With increasing demand to process or transmit more information, there is a possibility that current microelectronic technologies will fail. Radical new ways of making and connecting high-speed electronic devices are required. Exotic devices such as nanoscale transistors based on semiconductor nanowires, carbon nanotubes, or graphene may address the first issue, while shifting from electrical to optical routing may address the second. This chair will transition the University of Toronto Engineering from a leader in the microelectronics of the past to the leader of the nanoelectronics of the future.

Section 5.04 - Nanoengineering

As a result of recent advances, we now have the opportunity to approach the ultimate limit of engineering at the atomic scale – indeed to manipulate atoms and molecules. This growing field of nanoscale, quantum science and engineering will be one of the defining new technologies of the century. The Faculty established Canada's first centre for nanoengineering research. In 2001, we were the first to offer an undergraduate nanoengineering option in the world. Although this area of study is at its infancy, nanoengineering research has the possibility of threading into every avenue from telecommunications, to material, to biomedical devices. The Faculty had the foresight to pursue nanoengineering at the earliest stages. With our existing strengths and tremendous potential, our engineers will catapult the University as a premier research institution.

CHAIRS

Chair in Bionanotechnology
$3 million endowed or $1 million expendable (over 5 years)
One area of research focus at the Faculty is bionanotechnology. Several engineers are using quantum dots to target a disease site and light it up. This technology would make it possible to detect, target and kill cancer cells. Beyond cancer, researchers are also exploring whether the dots could be used to detect pathogens such as malaria and HIV and we estimate that these quantum dots could be lighting up human disease within five to ten years.

Junior Chair in Advanced Materials
$1.5 million endowment or $500,000 expendable (over 5 years)
The field of advanced materials is one of the fastest areas of growth and potential in technology and industry, and Canada's ability to remain innovative in this field will have a direct correlation with its ability to continue to compete globally in a number of important industries. The Chair in Advanced Materials will concentrate on finding innovative solutions to the challenges associated with materials engineering and design at the micro- and nanostructural scale with emphasis on alternative energy technologies.

CAPITAL PROJECTS

Nanoengineering Laboratory
$500,000 capital
The primary objective of the Nanoengineering Option (introduced in 2001) is to realize an undergraduate program that will blend all three enabling technologies into one educational experience. The Faculty will enhance our undergraduate facilities to enable synthesis and processing of nanomaterials and provide a range of tools to probe their mechanical, thermal, electrical, optical, magnetic and environmental properties. These labs are crucial for support of the Nanoengineering Option

Section 6.0 – Projects in Progress

Prior to the Faculty Retreat in the fall of 2007, a number of projects had already been underway and reflects the previous priorities. Several donors have already committed to these projects and funds are in the process of being raised.

Lassonde Institute
$21 million ($13 million in capital and $8 million in endowment)
The keys to continuing productive and sustainable mining in Canada and around the world are highly trained personnel and revolutionary technology and processes designed to lower production costs while meeting environmental challenges. The expansion of the Lassonde Institute will provide the space and infrastructure to educate highly qualified personnel for the industry by accommodating more than 100 graduate students and post-doctoral researchers within five years – a critical mass of industry leaders who will make a difference on a global scale. It will also help attract the best international students to study and conduct research in our collaborative, interdisciplinary research centre.