

Office of the Vice-President,
Research & Associate Provost

2004-2005 Report
2005-2006 Plans



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The mandate of the Office of the Vice-President, Research and Associate Provost is to create a research environment that is supportive of the highest quality research stature by maximizing opportunities for funding, recruiting the highest calibre faculty, staff and trainees, and providing an infrastructure and environment conducive to outstanding individual and interdisciplinary investigation and to opportunities for broad application.

Dear Colleagues:

I am delighted to introduce the 2004-2005 Research Report for the University of Toronto. This has been an outstanding year during which we have made terrific progress with the overall research enterprise. Moreover, in accordance with the *Stepping Up* plan for the University, we have initiated processes that will emphasize the relationship between cutting-edge research and undergraduate teaching, and that will provide more of our undergraduates with an individualized research experience.

The University of Toronto is Canada's leading research-intensive university. We lead the country in overall Tri-Council support, in support from the individual councils – the Canadian Institutes of Health Research (CIHR), the Social Sciences and Humanities Research Council (SSHRC) and the Natural Sciences and Engineering Research Council (NSERC) – and from the Canada Foundation for Innovation (CFI) and in our numbers of Canada Research Chairs. We are most grateful to the federal government and to these organizations for the outstanding level of research support provided to our university. We rank among an elite group of public universities in North America based on number of publications and number of citations and in the receipt of highly prestigious awards for scholarship from national and international organizations.

Individual accomplishments are highlighted later in this report. But let me offer a few examples of ways in which we are working to enhance the academic life of our university:

- We have started to develop a roadmap for undergraduate students that will provide them with a continuous opportunity for research experiences, beginning at the end of high school when they accept admission to the University of Toronto, through regular course work and summer experiences until the point of graduation.
- During the year, we have worked with chairs of our humanities departments to restructure our awards programs from the Connaught Fund in a manner that will make these more useful to our humanist colleagues, whether enriching dedicated time for research or pursuing a research-based sabbatical.
- We continue to build close relationships with our partner institutions, particularly the nine affiliated teaching hospitals.
- We have moved into MaRS (Medical and Related Sciences), the stunning new development that will create an innovative scholarship hub with the University.
- We have responded to John Manley's extraordinarily insightful review of the U of T Innovations Foundation in a way that should facilitate and encourage disclosure of inventions or new intellectual property generated by our faculty.
- We have taken a leadership role nationally through the G10 group of universities and provincially through the Ontario Council of University Research in the advocacy efforts for more research funding, complementarity across programs and enhanced recognition of the outcomes of university-based research.

Finally, we have re-organized the Office of the Vice-President, Research & Associate Provost into five groupings: Revenue Generation; Research Advocacy; Research Ethics; Research Coordination; and Research Commercialization/Knowledge Transfer. We hope with this model to increase interaction across the portfolio.

Above all, we will better fulfill our mandate of enhancing the resources available for research, developing individual researchers and research teams, and maximizing the output and recognition of the research enterprise at the University of Toronto. The next pages tell our story; please read on.

Sincerely,

A handwritten signature in black ink, appearing to read "John R. G. Challis". The signature is written in a cursive style with a large initial "J".

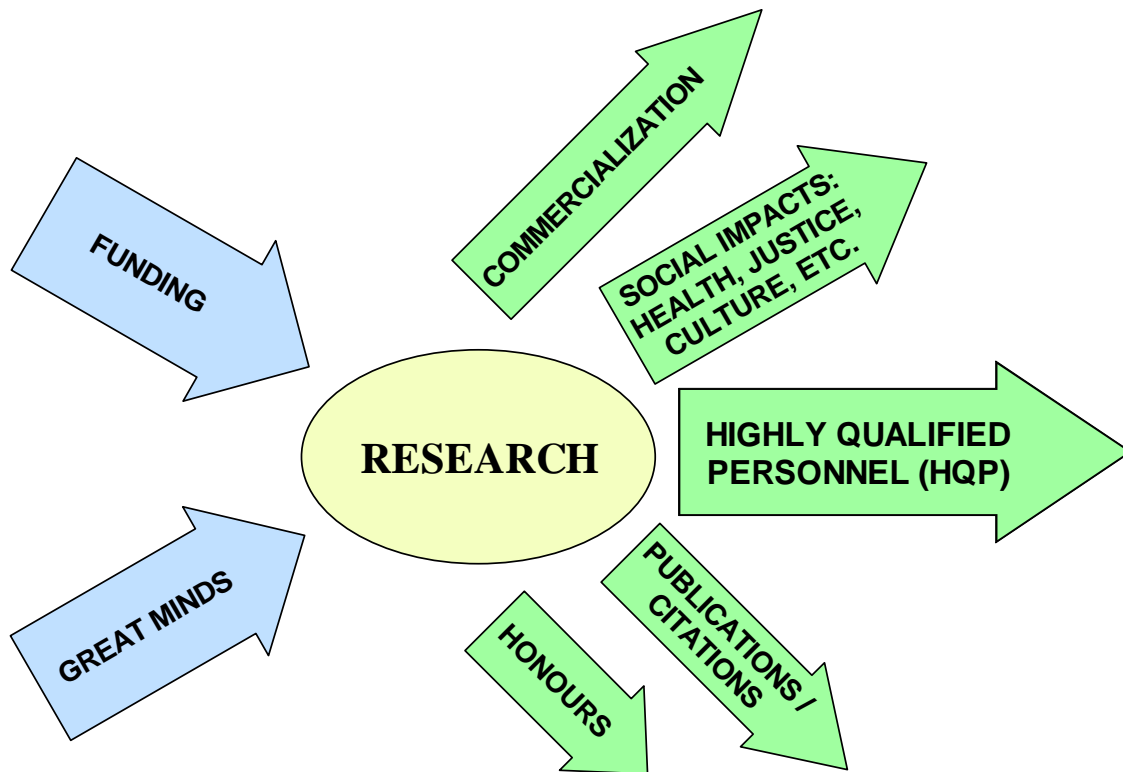
John R. G. Challis, DSc, FRSC
Vice-President, Research and Associate Provost
Professor, Department of Physiology, Obstetrics and Gynaecology and Medicine

RESEARCH PERFORMANCE AT THE UNIVERSITY OF TORONTO

Preamble

Research performance can be measured by a variety of indicators. Traditionally, we have used input measures, focusing on how much research funding the University of Toronto receives. Increasingly, we want to focus on output measures such as the honours conferred on our faculty members, the publications resulting from their research, the citations that follow when the research is influential, the commercial applications of the research, the development of highly qualified personnel, and the social impact of research.

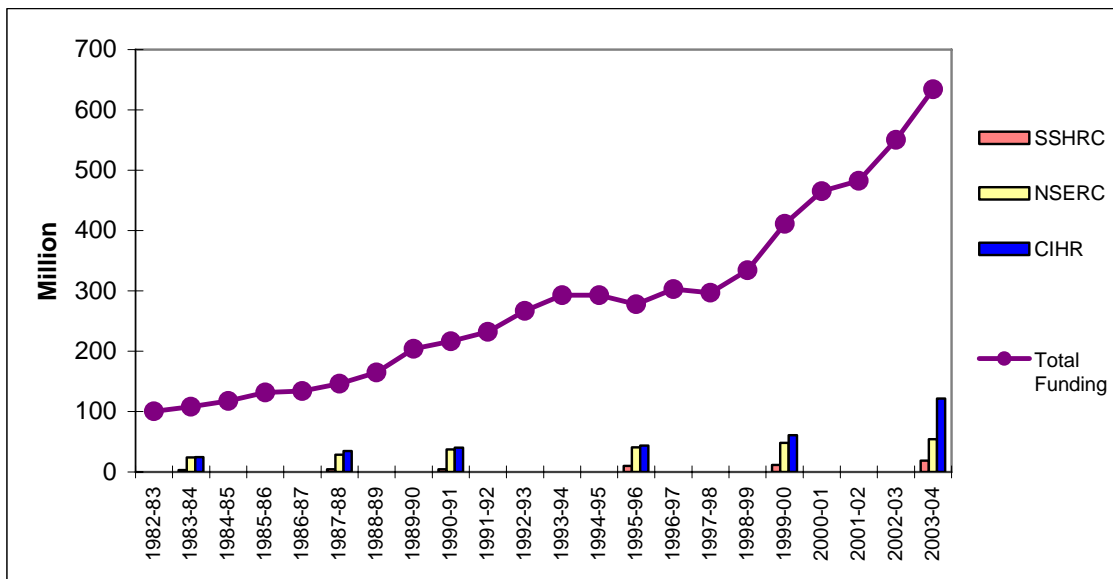
We are adding a new group of input measures for the great minds without which none of this research would be possible. We are focusing on how the University attracts and retains outstanding faculty through salary support and designation programs, such as the Canada Research Chairs and Endowed Chairs.



Research Funding Trend

Research funding at the University of Toronto is currently in a phase of accelerated growth compared to the past couple of decades (see Figure 1). This acceleration is due particularly to research infrastructure programs introduced by both the federal and provincial governments at the end of the last millennium. Meanwhile, the contribution to research funding made by the federal granting councils has dropped from as high as 50 percent of the total in the 1980s, to 31 percent in 2003-04, despite large increases to the budget of the Canadian Institutes of Health Research during the early years of its transformation from the Medical Research Council of Canada.

Figure 1: Research Funds Awarded* 1982-83 to 2003-04
University of Toronto and Affiliated Hospitals



* Research funds awarded are exclusive of funding from the Research Performance Fund and the federal Indirect Costs program, but include other overhead amounts

SSHRC, NSERC and CIHR (formerly MRC) funding exclude Networks of Centres of Excellence and Canada Research Chairs.

Sources:

Statements of Restricted Funds

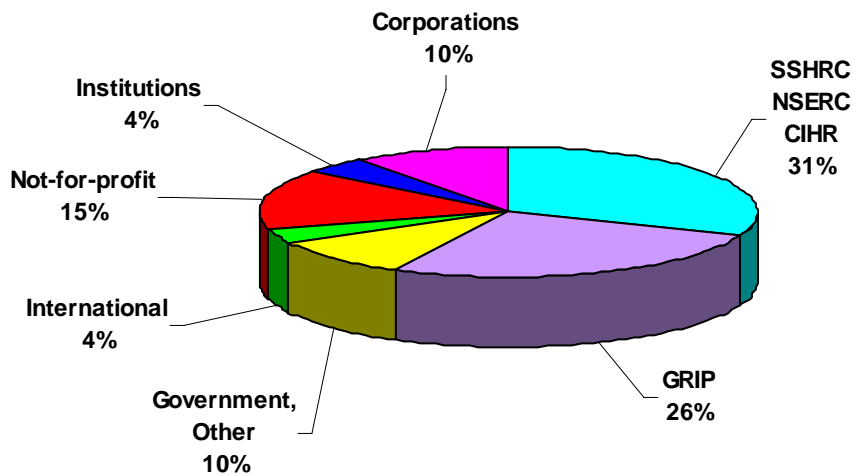
Research Information System

Councils' annual reports

Research Funding Breakdown

Funds awarded to the University of Toronto and affiliated hospitals for the direct costs of research in 2003-04 totalled \$623 million, of which \$326 million was awarded through the affiliated hospitals and \$297 million through U of T.

Figure 2: Research Funds Awarded by Sector
 University of Toronto, including Affiliates, 2003-04
 Total: \$623M for Direct Costs*



“GRIP” includes the Canada Research Chairs program, the Canada Foundation for Innovation, the Ontario Research and Development Challenge Fund, the Ontario Innovation Trust, the Ontario Genomics Institute, and the Premier’s Research Excellence Awards

“Government, Other” includes the Networks of Centres of Excellence, the Provincial Centres of Excellence, Health Canada, Public Works & Government Services Canada, and several other agencies

“International” includes the National Institutes of Health

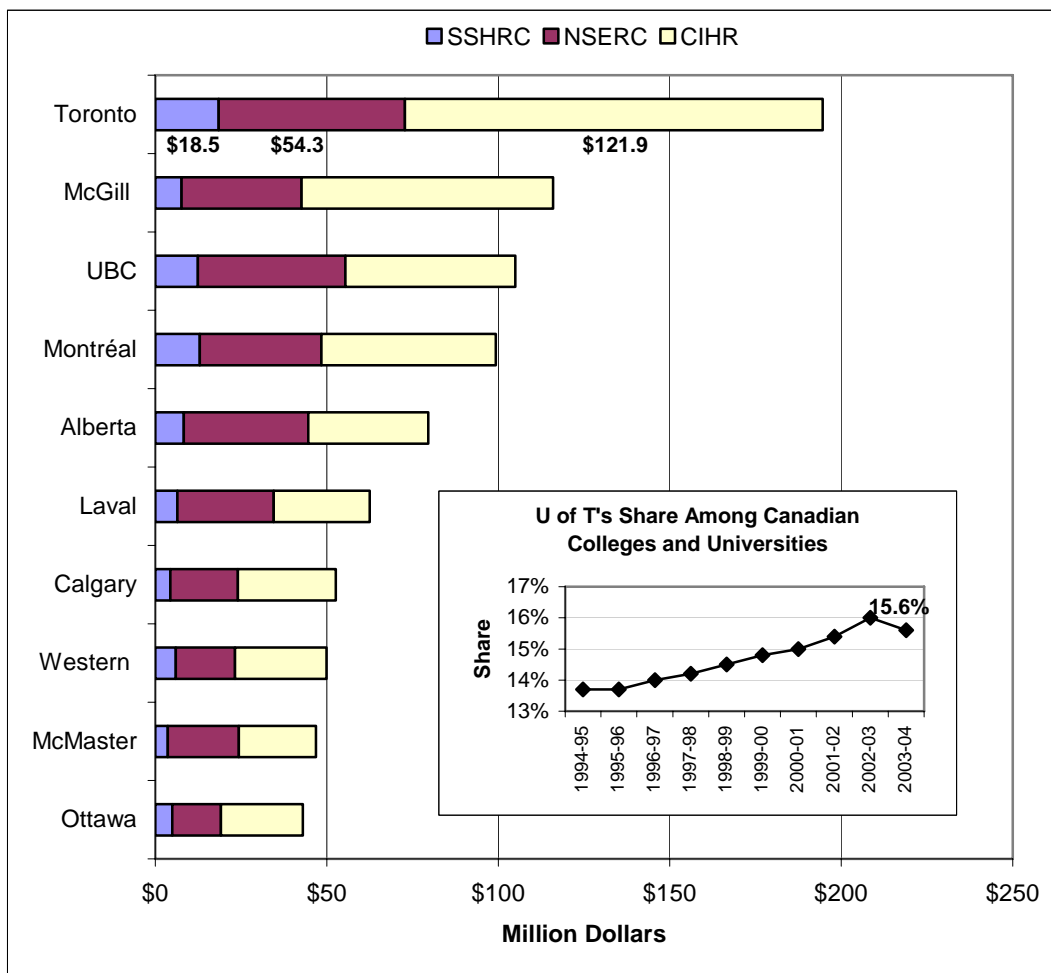
“Not-for-profit” includes foundations, societies and associations

* Research funds awarded are exclusive of overhead amounts for the U of T campuses but include these amounts for the affiliated hospitals (overhead data currently unavailable)

Research Funding Federal Research Councils Top 10

The University of Toronto continued to perform well in the major competitions of the three federal granting councils. The university maintained its #1 ranking in overall funding from all three councils and from each individual council for the 11th consecutive year. Figure 3 illustrates that U of T's share of funding relative to all Canadian colleges and universities stood at 15.6 percent in 2003-04, a slight decrease from 2002-03, possibly signalling a slowdown in the truly spectacular gains made over the previous eight years.

Figure 3: Federal Research Councils Payments
Top 10 Canadian Universities, 2003-2004

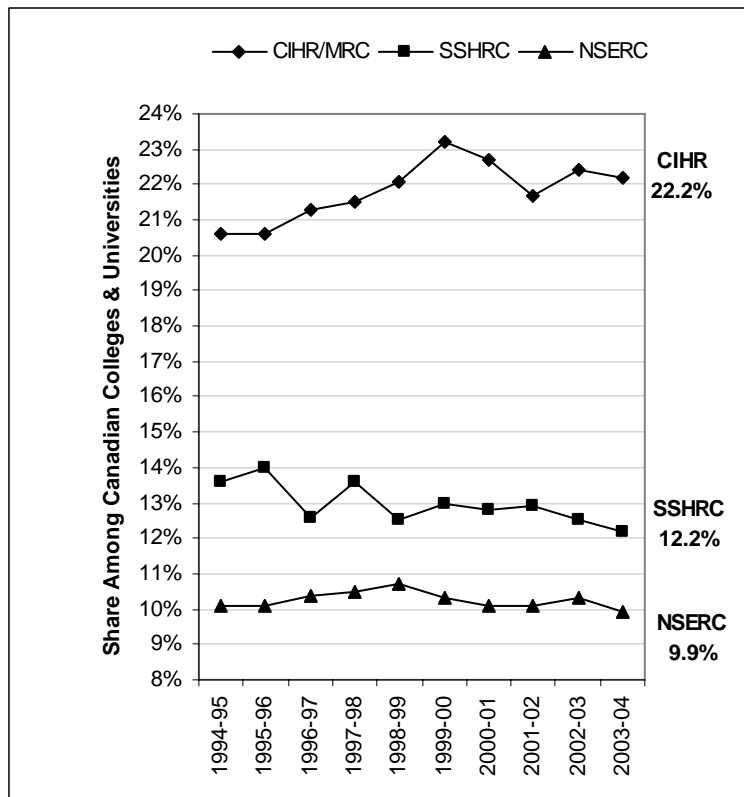


Top 10 universities determined by total funding from the three councils in 2003-04 (SSHRC: Social Sciences and Humanities Research Council; NSERC: Natural Sciences and Engineering Research Council; CIHR: Canadian Institutes of Health Research). Figures include funding from affiliated and federated institutions. Figures exclude funding for the Networks of Centres of Excellence, the Canada Research Chairs program, and the Indirect Costs program. Source: Councils' annual reports.

Research Funding Federal Research Councils Share

The total direct costs of research accruing to the University of Toronto from the federal granting councils generally increases from year to year, but it is important to track whether these exceed or fall short of increases in council funding to all Canadian colleges and universities, as illustrated in Figure 4. These monies influence directly our allocations of indirect costs and our number of Canada Research Chairs. U of T's increases in NSERC funding essentially keep up with national increases. For CIHR, the University is gaining shares, while for SSHRC the shares are declining slightly. These patterns are very likely linked to the demographic distributions illustrated on page 10.

Figure 4: Share of Federal Research Councils Payments
University of Toronto and Affiliates, 1994-95 to 2003-04



Percentage on right is for 2003-04.
Funding for the Networks of Centres of Excellence, the Canada Research Chairs program, and the Indirect Costs program are excluded.
Sources: Councils' annual reports

Research Funding

Federal Research Councils - U of T Demographics

The distribution of funds awarded as a function of faculty age range produces a very different pattern from one federal research council to the other. For CIHR (Figure 5a), the distribution is essentially bell-shaped, with faculty in the 45-49 and 50-54 age ranges receiving the largest proportion of funding. For NSERC (Figure 5b), there is a sudden drop in funding in the 50-54 and 55-59 age ranges, which has been traced to lower numbers of faculty members in these demographic segments. For SSHRC (Figure 5c), the pattern is doubly affected by a distribution of faculty members skewed toward the higher age ranges, and average values of grants that surge starting with the 50-54 age range.

The higher totals for more senior age ranges at SSHRC and NSERC suggest a need for younger faculty to achieve more funding more rapidly in order to maintain our “market share” of dependent programs (CRC and indirect costs).

Figure 5: **Distribution of Funds Awarded by Faculty Age Range**
University of Toronto and Affiliates, 2003-04

Figure 5a

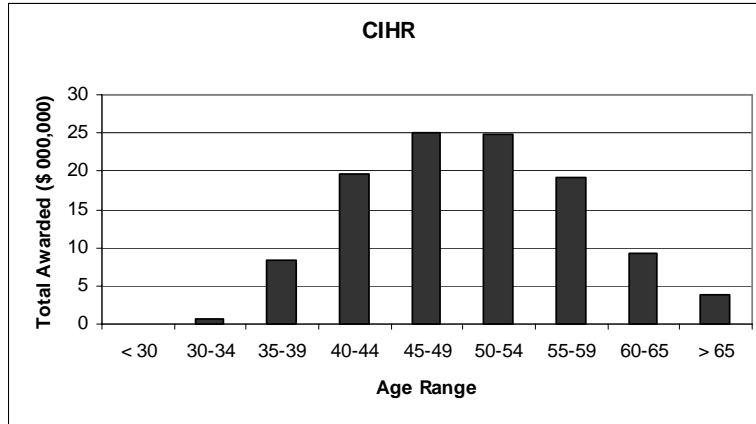


Figure 5b

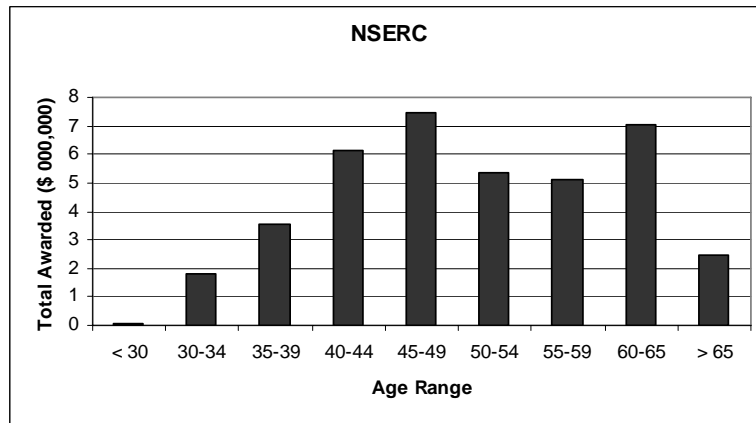
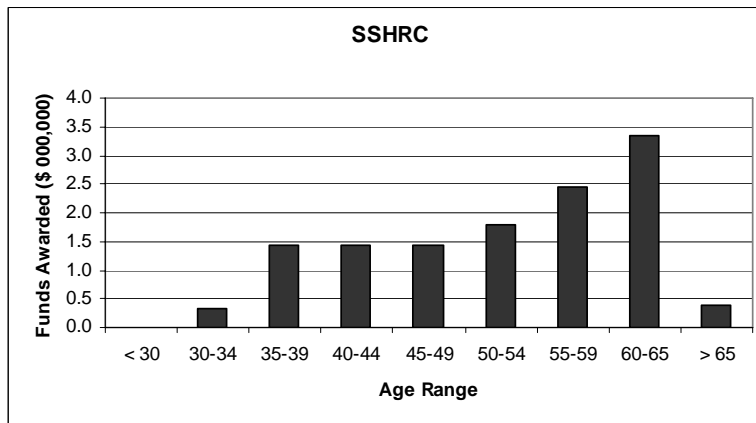


Figure 5c



Source: research data cube updated May 18, 2005

Research Funding

Government Research Infrastructure Programs

The government research infrastructure programs are currently responsible for about one quarter of annual research revenues at the University of Toronto. Their introduction by the federal and provincial governments starting in 1998 is still the most significant factor in the acceleration of growth in university research funding. U of T continues to lead all other universities in cumulative award totals from each of the sponsors where national statistics are available: Canada Research Chairs (CRC), Canada Foundation for Innovation (CFI), Ontario Research and Development Challenge Fund (ORDCF), Ontario Innovation Trust (OIT), the new Ontario Research Fund (ORF) and the Premier's Research Excellence Awards (PREA). No national statistics are available for Genome Canada (GC) or the Ontario Genomics Institute (OGI).

The past year was a time of transition, especially at the provincial level, where the ORF was created as the successor to the ORDCF, OIT and PREA programs. CFI also made changes to its suite of programs. In a number of cases, these changes delayed competitions and adjudications, resulting in fewer dollars awarded in 2004-05.

**Table 1: CFI, CRC, OGI, OIT, ORF and PREA award
in Millions**

	May 2004 – April 2005	Cumulative
CRC	\$29.90 M ¹	\$67.19 M
CFI	\$13.69 M ²	\$344.67 M
GC/OGI	\$20.04 M	\$61.14 M
ORDCF	\$5.29 M ³	\$211.59 M
OIT	\$0.15 M ⁴	\$325.10 M
ORF	\$7.91 M ⁵	\$7.91 M
PREA	\$2.10 M ⁶	\$20.10 M
TOTAL Funding	\$79.07 M	\$1,037.69 M

1 Awards from April, September, December 2004 submission dates. Assumes \$200K/year for seven years for Tier 1 and 100K/year for five years for Tier II awards. Does not include expected renewals of these awards. As of the December 2004 competition, 203 awards had been granted out of the allocation of 267, based on University of Toronto granting council performance.

2 Includes New Opportunities awards (\$2.89 M) from June, October 2004, February 2005 submission dates and infrastructure awards to CRC holders (\$.385M) from April, September and December 2004 submission dates, three Career awards (\$0.42), Innovation Fund awards (\$0), and Infrastructure Operating Funds (\$6.54M)

3 Funding listed above includes ORDCF awards from Round 13

4 Includes CFI matching awards for Career Awards (\$0.15).

5 Includes CFI matching funding for Career Awards (\$0.27 M) and New Opportunities (\$4.38M) from February, June, September and Ontario Distinguished Researcher Awards from December 03, April & September 2004 competitions (\$3.27M)

6 Includes awards from Round 11 (May 2004)

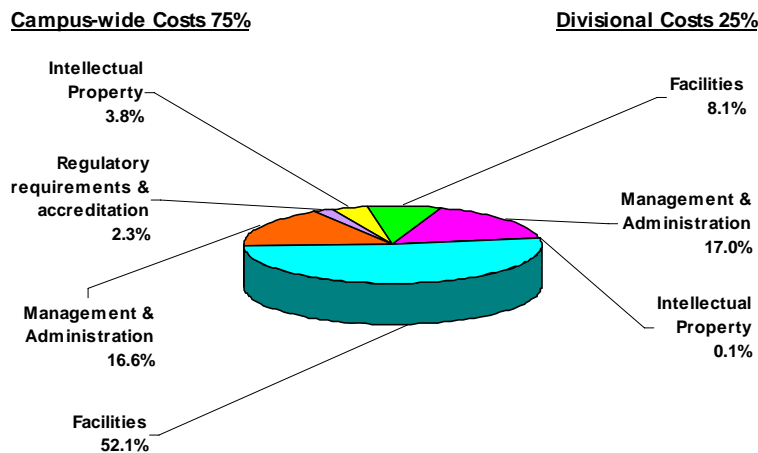
Research Funding Indirect Costs of Research

The *direct costs* of conducting research can be related directly to each project’s expenditures. These include salaries of research personnel, student stipends, equipment and supplies. Other costs, such as utilities, services provided by departments and central offices, administrative systems, libraries, space maintenance or renovation, and regulatory requirements cannot easily be accounted for on a project-by-project basis. They are known as *overhead* or *indirect costs*.

The most recent recognition of the need to fund these costs was the federal government’s introduction of a permanent Indirect Costs program in 2003-04. This program covers selected funding programs from the tri-councils (CIHR, NSERC, and SSHRC) and the networks of centres of excellence (NCEs). The rate is the result of a sliding scale constrained by the total funding allocated in each federal budget and advantaging smaller institutions. The formula is applied to an average of funding dating between four and two years from the current year. As a result, the University of Toronto received a rate of 21.7 percent when calculated according to the distribution formula, but only 12.3 percent when compared to all tri-council and NCE direct funding for 2003-04.

In actual dollars, the University of Toronto received \$29.3 million in 2004-05 from the federal Indirect Costs program. Of this, \$12.9 million was distributed to the affiliated hospitals, with no university surcharge. Twenty-five percent of the remainder, or \$4.1 million, was distributed to the faculties, and the rest, representing \$12.2 million, was applied to support campus-wide services and facilities such as research labs and offices. Figure 6 illustrates the distribution of indirect costs monies at U of T. The largest proportion, by far, was for the cost of facilities, including utilities, and renovation and upgrade of research space. Regulatory requirements include the work done for animal care and human ethics protocol review. In 2004-05, the University reviewed 528 animal care protocols and over 2,400 human ethics protocols, an increase of 38 percent over 2003-2004 in the case of the latter.

Figure 6: Use of Federal Indirect Costs 2004-05
University of Toronto, excluding Affiliates
Total \$16.4M

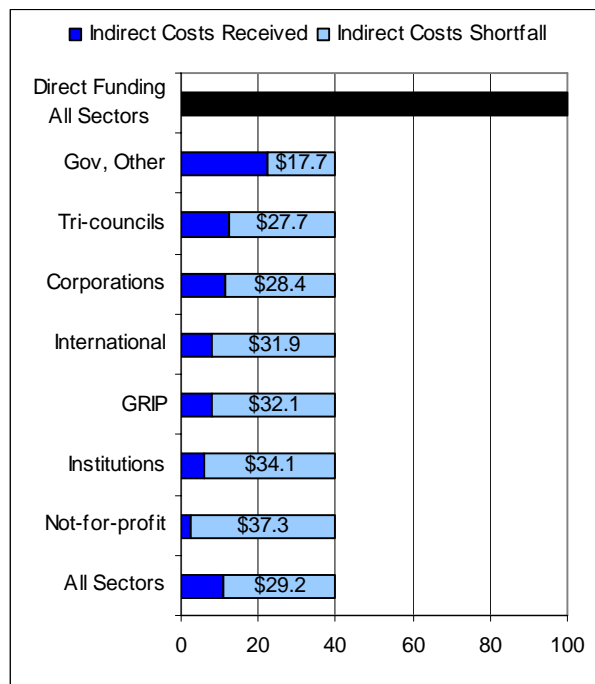


Note: use of funding from the Indirect Costs program is restricted to costs considered new in relation to the start of the program and sustainable thereafter.

Research Funding Indirect Costs Shortfall

The University of Toronto currently estimates the indirect costs of research at 40 percent of the direct costs. We continue to lobby for shortfall in indirect costs from the tri-council programs and from other sources. An analysis of the amounts actually recovered in 2003-04 shows that for every \$100 in direct research costs, overall the University had to absorb an average shortfall of \$29.2 in un-funded indirect costs. The shortfall by sector is illustrated in Figure 7.

Figure 7: Indirect Costs Shortfall by Sector per \$100 of Direct Research Funding
University of Toronto, excluding Affiliates, 2003-04



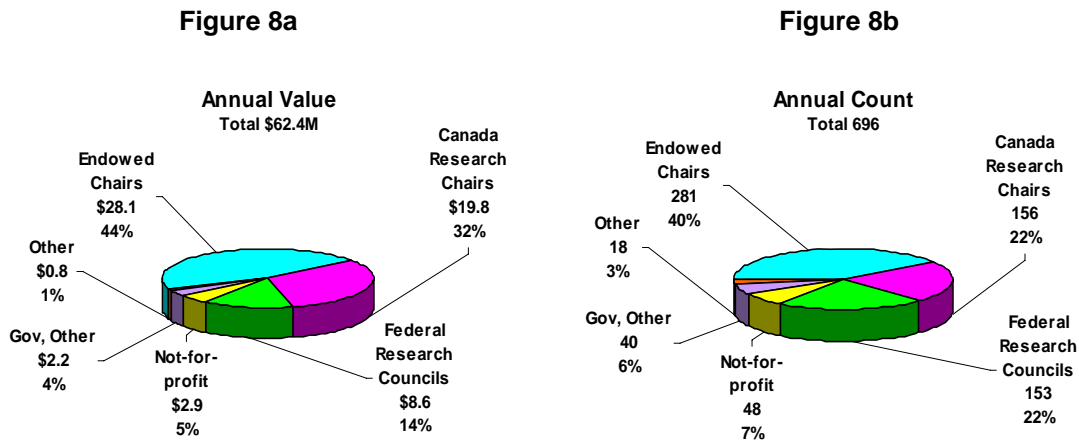
Source: Research Information System and Financial Information System

Great Minds Personnel Awards and Designations

In 2003-04, over \$62 million (see Figure 8a) from sources other than the provincial operating grant contributed to funding nearly 700 faculty positions at the University of Toronto and affiliated hospitals (see Figure 8b). This number represents 415 personnel awards earned through peer-reviewed competitions as well as 281 endowed chairs. All endowed chairs were created as a result of fundraising and reflect the generosity of individual and corporate donors, with 176 created by the University and 105 created jointly with the affiliated hospitals.

This salary support funding was attracted on the basis of research and scholarly excellence, and allowed the University and affiliated hospitals to recruit and retain the very best minds from around the world during a period of severe erosion of provincial higher education budgets. These faculty members not only contributed to the University’s stellar international research and scholarly reputation, but also to teaching and research training of undergraduate and graduate students. Most of the personnel awards and designations illustrated below represent relatively stable numbers from year to year, except for the Canada Research Chairs, where the numbers are progressively increasing to 267 by 2007-08. Sadly, we anticipate a decline in the CIHR personnel awards, where competitions in all but the new investigators category have been suspended.

Figure 8: Personnel Awards and Designations by Source
University of Toronto and Affiliates 2003-04



Notes:

Among personnel awards from the federal research councils, 90% were from CIHR; none were from SSHRC. The category “other” includes corporations, institutions and international organizations.

Great Minds

Canada Research Chairs - Origin

The University of Toronto's current allocation of Canada Research Chairs is 267, the largest by far in Canada. To date, this has allowed the University to retain 129 great minds, representing 61 percent of awards or nominations, and to recruit 83 new faculty members – with the majority, 73, coming from outside of Canada and 10 coming from within Canada (see Table 2). In addition to conducting leading-edge research and training graduate students, U of T's Canada Research Chairs are all expected to teach undergraduate students.

Table 2: Distribution of Canada Research Chairs by Origin
University of Toronto and Affiliates, June 2005

	Awarded	At Nomination Stage	Total	Percentage
From within U of T	119	10	129	61%
From within Canada/outside U of T	10	0	10	5%
From outside Canada	68	5	73	34%
Total	197	15	212	100%

Source: Government Research Infrastructure Programs (GRIP) database, updated May 27, 2005; excludes vacated chairs

Great Minds

Canada Research Chairs - Gender

The Canada Research Chairs program is, without a doubt, the most visible research personnel awards program in Canada, and is attracting a considerable amount of international attention. Key issues have been distribution by tier and granting council and the gender balance among chairholders. The University of Toronto recognized these issues early on, and has been monitoring its progress in attempting to match its percentage of CRC women to that in its faculty pool, at a minimum (see Table 3). Overall, U of T has appointed 25 percent women, exceeding the target of 16 percent for Tier 1 chairs, but lagging behind the target of 34 percent for Tier 2 chairs. Targets represent the percentage of women in the U of T faculty pools at these levels. With 79 percent of the University's CRCs already awarded or nominated, it has become clear that there are barriers to finding Tier 2 (junior) women candidates, especially in the NSERC fields. Certainly, the advent of this program has helped level the field for Canadian universities in recruiting the best minds, so there is competition for women faculty, especially in fields where their numbers are relatively low. However, as indicated previously (see Figure 8 on page 14), the CRC program is only one of several that provides salary support to outstanding faculty, and amongst CIHR awardees, for example, 35 percent were women.

Table 3: Distribution of Canada Research Chairs and Gender Targets
University of Toronto and Affiliates, June 2005

	A	B	C	D	E	F	G	H
	Total CRC allocation	% Women in UofT pool	Total target for women (A x B)	Total nominations as of May 27, 2005	CRC remaining to be nominated (A - C)	Number of women nominated	% Women nominated	Target women nominations remaining (C - F)
CIHR								
Tier 1	71	18%	13	60	11	18	30%	0
Tier 2	71	32%	23	56	15	14	25%	9
Total	142			116	26	32		
NSERC								
Tier 1	41	8%	3	32	9	5	16%	0
Tier 2	41	27%	11	30	11	4	13%	7
Total	82			62	20	9		
SSHRC								
Tier 1	21	21%	4	16	5	4	25%	0
Tier 2	22	43%	9	18	4	8	44%	1
Total	43			34	9	12		
GRAND Total								
Tier 1	133	16%	21	108	25	27	25%	0
Tier 2	134	34%	46	104	30	26	25%	17
Total	267			212	55	53		

Sources:

Government Research Infrastructure Programs (GRIP) database, updated May 27, 2005; excludes vacated chairs and reflects the sixth year recalculation of allocation

Human Resources Information System Fall 2002 download including status-only appointments; assumes Tier 1 are full professors and Tier 2 are associate or assistant professors

Publications & Citations

Publications and citations are indexed by a number of organizations including Thomson ISI, whose data were used in the present analysis. Our goal was to rank the University of Toronto against members of two leading research-intensive university groups: the Canadian G10 group and the American Association of Universities (AAU)¹. U of T is a member of both groups, as is McGill.

In addition, given private universities' advantage in several respects relevant to research, including lower ratios of undergraduate students to faculty members, we first looked at all 44 public universities, and then extended the study to include all 26 private universities. The results for the latest five-year period, from 2000 to 2004, are summarized in Table 4.

Table 4: Summary of Rankings for the University of Toronto, 2000-2004
Among AAU and G10 Universities

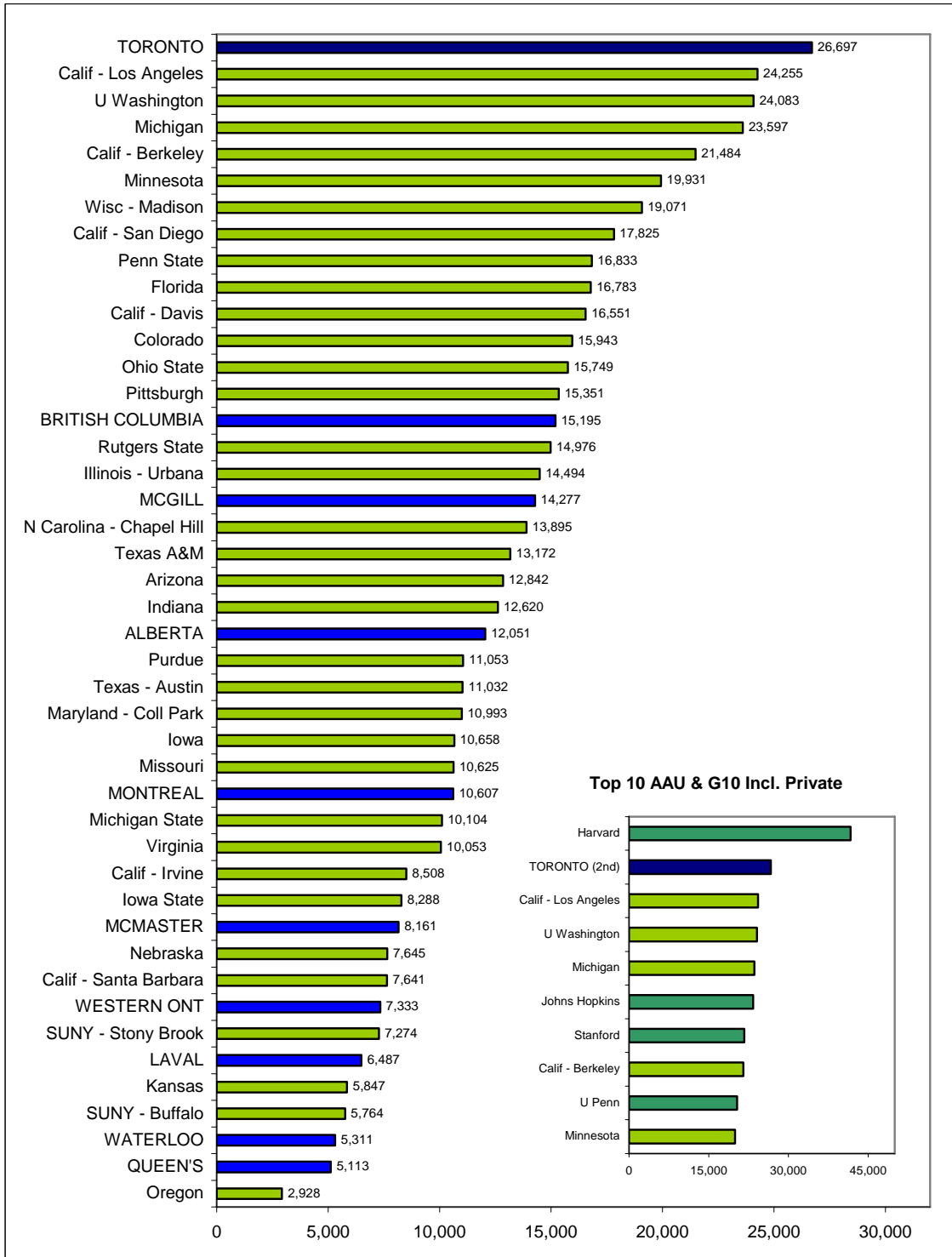
University Type (number)	Public (n=44)		Public & Private (n=70)	
	Publications	Citations	Publications	Citations
All Fields	1	3	2	6
All Sciences Fields	1	2	2	5
Health Sciences	1	1	3	3
Other Life Sciences	4	2	6	5
Computer Science & Engineering	14	13	17	20
Other Physical Sciences	14	17	19	28

Sources: Thomson ISI Canadian University Indicators - Deluxe Edition, 2004, and Thomson ISI U.S. University Indicators - Deluxe Edition, 2004.

The University of Toronto is clearly a leader among North American public universities and this leadership is still very strong when the private universities are included in the comparison. U of T's strength is particularly apparent in the health sciences and other life sciences. In all categories, U of T consistently ranked well ahead of all other Canadian G10 universities, as exemplified in the following two graphs showing total numbers of publications (Figure 9 on page 18), and total number of citations (Figure 10 on page 19), for all disciplinary fields.

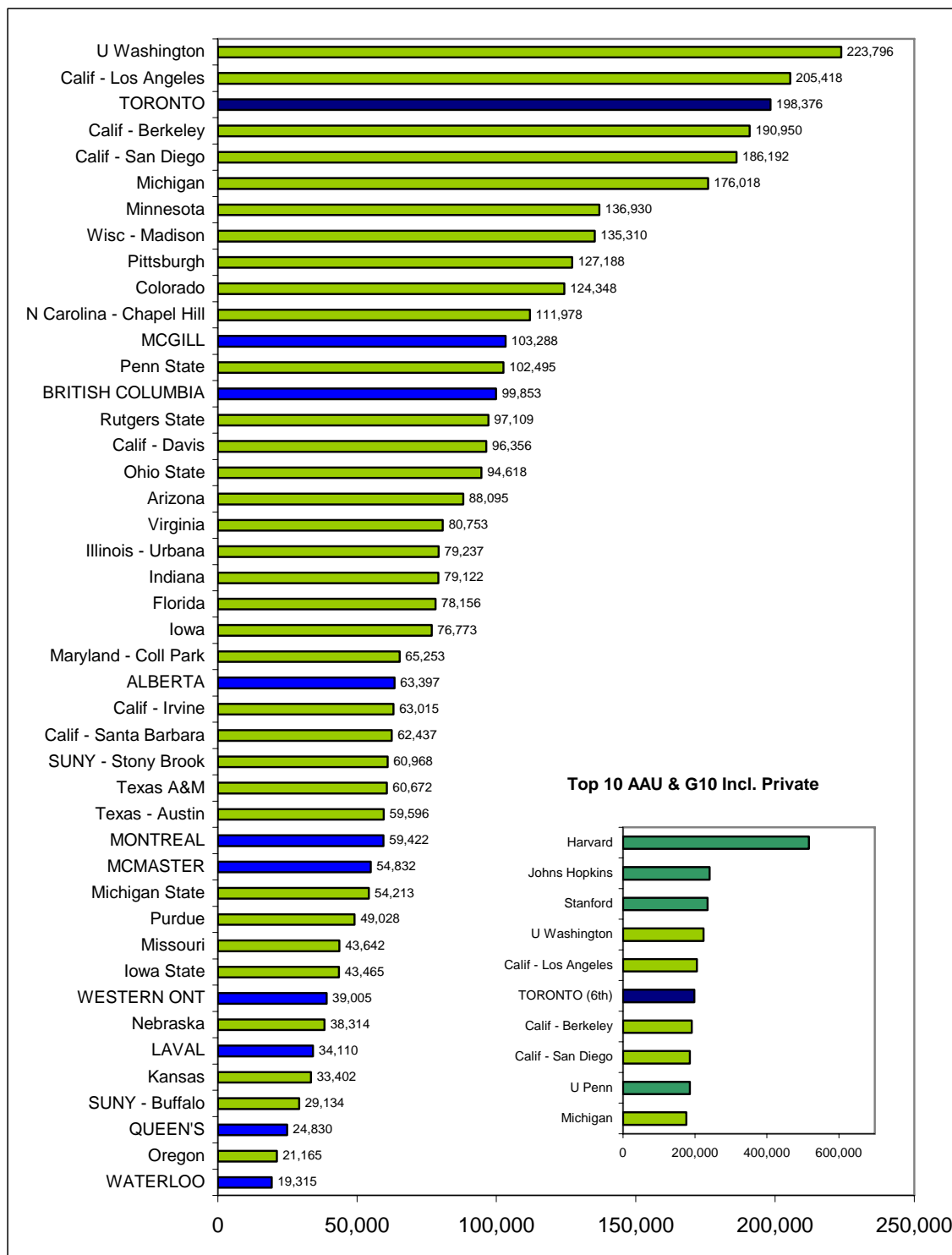
¹ Note in particular that the University of California in San Francisco has all its four faculties in the health sciences and is a recognized leader in these fields, but is not a member of AAU.

Figure 9: Number of Publications Indexed by ISI
AAU and G10 Public Institutions, 2000-2004 All Fields



Sources: Thomson ISI Canadian University Indicators - Deluxe Edition, 2004, and Thomson ISI U.S. University Indicators - Deluxe Edition, 2004.

Figure 10: Number of Citations Indexed by ISI
AAU and G10 Public Institutions, 2000-2004 All Fields



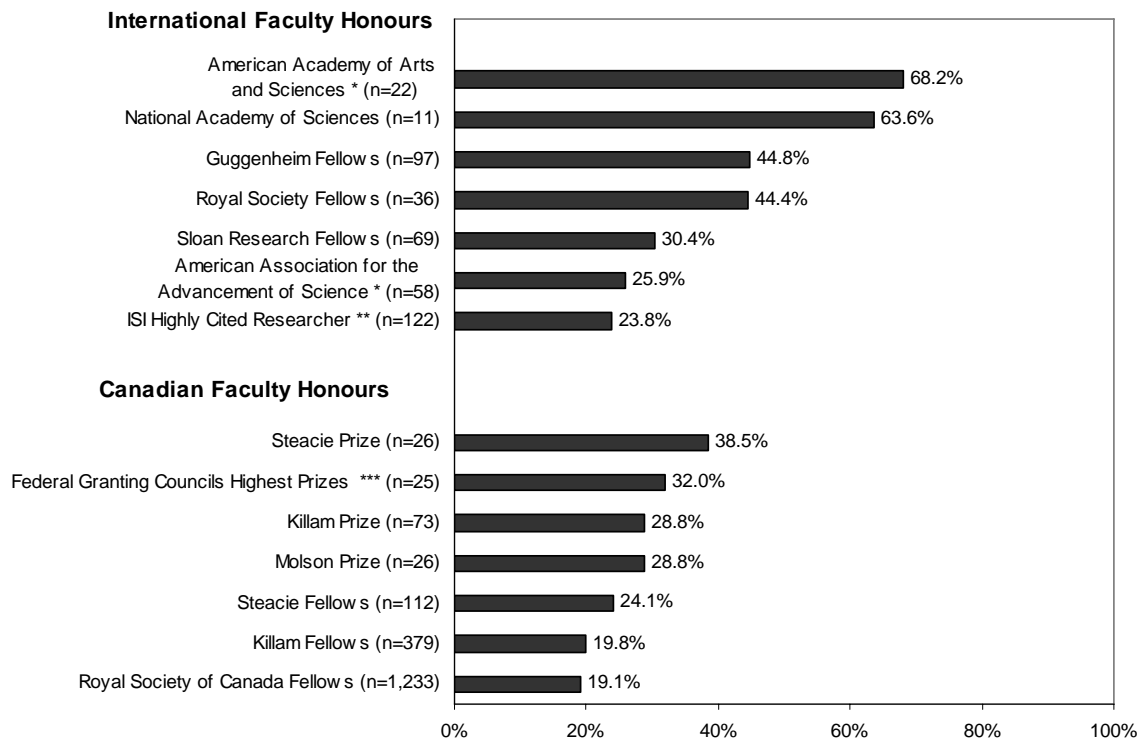
Sources: Thomson ISI Canadian University Indicators - Deluxe Edition, 2004, and Thomson ISI U.S. University Indicators - Deluxe Edition, 2004.

Faculty Honours U of T's Proportion

As illustrated in Figure 11, University of Toronto faculty members continued to receive honours and prizes, fellowships and election to groups recognizing outstanding scholarship and achievement, in proportions far exceeding U of T's proportion of faculty members in Canada (seven percent).

The University is particularly encouraged to find that its faculty members are receiving an overwhelming proportion of international honours bestowed on very few researchers in Canada, such as membership in the American Academy of Arts and Sciences and the National Academy of Science, fellowship in the Royal Society and research fellowships from the Alfred P. Sloan Foundation. Indeed, our proportions of international prizes and awards exceed those from Canadian sources.

Figure 11: Faculty Honours, 1980-2005
University of Toronto and Affiliates Compared to Canadian Universities



*Current members only

**As of 2005

*** Federal research councils' highest prizes: NSERC – Gerhard Hertzberg Canada Gold Medal for Science and Engineering (n=13); CIHR – Michael Smith Prize in Health Research (n=11); SSHRC – Gold Medal for Achievement in Research (n=1)

“n” refers to the number of honours held at all Canadian universities

Sources: Award announcements for each program

For description of selected faculty honours, see pages 21-25

Faculty Honours Selected Honours, 2004-2005

U of T faculty have excelled in the receipt of national and international honours in 2004-05. These successes are illustrated on the following pages.

American Academy of Arts & Sciences

Membership in the American Academy – which includes more than 150 Nobel laureates and 50 Pulitzer Prize winners – recognizes outstanding intellectual achievement, leadership and creativity in all fields. The following U of T faculty members are 2005 honorary members:

Richard Borshay Lee, Anthropology
Tak Mak, Medical Biophysics
Janice Gross Stein, Political Science and the Munk Centre for International Studies

American Association for the Advancement of Science (AAAS)

Fellowship in the AAAS is an honour bestowed upon members by their peers. Fellows are recognized for meritorious efforts to advance science or its applications.

Linda Kohn, Botany and Biology

Avicenna Prize for Ethics in Science (UNESCO)

Awarded every two years, this prize is intended to reward the activities of individuals and groups in the field of ethics in science.

Abdallah Daar, Public Health Sciences

Brockhouse Canada Prize for Interdisciplinary Research in Science & Engineering

Awarded by NSERC, this prize recognizes outstanding Canadian teams of researchers from different disciplines who came together to engage in research drawing on their combined knowledge and skills, and produced a record of excellent achievements in the natural sciences and engineering in the last six years.

Sajeev John, Physics
Geoffrey Ozin, Chemistry

CIHR Distinguished Leadership Award

Given by the Canadian Institutes of Health Research, this award recognizes the outstanding efforts of individuals who, through leadership, vision and commitment, have made a significant contribution to Canada's health research enterprise, from either a national or global perspective.

President Emeritus John Evans

Gairdner Foundation International Award

These annual awards recognize the world's top medical research scientists.

Endel Tulving, Psychology

Heinze Maier-Leibnitch Prize

Established by Deutsche Forschungsgemeinschaft DFG (the German Research Council), this prize recognizes the outstanding achievements of young scientists.

Valentin Blomer, Mathematics

ISI Highly Cited

This list represents 250 of the most highly cited researchers over the last 20 years in the articles indexed by the Thomson ISI in each of 21 broad subject categories in life sciences, medicine, physical sciences, engineering and social sciences. These individuals comprise less than one-half of one per cent of all publishing researchers – truly an extraordinary accomplishment. The following U of T researchers were added to the list in 2005:

Michael R. Bagby, Psychology, Psychiatry and the Centre for Addition and Mental Health

Ray G. Carlberg, Astronomy

Radford M. Neal, Computer Science

Walter M. Wonham, Electrical & Computer Engineering

Howard K.C. Yee, Astronomy

Kidney Foundation of Canada Medal for Research Excellence

This prestigious award is presented each year to a Canadian investigator for outstanding research in the area of kidney disease and related conditions.

Daniel Cattran, Medicine

Killam Prize

Awarded by the Canada Council for the Arts, these prizes honour eminent Canadian scholars in engineering, health sciences, natural sciences, social sciences and humanities.

Linda Hutcheon, English and Centre for Comparative Literature

Killam Research Fellowship

Awarded by the Canada Council for the Arts, these fellowships recognize and support distinguished Canadian scholars, normally full professors at Canadian universities and research institutes, who have established outstanding reputations in their areas of research.

Virginia Brown, Medieval Studies

Barbara Sherwood Lollar, Geology (Fellowship Renewal)

Lynne Viola, History (Fellowship Renewal)

Michael Smith Prize in Health Research

Created by the Canadian Institutes of Health Research, this prize is given annually to an outstanding Canadian researcher who has demonstrated a high degree of innovation, creativity, leadership and dedication in health research.

Sergio Grinstein, Biochemistry and the Hospital for Sick Children

MIT *Technology Review* 'World's Top 35 Innovators'

*Selected by the Massachusetts Institute of Technology's *Technology Review* magazine, the TR35 includes inventors, discoverers and entrepreneurs whose emerging technologies are shaping the world.*

Parham Aarabi, Electrical & Computer Engineering

Molson Prize in the Social Sciences & Humanities

Awarded by the Canada Council for the Arts, this prize recognizes an outstanding lifetime contribution to the cultural and intellectual life of Canada.

Ramsay Cook, History

National Academy of Engineering (Foreign Associate)

Academy membership honours those who have made important contributions to engineering theory and practice, and have demonstrated accomplishment in the pioneering of new fields of engineering, making major advancements in traditional fields of engineering, or developing innovative approaches to engineering education.

Walter M. Wonham, Electrical & Computer Engineering

NSERC Award of Excellence

Given annually by the Natural Sciences and Engineering Research Council, the Award of Excellence is given to the three finalists of the Gerhard Herzberg Canada Gold Medal for Science and Engineering, which recognizes sustained excellence and the overall influence of research conducted in Canada in the natural sciences or engineering.

Andre Salama, Electrical & Computer Engineering

NSERC Synergy Award for Innovation

These awards are given annually to recognize outstanding, long-lasting university-industry research and development partnerships.

Joseph Paradi of Mechanical and Industrial Engineering, along with researchers at U of T's Centre for Management of Technology and Entrepreneurship (CMTE), received a Synergy Award in recognition of an enduring partnership with TD Bank Financial Group, RBC Financial Group, BMO Financial Group and Bell Canada that focuses on developing innovative technologies for the financial services industry.

Order of Canada (Companion)

This distinction recognizes a lifetime of achievement and merit of a high degree, especially in service to Canada or to humanity at large. The Order recognizes people in all sectors of Canadian society.

Ian Hacking, Philosophy

Order of Canada (Member)

This distinction recognizes a lifetime of distinguished service in or to a particular community, group or field of activity. The Order recognizes people in all sectors of Canadian society.

Vincent Tovell, Massey College

Order of Canada (Officer)

This distinction recognizes a lifetime of achievement and merit of a high degree, especially in service to Canada or to humanity at large. The Order recognizes people in all sectors of Canadian society.

J. Richard Bond, Canadian Institute for Theoretical Astrophysics

Cranford R. Pratt, Political Science

Bruce Kidd, Physical Education and Health

Royal Society of Canada Fellows

Fellowship in the Royal Society is a prestigious honour recognizing outstanding contributions to the arts and sciences.

Peter Abrams, Zoology

Brenda Andrews, Banting & Best Department of Medical Research

Charles M. Boone, Banting & Best Department of Medical Research

Ronald de Sousa, Philosophy

James Drummond, Physics

Monica Heller, Ontario Institute for Studies in Education (OISE/UT)

John M. Kennedy, Psychology (UTSc)

Alexander Maxwell Leggatt, English

John F. MacDonald, Physiology

Alberto O. Mendelzon, Computer Science (Awarded posthumously)

Freda Miller, Medical Genetics and Microbiology

Robert Morris, Chemistry

Peter Richardson, Centre for the Study of Religion

Michael Salter, Physiology

Michael Sefton, Chemical Engineering & Applied Chemistry and the Institute for Biomaterials & Biomedical Engineering

John Edward Sipe, Physics

Sloan Research Fellowships

Given by the Alfred P. Sloan Foundation, these U.S.-based awards are intended to enhance the careers of the very best young faculty members in specified fields of science.

Sam Roweis, Computer Science

Steacie Memorial Fellowships

Awarded by the Natural Sciences and Engineering Research Council, these fellowships are given annually to university researchers who are capturing international attention for outstanding scientific or engineering achievement.

Roberto Abraham, Astronomy
Peter Zandstra, Chemical Engineering & Applied Chemistry

SOCAN Lifetime Achievement Award

Given by the Society of Composers, Authors and Music Publishers of Canada, this award is given to SOCAN members who have had outstanding success throughout their musical career.

Professor Emeritus John Weinzwieg, Music

Trudeau Foundation Fellowship

These three-year fellowships recognize innovative approaches to public policy issues.

George Elliot Clarke, English

Wolf Prize in Medicine

Given by Israel's Wolf Foundation, this prize is one six prizes in various fields that recognize achievements in science and art that benefit mankind.

Anthony Pawson, Medical Genetics & Microbiology

Innovation & Commercialization

The most visible outcomes of research are often those linked with commercialization. Indeed, the increased investments in university and hospital research by both levels of government were made in the context of a clear commitment by universities to increase their commercialization of research threefold between 2002 and 2010.

Over the past three years, the University of Toronto has recorded progressive increases in invention disclosures (see Table 5). Disclosures are mandated by the University's Inventions Policy and, although falling squarely at the pre-commercialization stage, their tracking provides a useful measure for innovation. The crossover into the commercialization realm occurs when an invention is licensed; that is, when a company has agreed to adopt an early-stage invention and invest in developing it further in exchange for the rights to the product for a specified territory and period of time. Alternatively, universities can help inventors to establish new companies to commercialize their inventions. These spin-off companies often go on to provide employment for many Canadians, including highly qualified personnel trained in universities, and may even contribute to funding further research at the university. Although our number of new licenses declined slightly in 2004-05, the number of new spin-off companies has remained similar over the past three years.

Table 5: Innovation and Commercialization Indicators
University of Toronto Excluding Affiliates

	2002-2003	2003-2004	2004-2005
Invention Disclosures	138	164	224
Licenses	40	38	28
Active Spin-off Companies*	96	100	103

*2003-2004 and 2004-2005 values are preliminary

Highly Qualified Personnel

Research, scholarship and the generation of new knowledge and understanding create unique opportunities to mentor the great minds of tomorrow. This mentorship is particularly intensive in the case of doctoral stream graduate students and postdoctoral fellows. In 2004, the University conferred degrees to 1,779 in the former group, and was engaged in training 1,446 in the latter. In addition, 1,785 degrees were conferred to students in professional masters programs. The breakdowns between the four School of Graduate Studies divisions are shown in Table 6.

Twelve percent of students who graduated in 2004 were international students, made up of seven percent in the professional masters programs, 10 percent in the doctoral stream programs, and 20 percent in the doctoral programs.

Table 6: Breakdown of Highly Qualified Personnel
University of Toronto and Affiliates, 2004

	Graduated in 2004				At U of T in 2004
	Doctoral Stream			Professional Stream Masters	Postdoctoral Fellows
	Masters Program	Doctoral Program	Total Doctoral Stream		
Humanities	221	88	309	31	31
Social Sciences	297	198	495	1,136	24
Physical Sciences	367	140	507	199	353
Life Sciences	262	206	468	419	1,038
TOTAL	1,147	632	1,779	1,785	1,446

Not shown: count of students who earned graduate level diplomas or certificates.

Source: U of T Planning & Budget Office, 2004 Degrees Awarded File submitted to Statistics Canada and the Ontario Ministry of Training, Colleges and Universities.

Social Impact

One of the important outputs of research is the beneficial impact it has on society, in Canada and around the world. This may take the form of improvements in areas such as health, childcare, education, human rights, transportation and safety, and often starts with policy changes. A large number of faculty members and, by extension, the students they supervise, take part in exchanges with policymakers on how to improve our society, based on insights gained through their research. These exchanges can be informal or confidential, or appear in the public domain as books and articles (including those aimed at non-specialists), reports, expert commentaries, interviews, membership on commissions and task forces, etc. Beyond counts of publications and citations in peer-reviewed journals, little has been done to quantify these activities and, more importantly, their potential for societal impact.

A starting point may be media coverage analysis reports such as the ones published quarterly by Cormex Research, which compares six research-intensive universities in Canada. Although the primary goal of these analyses is to assess public relations impact, such as rating news stories from favourable to unfavourable, or estimating the equivalent advertising value of the coverage, a key element is an analysis of media exposure of individual faculty members. The University of Toronto typically leads in numbers of professors in the top 30. However, this kind of study does not differentiate between exposure relating to internal university policy or to new knowledge or understanding, nor does it reveal whether there is genuine potential for societal impact.

Listed below are just a few of the many examples of the ways in which University of Toronto researchers have an impact on society:

Usha George of the Faculty of Social Work is regularly sought after by Citizenship and Immigration Canada (CIC) for her expertise in the needs of immigrant populations. In the past, George has conducted focus groups in several communities – including African, Yugoslavian and Afghan groups – to create better models for delivering services such as language training, housing and job searches and general orientation to Canada. CIC has implemented many of George’s recommendations, including the placement of trained settlement workers in Toronto schools.

Janice Stein, Harrowston Chair in Conflict Management and Negotiation in the Department of Political Science and founding director of the Munk Centre for International Studies, is a renowned expert on the Middle East and is a highly sought-after advisor to governments around the world. She has advised the American Association for the Advancement of Science and the United States Institute for Peace. In Canada, she has been Chair of the Research Advisory Board to the Minister of Foreign Affairs and Chair of the Advisory Board to the Canadian Centre for Foreign Policy Development. Stein also hosted a popular weekly TV Ontario series called, *Going Global*.

David Hulchanski, director of U of T’s Centre for Urban and Community Studies and professor of housing and community development in the Faculty of Social Work, has gained an international reputation as an authority on homelessness. As holder of the only endowed

chair in housing studies in North America – the Dr. Chow Yee Ching Chair in Housing – Hulchanski has penned a host of policy discussion papers regarding the rise of homelessness in Canada.

Darlene Johnston of the Faculty of Law, who conducts research in Aboriginal territoriality and governance and teaches courses in Aboriginal law and property law, used her expertise to spearhead a land claim on behalf of the Anishinabek people who live in the Bruce Peninsula in Southern Ontario. Armed with the insight she gained through that experience, Johnston acts as the Aboriginal advisor for the largest enrolment of First Nations law students in Ontario, and speaks in a variety of forums on Aboriginal issues.

Carl Corter of the Ontario Institute for Studies in Education and director of U of T's Institute for Child Study is spearheading an innovative pilot project in Toronto that integrates kindergarten, childcare and family support services within the school setting to provide a more seamless learning environment. Called the Toronto First Duty Project, the initiative involves five Toronto schools and aims to provide a well-documented framework that can make the project a long-term reality for primary school systems.

SELECTED ACCOMPLISHMENTS 2004-2005

Revenue Generation

1. Selected Award successes

Government Research Infrastructure Programs Office

- Attracted ~\$80 million in research awards, across all faculties, three campuses and the affiliated teaching hospitals
- Provided guidance and support to the Large Optical Telescope project, helping to secure the first \$10 million required to keep Canada in this unprecedented scientific initiative
- Secured one of the final ORDCF grants, providing over \$5 million of provincial support to a highly innovative medical initiative and aiding in the retention of a top faculty member

Research Grants Office

- Helped secure Canadian Foundation for Climate and Atmospheric Sciences (CFCAS) network grant of \$5 million to Professor W.R. Peltier in Physics – the largest network grant ever awarded by CFCAS
- Helped secure NSERC Research Network Grant for \$4.5 million for the Network for Effective Collaboration Technologies through Advanced Research (NECTAR) to R. Baecker in Computer Science (the 2nd U of T award)
- Achieved 58 percent success rate (16 percent above the national rate) in NSERC Research Tools and Instruments in 2005
- Helped achieve 53 percent success rate in NSERC Idea to Innovation program (since its inception two years ago), resulting \$1.3 million of new funding for developing technologies to U of T since April 2004
- Helped achieve 38 percent success rate (10 percent above the national success rate) in NSERC Strategic Projects in 2004, resulting in \$5.1 million of new funding

Connaught Fund

- Received and reviewed approximately 328 applications across six funding programs, leading to the support of over \$3 million to U of T faculty and graduate students

2. Launched improved services, including comprehensive review of all Social Sciences and Humanities applications, and new services, including NSERC Strategic Grant workshop
3. Prepared and supported audits of U of T grants for federal granting councils, the federal Indirect Costs, Canada Research Chairs and Canada Foundation for Innovation programs
4. Initiated planning respecting the University's "tier 1" strategy for high performance computing in research

5. Created a dedicated Connaught Fund website aimed at access to information and celebration of the achievements of Connaught award recipients, and revised the terms of the Connaught and Jackman Research Fellowships programs leading to program enhancements in order to increase participation and profile of the fund

Research Commercialization and Knowledge Transfer

1. Implemented recommendations of the Manley report regarding improved coordination and integration of UTIF and the VP-RAP Tech Transfer offices, including developing a revised invention disclosure template and streamlining the disclosure procedure to ensure accuracy
2. Participated in the formal establishment of BioDiscovery Toronto, a consortium comprised of U of T, the affiliated teaching hospitals, Ryerson and MaRS
3. Acted as the lead institution on behalf of BioDiscovery for both a Tri-Council IPM proposal, which resulted in a \$1.25 million award for BioDiscovery related activities, and an Ontario Research Commercialization Program application for funding for a proof-of-principal fund and related tech transfer resources
4. Established a presence at MaRS through the relocation of the University of Toronto Innovations Foundation (UTIF) to the MaRS complex

Research Ethics

1. Implemented a Delegated Ethics Review program for undergraduate research throughout the University, which will enable the expansion of “research experiences” at the undergraduate level to be planned and conducted in accordance with ethical standards
2. Developed a program for Continuing Review to ensure ethical conduct in research involving human subjects and to educate researchers on best practices
3. Held first annual Research Ethics Board retreat, attended by more than 60 REB members
4. Successfully responded to the Canadian Council of Animal Care’s (federal) assessment of all the University’s research facilities and fully complied with provincial (Animals for Research Act) regulations
5. Successfully expanded and planned expansion/renovation of animal research facilities (e.g., Centre for Cellular & Biomolecular Research, Centre for Biological Timing & Cognition, Ramsay Wright Zoology Laboratories)

Research Advocacy

1. Enhanced the University of Toronto's research profile among provincial and federal governments through strategic meetings in Ottawa and Queen's Park and as a new member of Industry Canada's University Advisory Group
2. VP, Research & Associate Provost has assumed the Chair of the OCUR Provincial Relations Committee and has provided input for the establishment of the new Ministry of Research and Innovation as well as the Ontario Research and Innovation Council
3. Advocated for the following initiatives, which were announced in the November 14, 2005 Federal Economic Update:
 - \$1 billion to the provinces and territories to invest in Canada's postsecondary infrastructure and to help modernize and improve facilities
 - \$1.2 billion in additional funding over the next five years for the Indirect Cost program
 - An \$85 million increase to the federal research councils' budgets: \$35 million each for CIHR and NSERC, and \$15 million for SSHRC
 - \$500 million in 2005-06 to the Canada Foundation for Innovation to sustain its activities over the next five years
4. In collaboration with Public Affairs, Government Relations, other faculties, and UTM and UTSc, led the development and implementation of two full-page advertisements in the *Hill Times* re "Innovation" and "Life Sciences"
5. Published promotional information package (large brochure, pamphlet, media folder) about research at U of T. The brochure, the first such material U of T has published since 1998, was awarded the Gold Prize for Best Brochure from the Canadian Council for the Advancement of Education (CCAЕ) and has met with great acclaim throughout the University and federal and provincial governments
6. *Edge Magazine*:
 - Was awarded a Gold Prize for Best Magazine (under \$100,000) from the CCAЕ, a Silver Prize and a Bronze Prize from the U.S.-based Council for the Advancement and Support of Education (CASE), and an Ovation Award from the International Association of Business Communicators (Toronto Chapter)
 - Increased publication frequency to three issues a year
 - Developed targeted distribution method to reach key leaders in government
7. Worked with the Ontario Science Centre to identify researchers who could be profiled in various new OSC programs (Hot Zone, Main Screen Area, etc.)

PRIORITY PLANS 2005-2006

Revenue Generation

1. Negotiate program terms for new Ontario Research Fund programs offered by the Ministry of Economic Development and Trade and implement new program/competition structure for U of T participation (Summer/Fall 2005)
2. Help to shape upcoming Canada Foundation for Innovation programs and coordinate the University's participation, consistent with academic planning and priorities
3. Implement the University's strategy for high performance computing
4. Finalize completion of nominations for Canada Research Chairs and support planning regarding the future of the program in the context of the elimination of early retirement, gender representation goals, Tier 2-Tier 1 transition issues, etc. (Spring 2006 and beyond)
5. Implement information sessions for U of T Canada Research Chairs submitting renewal applications (Summer 2005)
6. Work toward a successful outcome of applications to Genome Canada Round III and continue to press for reasonable, streamlined award terms and conditions
7. Implement program support for the upcoming Research Talent Fund program for junior faculty
8. Create a Health Sciences International Research Partnership Office position to increase the number of applications to the National Institutes of Health and other international health sciences sponsors
9. Provide new grantsmanship workshops and clinics (e.g., NIH, SSHRC unsuccessful applicants, and how to leverage corporate funding)

Research Commercialization and Knowledge Transfer

1. Complete the integration of UTIF into the University
2. Solidify U of T's associations and partnerships with existing commercialization organizations being established (e.g., Toronto Region Research Alliance, Ontario Society for Excellence in Technology Transfer, Alliance for Commercialization of Canadian Technology) to ensure U of T is both represented and influential in commercialization activities and initiatives being put forward provincially and nationally and to help achieve common priorities

3. Participate in a national working group to re-examine and redefine metrics to properly measure the impact and effectiveness of university-to-industry technology transfer and commercialization

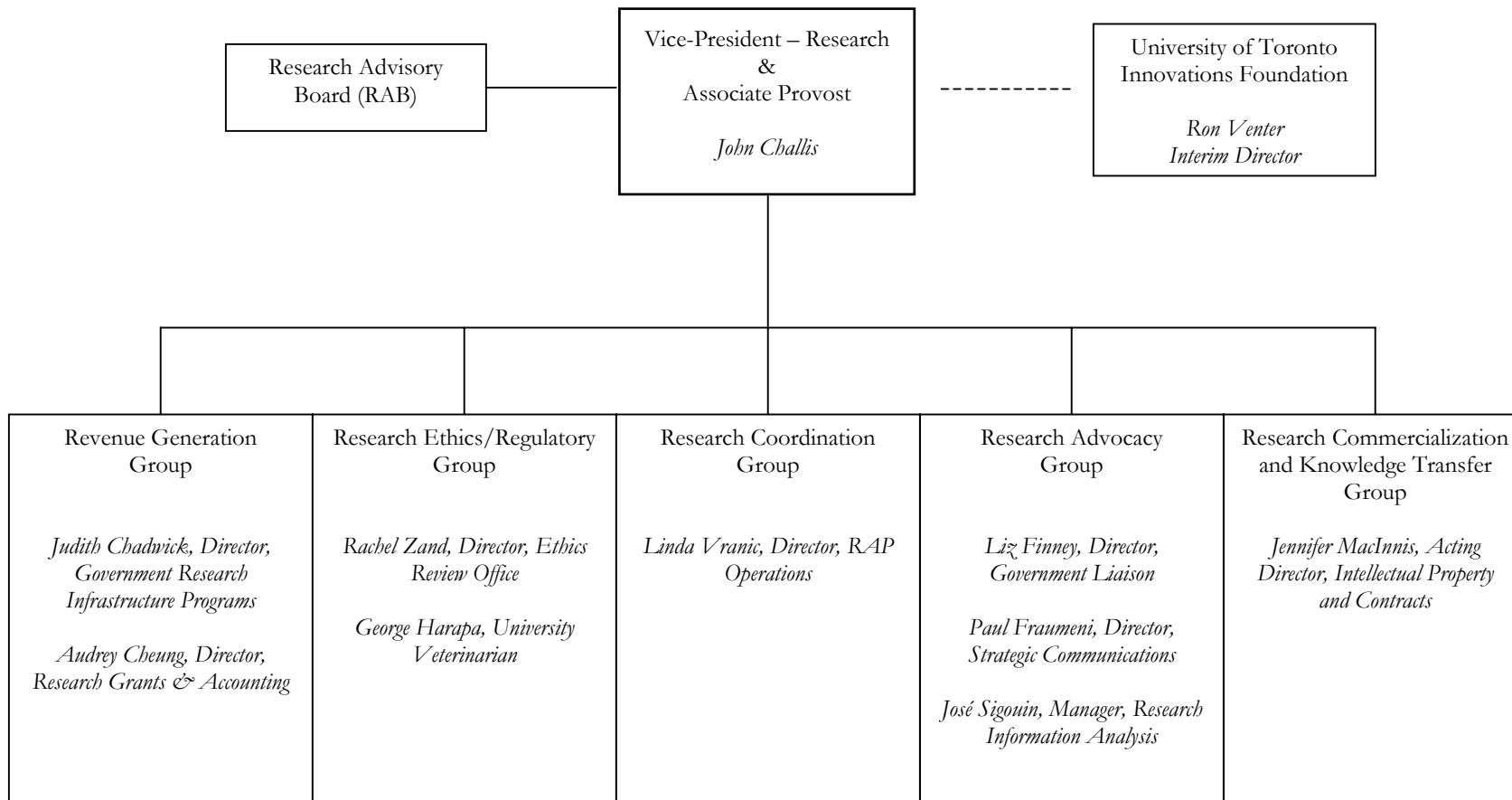
Research Ethics

1. Develop policies in response to regulations and best practices for:
 - Personal Health Information Protection Act
 - Personal Information Protection and Electronic Documents Act
 - Freedom of Information and Protection of Privacy Act
 - Tri-Council Policy Statement, as it evolves
 - Other regulations (e.g., UNESCO)
 - REB accreditation, once implemented
2. Revise, update and develop policies including:
 - Ethical Conduct in Research
 - Research Misconduct
 - Conflict of Commitment and Conflict of Interest
3. Create a variety of continuing lecture series and courses available to the University community, researchers and high school students in the areas of human subjects research, animal research and ethical conduct in research
4. Purchase and implement use of ethics review software to facilitate procedures and communication between RAP groups, researchers and ethics protocol reviewers

Research Advocacy

1. Develop a strategic advocacy plan to further promote the research interests of the University and its affiliated institutions locally, provincially, nationally and internationally
2. Identify and develop, if necessary, the appropriate metrics to measure and advocate for the University's research excellence
3. Launch new RAP website in January 2006, and build on successes with *Edge*, the U of T research brochure, and commercialization publications
4. Develop high profile mechanisms for promoting U of T scholarly awards and prizes, and overall accomplishments of the research enterprise

APPENDIX A
Office of the Vice-President, Research & Associate Provost
September 2005



APPENDIX B

Glossary of Abbreviations

AAU	Association of American Universities
AUCC	Association of Universities and Colleges of Canada
CASE	Council for Advancement and Support of Education
CCAE	Canadian Council for the Advancement of Education
CIHR	Canadian Institutes of Health Research
CFI	Canada Foundation for Innovation
CRC	Canada Research Chairs
G10	Group of 10 Canadian Universities (Alberta, UBC, Laval, McGill, McMaster, Montreal, Queen's, Toronto, Waterloo, Western)
GC	Genome Canada
GRIP	Government Research Infrastructure Programs
ISI	Institute for Scientific Information
IPM	Intellectual Property Management
MaRS	Medical and Related Sciences Discovery District
NCE	Networks of Centres of Excellence
NIH	National Institutes of Health
NSERC	Natural Sciences and Engineering Research Council of Canada
OCUR	Ontario Council on University Research
OGI	Ontario Genomics Institute
OIT	Ontario Innovation Trust
ORDCF	Ontario Research & Development Challenge Fund
PREA	Premier's Research Excellence Awards
RAB	Research Advisory Board
RAP	Office of the Vice-President, Research & Associate Provost
REB	Research Ethics Board
SSHRC	Social Sciences & Humanities Research Council of Canada
UNESCO	United Nations Educational, Scientific and Cultural Organization
UTIF	University of Toronto Innovations Foundation
UTM	University of Toronto at Mississauga
UTSc	University of Toronto at Scarborough

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