



Briefing Notes

Produced by the

Research Grants & Scholarships Directorate
Natural Sciences and Engineering
Research Council of Canada
Ottawa, Ontario
Canada

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List of Acronyms

BAP	Broad Area Panel
CRC	Canada Research Chair
CREATE	Collaborative Research and Training Experience
DAS	Discovery Accelerator Supplements
DGP	Discovery Grants Program
FTA	First-Time Applicants
GSC	Grant Selection Committee
NSE	Natural sciences and engineering
PPP	Purchasing Power Parity

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1 Additional Data & Analyses

1.1 Funding Rates

Tables 1.1.1 and 1.1.2 show the funding rate (dollars awarded vs dollars requested) by GSC, for new and established researchers respectively.

Figure 1.1.1 shows that the amounts requested and funding rate (amount awarded relative to the amount requested) by decile of grant awarded for new and established researchers is far from being static around the overall value of 51%. For both groups, researchers receiving smaller grants are requesting lower amounts than those in the upper deciles. The funding rate increases with the award decile for both new and established researchers. The funding rate is particularly notable for established researchers at the 90-100 decile who receive almost 70% of a substantially larger requests compared to the 38% funding rate for grantees in the 0 to 10 decile.

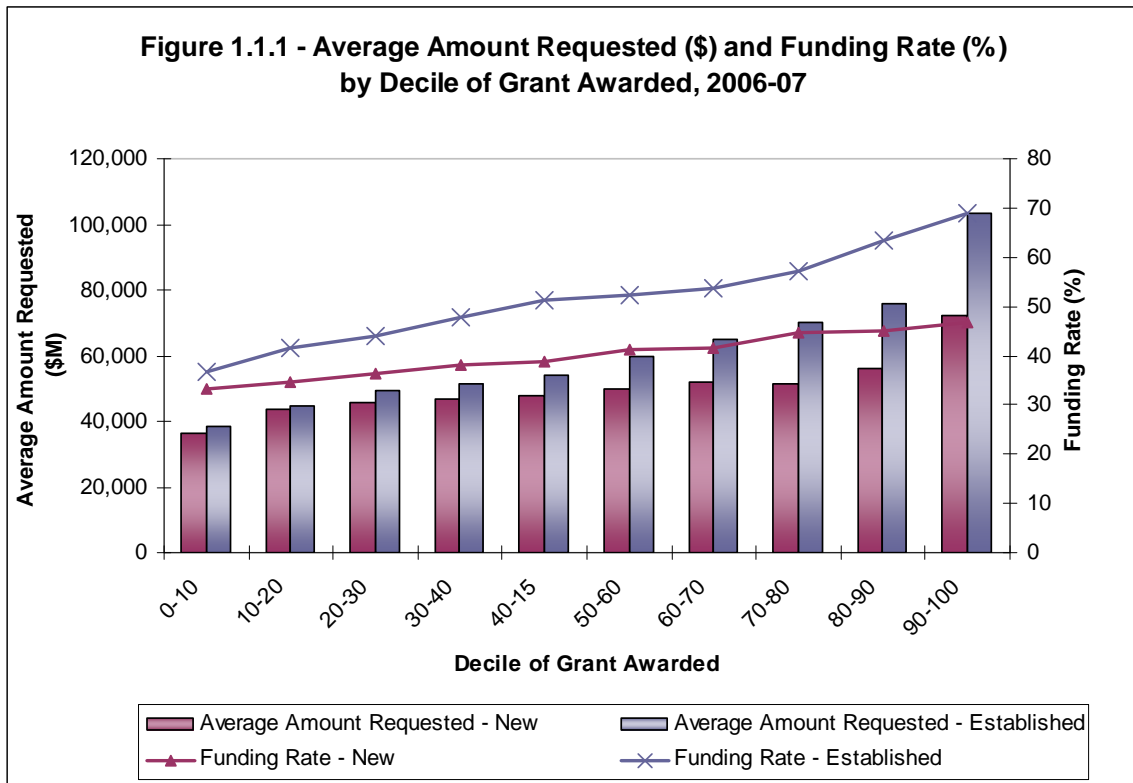


Table 1
Funding Rate¹ for New Researchers², 2006-07

Grant Selection Committee (GSC)	Funding Awarded (\$) by Decile									
	0-10	10-20	20-30	30-40	40-45	50-60	60-70	70-80	80-90	90-100
Integrative Animal Biology	39.2	40.6	32.9	36.4	45.3	43.3	44.4	41.1	47.4	38.6
Plant Biology & Food Science	36.8	39.4	35.8	46.1	40.5	45.2	49.9	47.1	55.0	54.6
Psychology: Brain, Behaviour & Cognitive Science	39.7	35.9	35.4	37.3	40.8	41.2	42.0	42.2	41.8	47.5
Evolution & Ecology	34.4	37.4	38.7	44.9	42.7	43.3	42.9	46.7	47.4	52.8
Cell Biology	35.6	27.8	37.3	34.5	35.7	34.1	41.8	43.2	42.7	48.6
Molecular & Developmental Genetics	31.6	29.7	30.5	33.7	38.0	37.7	38.9	41.1	43.9	40.8
Solid Earth Sciences	39.2	39.3	31.5	38.3	37.9	42.9	42.2	43.4	54.1	55.3
Environmental Earth Sciences	38.5	34.4	38.0	51.5	54.9	46.6	52.2	57.6	62.6	60.4
Space & Astronomy	26.3	33.6	35.9	36.9	33.9	37.9	38.2	39.1	45.9	37.8
Analytical & Physical Chemistry	30.7	28.8	35.4	37.2	34.1	39.9	35.3	47.9	43.5	42.1
Inorganic & Organic Chemistry	24.7	28.7	35.9	38.3	35.4	44.8	35.7	32.4	31.9	44.3
Condensed Matter Physics	30.5	38.5	39.0	41.7	43.2	37.0	50.3	61.8	57.4	59.2
General Physics	34.9	37.4	35.7	33.4	37.2	36.2	43.6	44.0	41.9	41.0
Pure and Applied Mathematics	40.8	40.3	45.0	47.7	41.6	46.0	47.3	46.6	52.8	49.4
Statistical Sciences	24.5	32.1	32.6	52.0	38.0	38.3	47.4	53.7	39.4	49.0
Computing and Information Sciences	27.2	36.3	38.1	37.6	38.9	45.8	41.2	46.4	46.8	50.8
Chem. & Metallurgical Eng	40.7	37.8	37.6	40.8	37.2	44.2	48.5	54.4	39.4	61.7
Civil Engineering	43.1	59.4	44.2	43.7	51.3	48.9	44.0	47.5	51.1	48.2
Mechanical Engineering	27.1	26.0	37.8	27.3	36.5	36.5	32.1	39.3	36.8	37.6
Industrial Engineering	24.6	27.1	31.7	33.4	30.1	35.2	35.7	43.9	37.1	44.1
Communications, Computers & Components Engineering	35.1	40.3	31.5	34.3	44.4	53.0	39.7	50.0	41.4	46.2
Electromagnetics & Electrical Systems Engineering	25.0	49.4	60.9	39.5	31.3	61.7	30.7	48.4	48.4	47.8
Interdisciplinary	26.9	34.8	34.5	29.8	30.6	37.9	39.7	38.8	44.3	55.0
Total	33.4	34.8	36.3	38.1	38.7	41.3	41.5	44.8	45.1	46.8

1. Dollars requested divided by the amount awarded.

2. Grantees still on their first NSERC Individual Discovery Grant in 2006-07. Excludes Subatomic Physics.

Table 2
Funding Rate¹ for Established Researchers², 2006-07

Grant Selection Committee (GSC)	Funding Rate (\$) by Decile									
	0-10	10-20	20-30	30-40	40-15	50-60	60-70	70-80	80-90	90-100
Integrative Animal Biology	36.3	42.1	50.7	51.0	55.0	56.5	60.0	62.7	60.2	71.4
Plant Biology & Food Science	40.0	50.2	50.4	51.0	61.5	51.1	65.9	57.7	72.2	74.6
Psychology: Brain, Behaviour & Cognitive Science	38.7	45.0	46.8	49.0	49.3	50.3	52.4	52.5	57.3	71.7
Evolution & Ecology	43.1	43.7	47.0	46.5	53.9	55.4	57.5	60.8	58.9	66.6
Cell Biology	33.3	36.2	39.7	40.4	46.4	49.3	52.6	52.7	70.4	75.9
Molecular & Developmental Genetics	33.4	35.9	37.7	40.5	49.0	47.4	46.5	50.6	56.9	65.0
Solid Earth Sciences	37.1	36.8	40.5	49.3	52.0	53.6	48.8	52.9	69.6	68.4
Environmental Earth Sciences	47.0	46.9	52.6	54.2	53.6	63.5	61.5	61.9	73.8	71.5
Space & Astronomy	34.2	39.6	41.2	41.8	46.1	46.0	45.5	53.0	60.0	64.9
Analytical & Physical Chemistry	32.6	34.1	36.8	47.3	49.0	47.4	53.1	58.0	64.4	69.8
Inorganic & Organic Chemistry	32.8	44.8	41.3	44.0	47.7	44.6	44.4	56.1	61.8	61.4
Condensed Matter Physics	33.5	42.7	42.3	45.1	50.1	47.2	54.4	53.6	63.7	70.0
General Physics	40.4	44.8	43.7	49.2	57.8	56.9	57.8	62.2	64.1	62.2
Pure and Applied Mathematics	43.3	41.0	54.9	55.5	57.3	59.4	62.4	57.6	62.2	74.4
Statistical Sciences	22.6	36.6	34.5	37.1	60.0	49.6	50.8	53.7	77.1	71.7
Computing and Information Sciences	36.1	44.0	43.9	51.1	52.4	48.6	51.6	56.1	63.8	66.8
Chem. & Metallurgical Eng	34.9	49.1	43.8	58.2	56.7	63.9	57.6	71.1	65.1	76.2
Civil Engineering	39.8	49.9	50.0	52.2	57.1	57.0	58.6	58.8	71.1	72.2
Mechanical Engineering	33.1	38.4	44.3	44.2	44.1	51.8	49.3	53.7	63.5	64.9
Industrial Engineering	29.5	31.3	38.9	41.9	41.4	44.0	47.0	56.7	62.6	66.5
Communications, Computers & Components Engineering	37.0	45.4	40.0	53.7	50.1	53.1	54.6	62.0	62.3	71.7
Electromagnetics & Electrical Systems Engineering	26.6	45.4	53.2	54.5	43.2	59.7	57.1	54.3	67.1	67.3
Interdisciplinary	39.4	39.3	40.2	44.3	47.6	54.2	50.1	56.2	57.0	59.7
Total	36.6	41.6	44.1	47.9	51.2	52.4	53.8	57.1	63.4	68.7

1. Dollars requested divided by the amount awarded.

2. Grantees on their second or greater NSERC Individual Discovery Grant in 2006-07. Excludes Subatomic Physics.

1.2 Changes in Amount at Renewal of Grant

This analysis was carried out in order to assess whether there was real or simply a perception of ‘built-in’ inertia in moving funds towards the most meritorious applications.

Parameters

- Using the data from the 2007 competition, which involved 2,053 renewal applicants, including 710 applicants renewing their grant for the 1st time, a comparison was carried of the new grant awarded relative to the previous amount held by these applicants.
- The percentage change was used, rather than the amount, in order to readily compare disciplines with very different grants levels.
- A similar data extract was used to compute the % difference by quartile of the previous grant (unfortunately the methodology used did not allow in this instance to compute the number of applicants whose grant was not renewed).

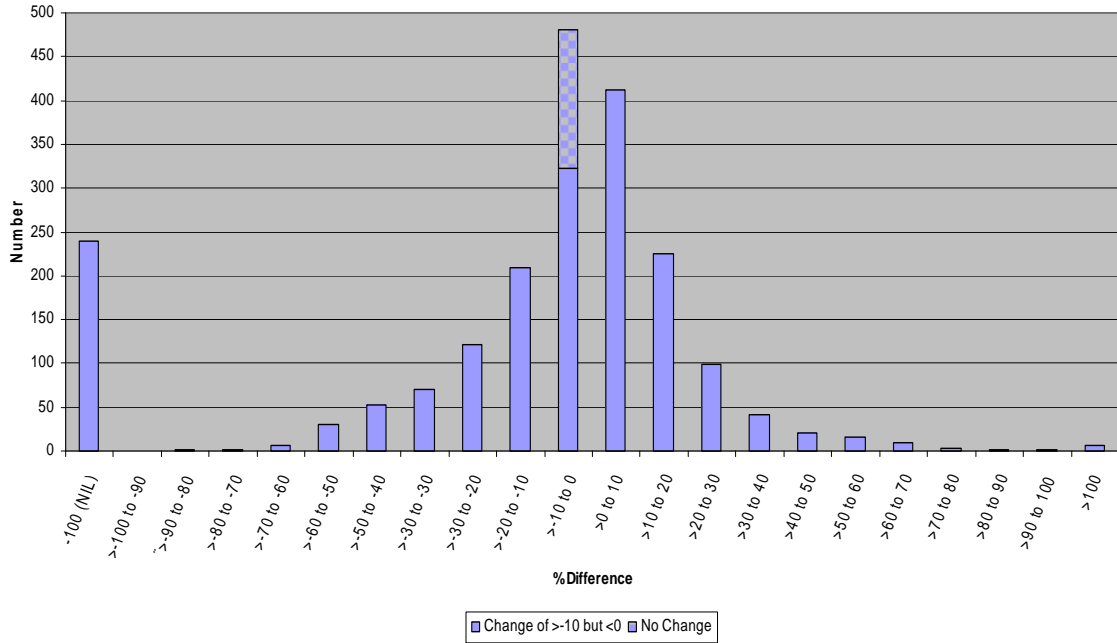
Budgetary Context of the 2007 Competition

The pressure on the renewal budget was 10%, meaning that the funds available for renewal applicants were 10% less than the sum of renewing grants. This resulted from the overall budgetary pressure in the Discovery Grants program and the decision by NSERC to earmark some funds “off the top” for First-Time Applicants. At the GSC level, renewal pressure ranges from 1% (e.g., Condensed Matter Physics) to a little over 20% (e.g., Industrial Engineering and Molecular & Developmental Genetics) due to the residual impact of the last Reallocation Exercise (see section 2.4).

Observations

Figure 1.2.1 and 1.2.2 illustrate the overall results: figure 1.2.1 shows the results for all renewal applicants while figure 1.2.2 shows the results for 1st renewals only. Figures showing results at the GSC level are presented in Appendix 1.2.A. Figure 1.2.3 shows the results by quartile of the previous grant.

**Figure 1.2.1 - %Difference between New and Previous Grant
All Renewal Applicants, 2007 Competition**



**Figure 1.2.2 - %Difference between New and Previous Grants
First Renewals, All GSCs, 2007 Competition**

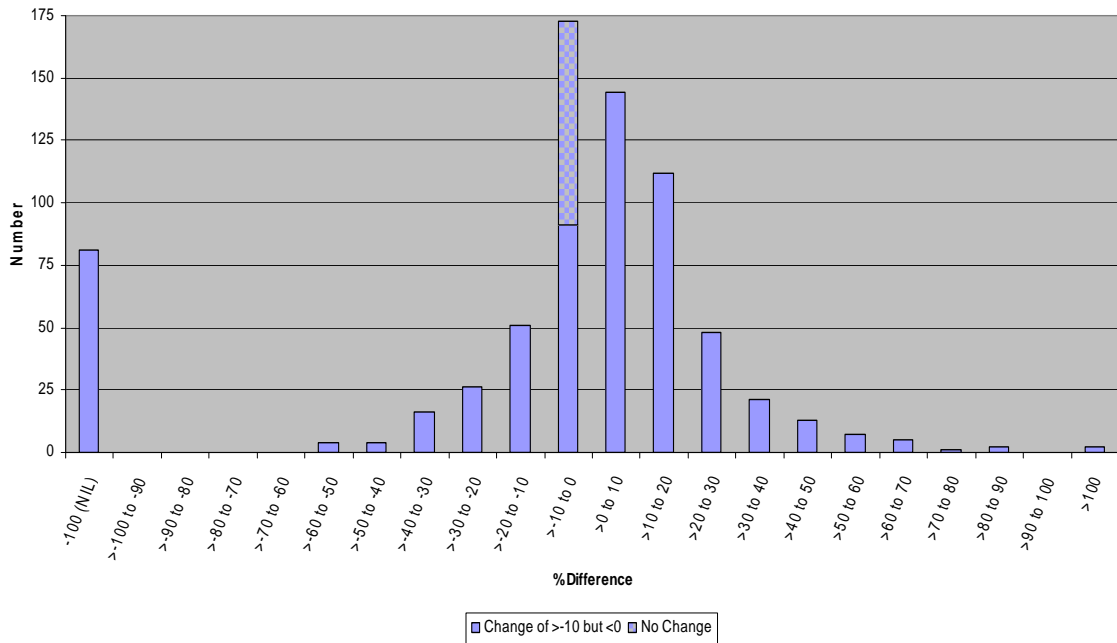
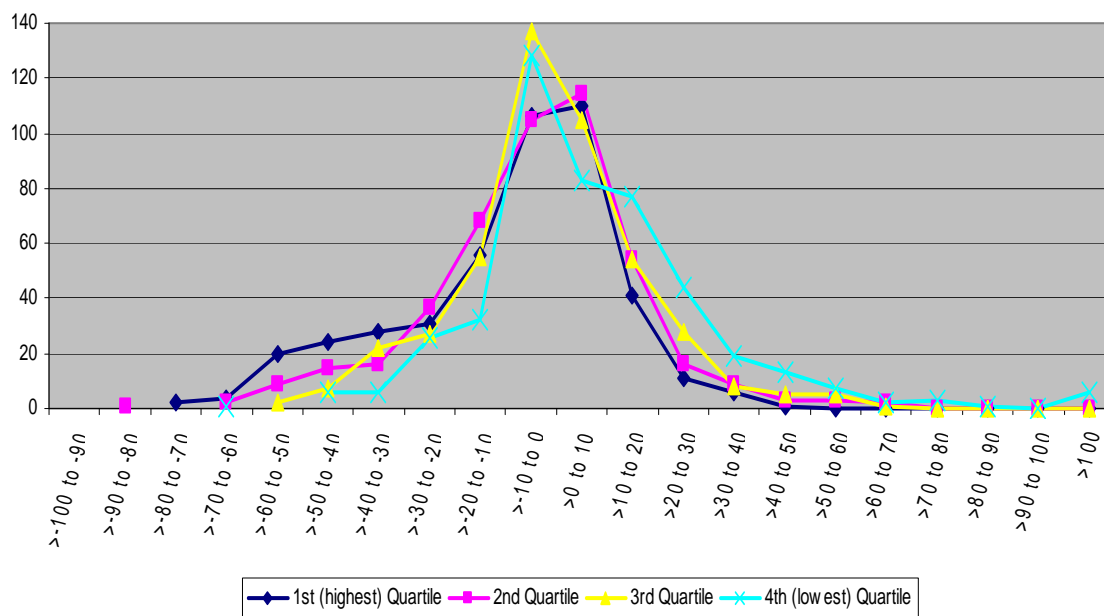
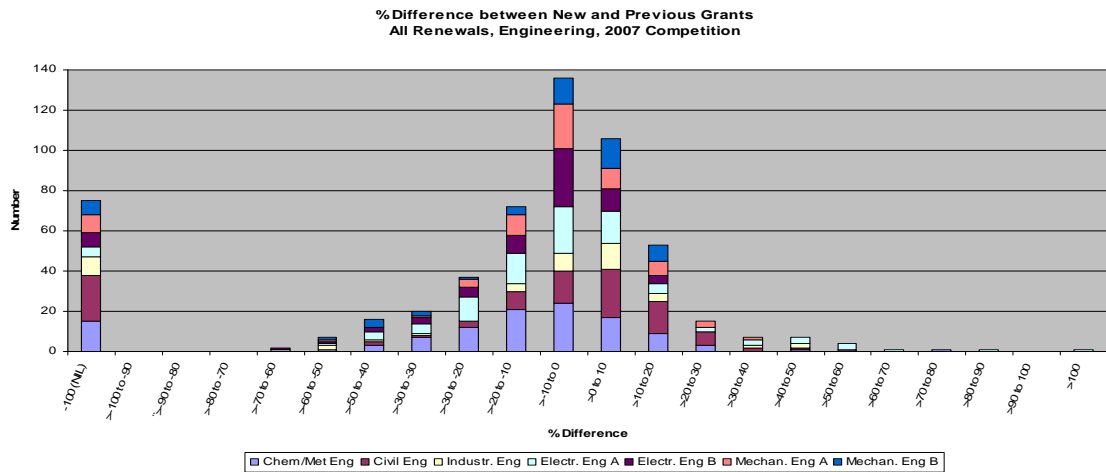
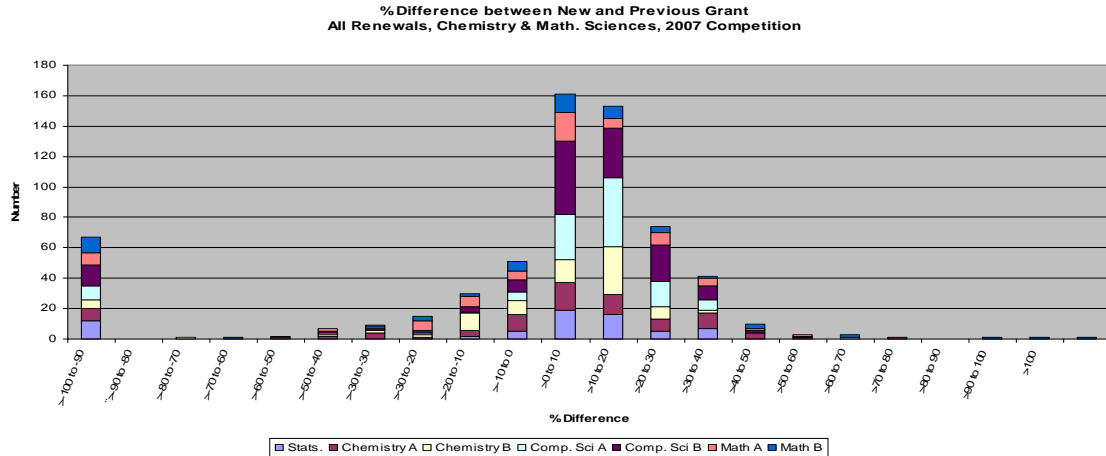


Figure 1.2.3 - % Difference between New and Previous Grants
By Quartile of Previous Grant, 2007 Competition

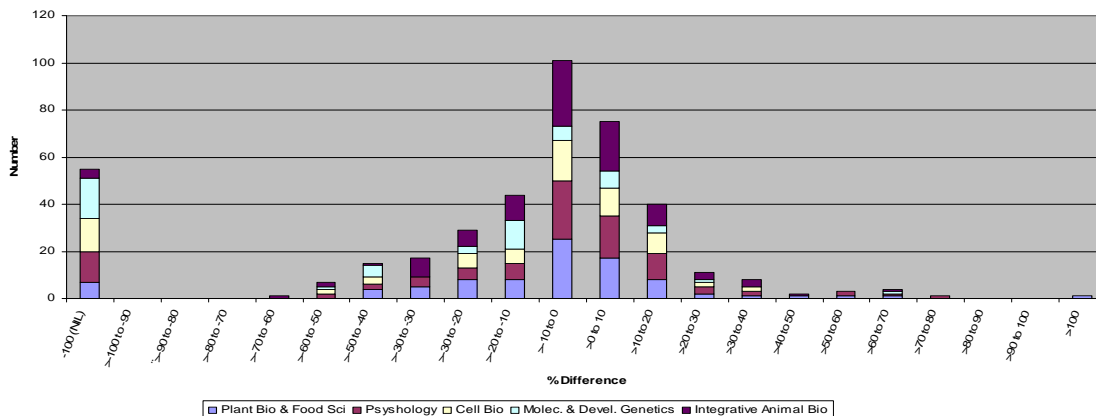


- The large bar at the far end of figure 1.2.1 represents the 240 (or 11.7%) previously funded applicants who were not competitive and lost their Discovery Grant; for 1st renewals, there were 82 (or 11.5%) such applicants;
- Of the 2,053 applicants, only 159 (or 7.7%) received a new grant at the same amount as the previous one; more applicants received a cut (1,058 or 51.5%) than received an increase (836 or 40.7%);
- For the 710 applicants who were 1st renewals, 38.5% received a new grant smaller than the previous one, 11.5% received the same amount and 50.0% saw their grant increase, demonstrating the GSC's desire to ramp up the grant of the most deserving of the applicants who had proven their potential early in their career;
- The distribution is fairly clustered: 44% of the new grants are within 10% of the previous grant and 65% are within a 20% change. For 1st renewals, the numbers are very similar: 45% and 67% of applicants are within 10% and 20% change respectively.
- 109 (or 25%) of the 1st quartile grantees received cuts larger than 20%, compared to 18% (2nd quartile), 13% (3rd quartile) and 9% (4th quartile). 34 of the 1st quartile received cuts of more than 50% - these are often researchers near retirement who ask for much smaller grants as they ramp down their laboratory.
- At the other end of the curve, 20% of the 4th quartile grantees received an increase of more than 20%.

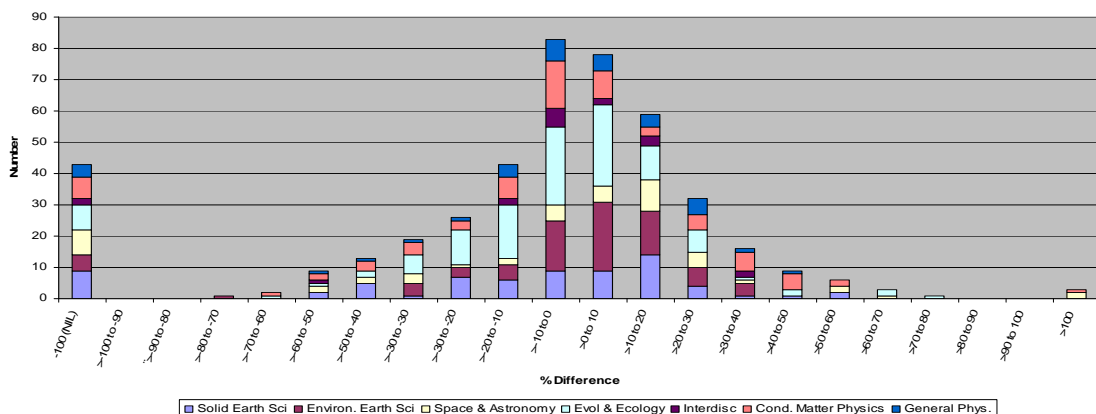
- At the GSC level (graphs on following pages), the shape of the distributions varies from group to group, reflecting the specific budget pressures of the various GSCs. For instance the two Computing Sciences GSCs (the light blue-green and dark maroon bars in the graph at the top of the pages) enjoyed a low pressure and the termination of a relatively small number of grants allowed this GSC to distribute a number of increases of more than 10%.



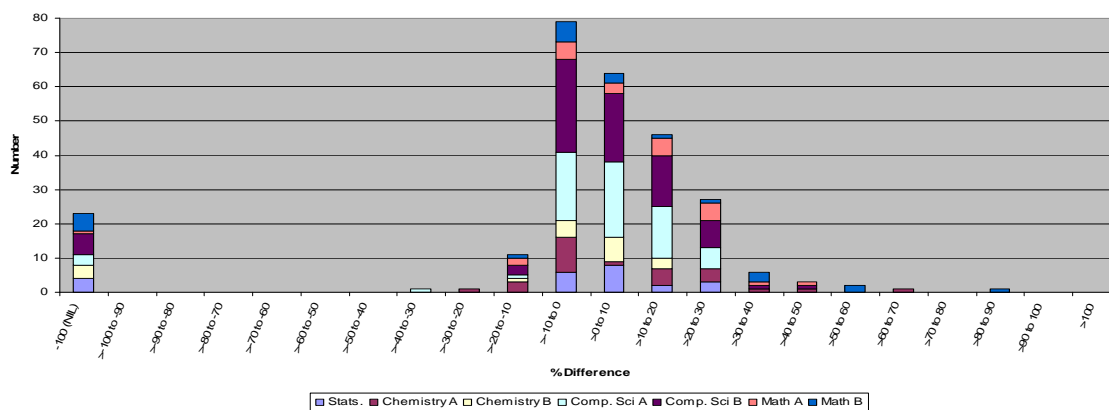
**% Difference between New and Previous Grants
All Renewals, Life Sciences, 2007 Competition**



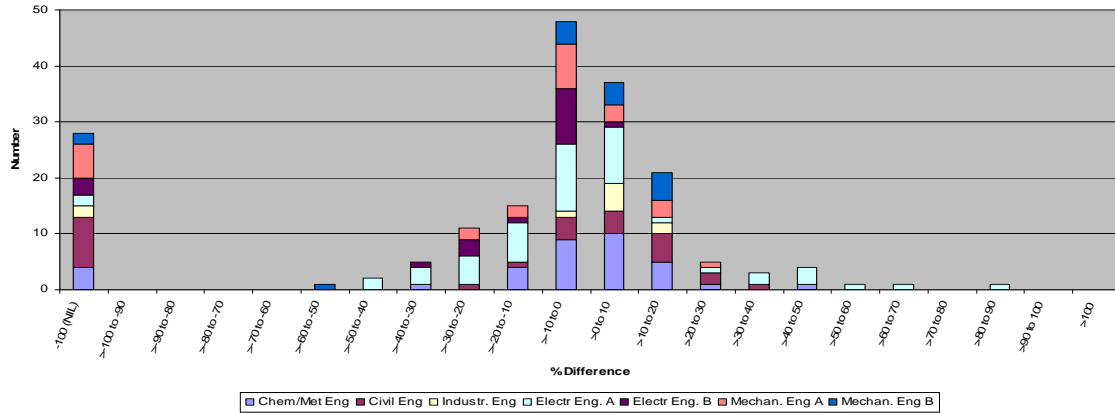
**% Difference between New and Previous Grants
All Renewals, Physics & Environmental Sci., 2007 Competition**



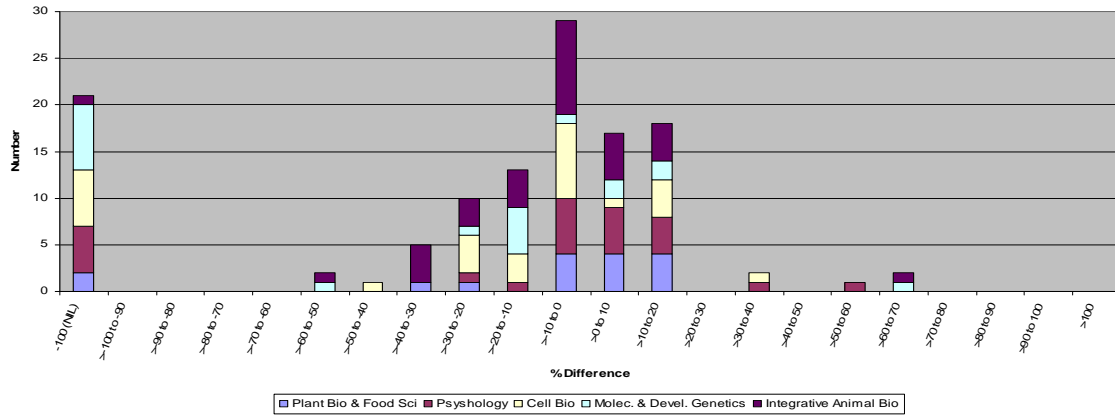
**% Difference between New and Previous Grant
First Renewals, Chemistry & Math. Sciences, 2007 Competition**



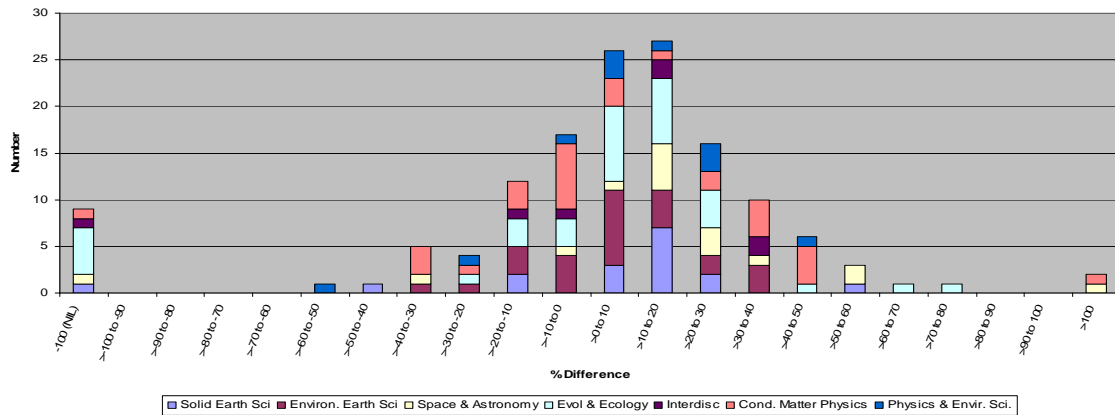
**% Difference between New and Previous Grants
First Renewals, Engineering, 2007 Competition**



**% Difference between New and Previous Grants
First Renewals, Life Sciences, 2007 Competition**



**% Difference between New and Previous Grants
First Renewals, Physics & Environmental Sci., 2007 Competition**



1.3 Leveraging Study

An analysis of the research funding held by top one percent of recipients of NSERC Discovery Grants was carried out

Parameters

- ❑ The data in the following slides are based upon a file review of the applications of 103 of the most successful researchers in NSERC's Discovery Grants program. Four researchers with the highest Discovery grants were identified from each GSC and a review of their most recent Discovery Grant application was undertaken; only one file was unavailable for the review. The file review captured the amount of funding as well as the funding organization; both NSERC and non-NSERC funding were included.
- ❑ The first two slides compare survey data that was presented at the last meeting of the International Review Committee with data from the file review. The remaining slides present information from the file review.

Profile of Researchers: Average Total Research Funding

- ❑ The top grantees in each GSC have roughly 3.5 times the funding compared to the average funding of all grantees.
 - Top grantees in the life sciences have roughly twice the funding of all grantees in the life sciences
 - Top grantees in engineering and physical sciences have 4 times the funding compared to all grantees in these disciplines.

Profile of Researchers: Average Discovery Grant

- ❑ Definitions:
 - Mean % (Mean of Ratio) – this looks at the impact of Discovery Grant funding at the level of the individual researcher. For each researcher, a ratio of Discovery Grant to total funding is calculated. The mean % is the average of this ratio. This percentage can be much higher than the Total % (described below) if, for some researchers, Discovery Grant funding makes up the vast majority of their funding.
 - Total % (Ratio of overall means) – this looks at the impact of the Discovery Grants program in a more global context. It indicates, of all the research funding available to researchers, the proportion accounted for by Discovery Grants program funding. The Total % is the average Discovery grant, divided by the average total funding.
- ❑ Of the total amount of funding available to the top grantees in each GSC, NSERC Discovery Grants accounts for just under one-third of this funding. This is comparable to the proportion for all grantees (i.e., NSERC funding accounts for about one-third of the total funding available to all grantees).
- ❑ At the level of individual researcher, however, the Discovery Grant does not account for as great a portion among the top grantees in each GSC. At the individual researcher level, on average, Discovery Grants account for 58% of a researcher's funding; compared to only 40% among the top grantees. This indicates less reliance on Discovery Grants funding in individual research programs among the top researchers, compared to all researchers.

Research Funding

- ❑ This graph provides additional detail on the breakdown of total research funding. The calculations are the same as for the total % calculation in the previous slide. Discovery Grants accounts for about 30% of total funding, other NSERC programs an additional 30% and other (non-NSERC) 40%.
- ❑ The average Discovery Grant is roughly \$100,000, as is other NSERC funding; other funding is roughly \$140,000. This means that, on average, for every \$1 top grantees receive from the Discovery Grants program, they can lever an equivalent amount from other NSERC programs, and just under \$1.5 from other sources of funding.

Research Funding by Broad Discipline

- ❑ This graph replicates the graph on the previous slide, but broken out by broad discipline grouping. The ratios are similar to the overall ratios, with the exception of researchers in the life sciences and in particular, engineering, who have greater access to funding from sources other than NSERC.

Other Researcher Funding

- ❑ This graph provides a breakdown of the sources of other non-NSERC funding. The total amount of non-NSERC funding available to the top 103 researchers totals roughly \$14.5M. Provincial funding makes up the greatest share (27%), followed by funding from foreign sources (21%), other Federal sources (20%) and industry (18%).

Distribution of Top Researchers by Province

- ❑ The 103 top researchers are spread out over 25 institutions. However, just over one-half of them are at 4 institutions: 27 of them are at U of T (26%); 14 at UBC (14%); 8 at McGill (8%) and 7 at U of A (7%).



Profile of Researchers: Average Total Research Funding

GSC Group	All grantees		Top 4 grantees in each GSC	
	Source: Survey of Grantees		Source: File Review	
	Mean	Median	Mean	Median
Physical Sciences	\$100,343	\$60,000	\$475,812	\$320,228
Mathematical Sciences	\$46,070	\$25,000	\$146,877	\$124,476
Life Sciences	\$118,129	\$80,000	\$225,381	\$149,400
Engineering	\$115,190	\$60,000	\$476,764	\$362,040
Total	\$99,542	\$55,000	\$346,516	\$244,120

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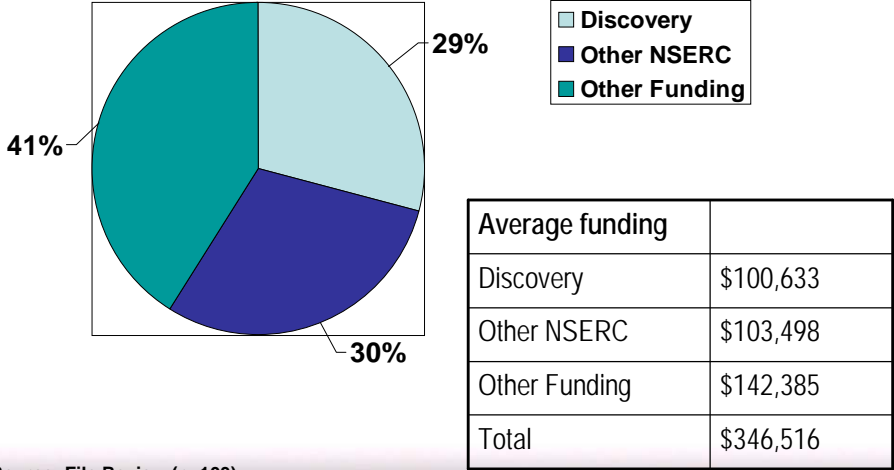
Profile of Researchers: Average Discovery Grant

GSC Group	All grantees (Source: Survey of Grantees)			Top 4 grantees in each GSC (Source: File Review)		
	Average Discovery Grant	Ratio of Discovery Grant funding to Total Research Funding		Average Discovery Grant	Ratio of Discovery Grant funding to Total Research Funding	
		Mean % (Mean of Ratio)	Total % (Ratio of Overall Means)		Mean % (Mean of Ratio)	Total % (Ratio of Overall Means)
Physical Sciences	\$43,777	65%	43%	\$154,833	39%	33%
Mathematical Sciences	\$21,795	73%	49%	\$54,252	49%	37%
Life Sciences	\$33,735	51%	30%	\$76,049	45%	34%
Engineering	\$27,274	49%	24%	\$94,673	28%	20%
Total	\$31,856	58%	33%	\$100,633	40%	29%

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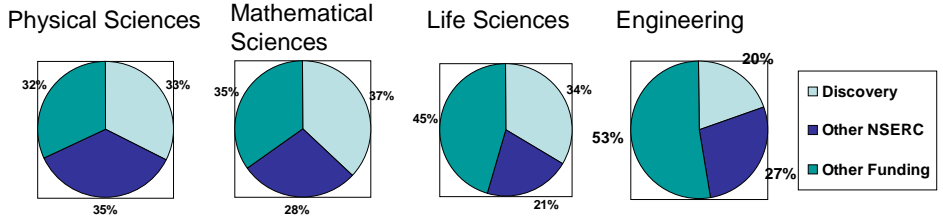


Research Funding



Source: File Review (n=103)

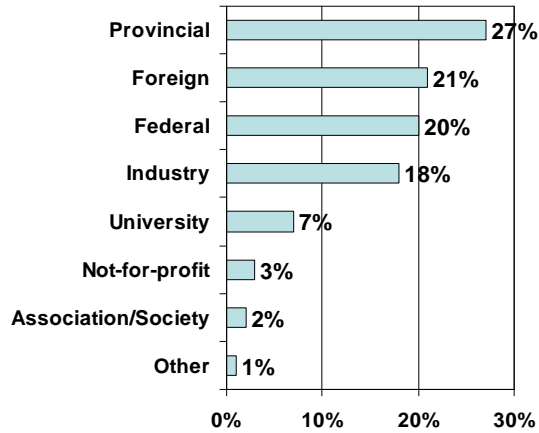
Research Funding by Broad Discipline



Average Funding	Physical Sciences	Math. Sciences	Life Sciences	Engineering
Discovery	\$154,834	\$54,252	\$76,049	\$94,673
Other NSERC	\$169,467	\$41,257	\$46,901	\$131,079
Other Funding	\$151,511	\$51,368	\$102,432	\$251,011
Total	\$475,812	\$146,877	\$225,381	\$476,764

Source: File Review (n=103)

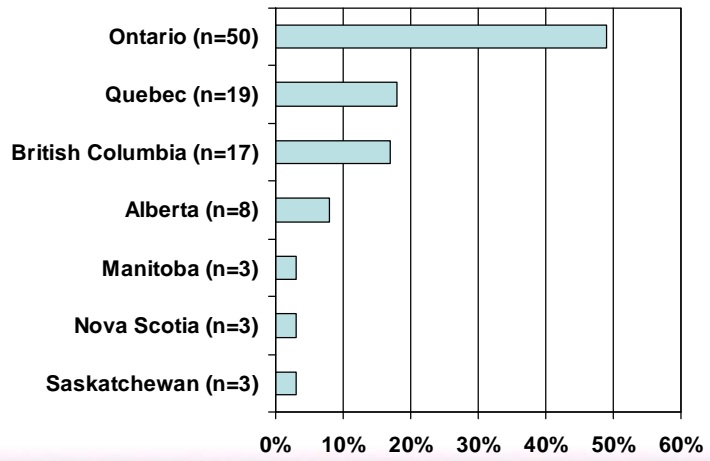
Other Research Funding



Total Funding	
Provincial	\$4,021,010
Foreign	\$3,107,167
Federal	\$2,993,298
Industry	\$2,590,204
University	\$1,096,504
Not-for-profit	\$508,664
Association/Society	\$248,449
Other	\$100,339
Total	14,665,636

Source: File Review (n=103)

Distribution of Top Researchers by Province



Source: File Review (n=103)

1.4 Direct support to Students – comparison with other countries

Several years ago a study was undertaken to compare the level and number of scholarships and fellowships provided in various countries. Though ‘old’ the data may be a useful benchmark of efforts made (then) by various agencies to provide direct support to graduate students and postdoctoral fellows.

Table 1.4.1 International Comparison of Granting Council Postgraduate Scholarship Programs

Country/ Agency	Type of Award	Stipends/ Remuneration (\$ PPP ¹)	No. of Awards	Duration of Awards (Years)	Annual Expenditure (\$M PPP)
Canada NSERC	Masters’ Doctorate	15,200 16,200	1,700 1,100	2 2	23.4 17.1
U.S. NSF	Graduate Res. Fellow. (Ph.D.)	20,500 + 10,500 to university	900	3	28.0
U.K. EPSRC	Doctoral Training Grants	11,500 – 16,500 + free tuition + child support	-	3	79.0
BBSRC	Doctoral Training Account	13,100 – 16,200 + free tuition + child support	-	3	40.8
Germany DFG	Through Research Training Grants awarded to professors				
France CNRS	Doctoral Program	18,200	275	1 – 3	5.0
Australia ARC/DEYT	Australia Postgraduate Awards (APA)	13,400 + free tuition	1,550	2 Master’s 3 Ph.D	61.0
Japan JSPS	Doctoral Program	16,100	700	2 - 3	11.3

¹ PPP – Purchasing Power Parity; a conversion factor developed by the OECD to take into account currencies and the relative purchasing power between various countries

Table 1.4.2 International Comparison of Granting Council Postdoctoral Fellowship Programs

Country/ Agency	Type of Award	Stipends/ Remuneration (\$ PPP)	No. of Awards	Duration of Awards (Years)	Annual Expenditure (\$M PPP)
Canada NSERC	PDF	29,700	450	2	11.1
U.S. NSF	PDF	21,000 – 51,000	100	2 – 3	3.8
U.K. EPSRC	PDF Advanced Fellow.	- 27,700 – 47,700 (age dependant)	25 160	- 5	- 6.0
Germany DFG	PDF	~27,200 (age and family situation dependant)	1,000	1 – 2	27.2
France CNRS	PDF	25,600	35	2	0.9
Australia ARC	APD Research Fellowship	32,200 38,400	200 (total)	2	17.0
Japan JSPS	PDF Abroad Young Scientist	~50,000 16,700	225 380	2 3	11.3 6.4
JST	Overseas Domestic	54,200 35,100	13 325	1 – 2 3	0.7 11.4

The following table provides recent data on the number of scholarships awarded to individual students in Canada and US.

**Table 1.4.3 Comparison of Graduate Student Support
– Canada vs. US**

	Canada	US
Number of Graduate Students enroled in NSE ¹	38,547	486,287
Number of Scholarships Awarded	4,059	1,000
% of Grad. Students receiving direct support	10.5%	0.2%

¹ Canada: 2003 data; US 2006 data

2 NSERC Policies and Guidelines

2.1 Discovery Accelerator Supplements

Introduction

NSERC Council approved the implementation of this new program at its June 2006 meeting. These supplements provide substantial and timely additional resources to accelerate progress and maximize the impact of outstanding research programs. Each supplement is valued at \$120,000 normally over three years.

The first awards were made in the spring of 2007, and once the program is ramped up there will be 300 active DAS per year. The Accelerators are awarded to a small group of outstanding researchers who have a well-established research program, and who show strong potential to become international leaders in their respective area of research. These additional resources will be allocated when progress of the incumbent's research program is held back by insufficient funding.

The DAS program supports the strategic priorities of the Government of Canada, as half of the awards are set aside for the three areas identified as a priority in the 2007 federal Science and Technology Strategy, *Mobilizing Science and Technology to Canada's Advantage*: information and communications technologies, energy and environment.

Implementation

In implementing the Accelerator program, NSERC was very conscious of the workload this new program could generate for applicants, peer review committees and for NSERC itself. Because thousands of talented and productive researchers only receive a modest Discovery Grant and would relate to the 'held back by insufficient funding' element, we opted for tying the selection of DAS with the review of Discovery Grant applications. GSCs review applications in accordance with the Discovery Grant criteria and receive a quota of nomination totaling twice as many supplements available. GSC recommendations are forwarded to multidisciplinary selection committees that make the final recommendations to NSERC.

Universities, through their Vice-President of Research (VPR), can request a reduction in the duration of the Discovery Grant of a limited number of researchers from their institution, the ones they believe best meet the intent and selection criteria for the DAS program. This reduction allows those researchers to come back earlier in the Discovery Grants competition and possibly be nominated for a DAS. The Question & Answer document that complements the DAS program description specifies that "however, NSERC can neither guarantee that a supplement will be awarded, nor that the previous Discovery Grant level will be maintained."

In the summer of 2007, NSERC invited VP-Research to submit a total of about 250 requests for duration reductions, proportionally to the number of grants held at their institution. Only 49 requests were actually submitted, and, not surprisingly, the majority of requests (31) came from 10 of the 13 large, research-intensive institutions; the other 18 are from 7 medium-sized institutions. The average current grant held by these applicants is close to \$37,000, or about \$7,000 over the overall DG average.

NSERC expects VP-Research to only encourage, and forward requests from, their most promising candidates, who are likely to fare very well in competition with other researchers. In terms of 'risk' to the researcher, it would be surprising if these applicants were to receive important cuts to their grants, and the probability they would not be recommended for any funding is very low.

As the program is still only in its second year of existence and this is the first opportunity to see "duration reduced" applicants in the competition, staff will monitor these applications closely in the February 2008 Competition.

2.2 Program vs. Project Support

The following text comes from a researcher

The NSERC Discovery Grant Program underpins the core research of Canadian university laboratories in science and engineering, and one of its major strengths is that it requires that the research be proposed and conducted within a “program framework”. The applicant is requested to present his or her research proposal in terms of a cohesive set of projects, most of which will also involve the training of research students or postdoctoral fellows. As in any research proposal, the applicant must present short-term research goals: the specific objectives, likely outcomes and significance of each project within the 5–year duration of the Discovery Grant award. However, the applicant must also present long term (>5 years) research goals that the current set of projects will advance towards. This contrasts with a “project framework”, which is the more usual research structure found in other research funding programs in Canada (including NSERC, other than the Discovery Grant program) and elsewhere. In the project framework, all goals are short-term and must be achieved within the timeframe of the award (2-7 years depending on the program).

This unique feature of the NSERC Discovery Grant Program has a number of very interesting outcomes.

- Crafting a proposal within the program framework helps the applicant during the earliest stages of their first academic appointment to map out how they would like their research career to develop, and to formulate the central questions that their laboratory will tackle. Many new as well as established researchers have commented on the value of developing this long term plan, with each successful award seen as a contributing step towards major long term goals.
- The program framework leads to a more cohesive set of research objectives in each laboratory, efficient use of research resources (e.g., requests for CFI infrastructure based long term goals rather than a short-term, one-off projects) and the international recognition of each laboratory as a center of excellence in a specific research area.
- This approach also allows research trainees to place their work within a bigger picture, and to better understand the broader scope and context of their specific project.
- Perhaps most importantly, the program framework encourages the applicants to ask: what are the big questions in my field? It then allows the ambitious targeting of such questions, including those that can only be adequately addressed by long term effort, while also requiring demonstrable progress and meritorious achievements within the 5-year timeframe.
- Finally, the Discovery Grant Program recognizes the dynamic nature of research: the stated long term research goals are expected to evolve and sharpen as a function of new results, breakthroughs, technologies and ideas, allowing a flexibility in pursuing the most promising lines of inquiry unmatched in project-based programs, and resulting in maximum impact.

2.3 Membership of Grants Selection Committees

In 2008, GSCs comprise 330 members, with the majority of these members coming from Canadian universities:

Table 2.2.1 Distribution of GSC Members by Country/Region and Sector

	University	Industry	Government	Total	
				Number	%
Canada	260	19	26	305	92.4%
US	12	4	1	17	5.2%
Europe	4	2	2	8	2.4%
Total				330	100.0%

In contrast a larger fraction of referees (who provide a written report to the GSCs) come from outside Canada. NSERC considers this input highly valuable.

Table 2.2.2 - Distribution of Referees by Country

Country	Reviews requested		Reviews received		Return Rate
	Number	%	Number	%	
Canada	8,376	69%	6,112	75%	73%
US	2,392	20%	1,196	15%	50%
International	1,371	11%	838	10%	61%
Total	12,139	100%	8,146	100%	67%

NSERC has enjoyed a 67% overall return for the past 20 years if not more. Traditionally Canadian referees have a higher return rate than those from outside Canada.

The following criteria and guidelines govern the appointment of members of NSERC selection committees and panels. These guidelines were approved by the two program standing committees (Committee on Grants Scholarships and Committee on Research Partnerships) and presented to NSERC's Council in 2001.

Composition

In order to perform its task efficiently and equitably, each selection committee or panel must represent diversified expertise in the areas of research covered by the committee or panel and have good judgement and a broad knowledge of the areas, including new and emerging ones that are often at the frontier between disciplines, and an ability to assess the potential contribution of the proposals against the objectives of the program. Selection committees and panels are peer based. Although the majority of panel members are drawn from Canadian universities, committees and panels should include research managers, experienced practitioners (those with hands-on experience) and researchers from industry, government laboratories and/or foreign institutions. Recently retired individuals who remain very active in research are potential members.

Members from the private and public sectors provide an important perspective in the assessment of applications. Their participation in the review process can enhance awareness and appreciation of the value of applied research and the potential for application of basic concepts to technology transfer or, where appropriate, commercialisation. Members from the private and public sectors can offer an understanding of the potential exploitation of research results in commercial operations.

Members from outside the Canadian university system provide valuable contributions and help bring fresh ideas to the process. This is particularly important in relatively small disciplines, or in areas where Canadian expertise is concentrated in only a few institutions.

In addition to bringing an international perspective, foreign members bring with them valuable experience with other peer review systems and research communities. Although each committee or panel should be representative of the community it serves, members should not be considered representatives of their university, industry or government department.

Potential members include accomplished researchers, new scientists and engineers from all sectors and all universities, large or small. Members need not be NSERC grantees. Scholarships selection committees should also include postdoctoral fellows.

Because of the diversity of the population of Canada and of the research community, other factors need to be taken into account to ensure equitable representation of various groups. For example, both women and men should participate in the selection process, the various fields of research under the purview of a committee must be adequately represented over time, the different regions of Canada must participate fully in the selection process and each committee must be able to assess applications in Canada's two official languages.

Membership Dynamics

To maintain a certain stability in membership while providing a mechanism for membership renewal, NSERC has established a rotation pattern based on three-year terms for committee and panel members. These terms represent an appropriate balance between giving members time to become familiar with policies and procedures and time to deal with the workload. Three-year terms also address the need for renewal, so that it is not always the same people involved in the review process. Inasmuch as possible, one third of the membership should be replaced each year.

Roles and Responsibilities for Appointments

Selection committee and panel members are appointed by the Corporate Secretary to Council, upon co-approved by the appropriate Director and/or Vice-President. In developing recommendations, Program Officers, in consultation with Team Leaders and/or the Director:

- review nominations from the universities, professional and learned societies and the committees or panels themselves;
- consult the selection committees and panels (including the incoming Chair) on their perceived needs for the short and medium term and on the suitability of nominations received; and
- consult advisors, including the Chair of the Committee on Research Partnerships, to seek references on the suitability of nominees.

The committee and panel chairs are appointed by NSERC, generally from the continuing members of the committee or panel.

Guidelines for Nominators, Panels and NSERC Staff

It is essential that committees and panels examine trends in research and lend special consideration to planning their expertise requirements for the next three years, noting particular pressures, or changes in direction of research; it is important to recommend the appointment of new members to cover new or priority areas. One-for-one replacement is not always appropriate.

Prime considerations in the renewal of membership are the nominees' stature in the research community, their areas of expertise and breadth of interest, their good judgement and their ability to work on a committee or panel. In addition to the requirements of competency and being representative of the community the committee or panel serves, the following guidelines are taken into account in considering nominees:

1. Each committee or panel must have the capability to review applications in Canada's two official languages. In addition to recruiting a minimum of two members whose first official language is French, committees should have as many bilingual members as possible.
2. Each committee or panel should reflect the gender balance of the community it represents and, if possible, include a minimum of two women and two men.
3. The extension of a term for one additional year may be accepted in exceptional circumstances, for example in situations where a disproportionately high turnover of membership occurs.
4. Individuals who have previously served on a selection committee or panel may be re-appointed to that same committee or panel to ensure the necessary stature or to satisfy other guidelines. However, a minimum of four years should elapse before re-appointment.
5. Consecutive representation from a given institution should be avoided. Exceptions may occur if there is a concentration of excellent researchers in a few large departments or if other guidelines cannot otherwise be satisfied.
6. Except in unusual circumstances (e.g. when a member moves or areas of research are rearranged between panels), the simultaneous membership of two persons from the same university on a committee or panel is not permitted. Because of conflict of interest guidelines that preclude members from being involved in the

review of applications from their own institution, the committee or panel would be short two members when applications from that institution are reviewed.

7. Individuals from the university sector whose duties include fund-raising for research and co-ordination of research contracts or the selection of PGS applications submitted to NSERC cannot be considered for membership on a selection committee or panel, as their functions put them in the position of a real or perceived conflict of interest. These groups include Research Grants Officers, Directors of Research Offices and Vice-Presidents (Research) for grants selection committees and panels, and Scholarships Liaison Officers and Deans of Graduate Studies for scholarships and fellowships committees. Such individuals may, however, be considered for appointment to NSERC standing committees, where the principal function is policy development.
8. Members should be drawn from the various regions of the country and from large and small institutions.
9. Representation from outside the Canadian academic community is important. This includes the Canadian public and private sectors, and also researchers from foreign institutions. Committees and panels should have at least one person from an institution other than a Canadian university. Canadians or ex-Canadians working abroad are generally valuable participants in the NSERC peer review system. The balance of university, private and public sector members changes from committee to committee or panel to panel and reflects the nature of the fields covered by each committee or panel, or the need for consideration of the application of research results. Some committees or panels will require a larger representation from outside the academic sector than others.

Recommendations not consistent with the guidelines, as well as recommendations for a change in the size of the committee or panel, must be fully documented.

NOTE: Committee or panel members who find themselves in the position of having to respond to formal allegations of financial or professional impropriety will not participate in the work of the committee while an investigation is under way.

2.4 Budget Allocations to GSCs

From 1993 to 2006, the allocation of funds to GSCs was directed through a process called the Reallocation Exercise, whereby every 4 years 10% of the Discovery Grants budget was pooled and reassigned to the specific needs and initiatives that were considered being of highest priority.

In the 1998 and 2002 exercises, the steps were as followed:

- Each discipline, or discipline grouping (based on the Grant Selection Committee structure), was represented by a Steering Committee (SC) that consulted with its community and prepared a submission to NSERC on the discipline's vision, strategy and funding priorities.
- Submissions were to respond to the question, "Why is it important for Canada that your research community should receive some of the reallocated funds?" It was up to each community to determine what arguments to use to support its request, keeping in mind that "importance to Canada" should be interpreted in the context of NSERC's Mission Statement² and the philosophy and objectives of the Research Grants program. In the context of the Reallocations Exercise, NSERC's interpretation of the criterion "importance to Canada" was very broad and included advancement of knowledge, training, social, environmental or economic impacts, etc.
- NSERC provided some financial, technical and administrative assistance to the Steering Committees.
- Independent, renowned referees then evaluated the submissions.
- An NSERC-appointed committee (the Reallocations Committee) assessed the discipline submissions and the referees' comments, and re-assigned up to 10% of the Discovery Grants budget to the specific needs and initiatives that it considered being of highest priority. The resulting changes to the GSCs' budgets were implemented over the following four fiscal years³.

After the 3rd Exercise NSERC carried out a thorough evaluation of the Reallocation Exercise and its impact, and found that:

- Over the 13 year period of the 3 exercises, changes in the Canadian research landscape had cast a shadow on the potential of the Reallocations Exercise, and that though the original rationale for the Exercise was still relevant, the

² NSERC invests in people, discovery, and innovation to build a strong Canadian economy and to improve the quality of life of all Canadians. It supports research in universities and colleges, research training of scientists and engineers, and research-based innovation. The Council promotes excellence in intellectual creativity in both the generation and use of new knowledge, and it works to provide the largest possible number of Canadians with leading-edge knowledge and skills to help Canada flourish in the 21st century.

³ At that time the normal duration of Discovery Grants was four years.

mechanism used had to be reconsidered to take recent developments, such as the massive faculty renewal underway, into account.

- The amount of funding available to be reallocated was insufficient to meet the ambitious objectives of the Exercise.
- The Exercise's design required volunteers to take on the considerable task of developing each submission, which became an important detractor for potential Steering Committee members. A secondary but important cost was the frustration and personal stress experiences by SC members faced with the responsibility of a poor outcome for their discipline, coupled with low levels of support from their communities and little recognition of their efforts.
- The operational cost of the Exercise was estimated to be similar to the actual amount of funding to have changed disciplines in each of the exercises.
- Concurrently to the implementation of the 2nd and 3rd Exercises, the number of new professors being hired reached unprecedented numbers and Council invested massively in the Discovery Grants program to support these First-Time Applicants. This injection of new funds had more impact on the GSC budgets than these two Exercises combined.
- Over the 13 years of the Reallocation Exercises the Electrical and Computer Engineering Committees received the largest increase (\$3.67M or +8.1%) and the Earth Sciences Committees fared the least well (\$1.8M or -3.2%) Committees.
- While there was general agreement over the appropriateness of the "importance to Canada" criterion, the use of such a broad criterion resulted in confusion among some SC members who stated they were unable to identify on what ground their submission would be assessed. Members of the Reallocations Committee also claimed that it had been of little practical use in ranking submissions in the 1998 and 2002 exercises.
- The degree to which a discipline was homogeneous generally appeared to have an impact on the results of the Reallocations Exercise, especially in the 3rd Exercise. This was mainly due to the fact that disciplines that regroup fewer or more cohesive areas of research were more likely to be organized, have an established network and communications protocol, and can more easily express a common voice for their submissions.

Overall, the conclusion was that the costs of the Exercise outweighed its benefits and the NSERC Council recently decided to terminate the Reallocations Exercise and replace it with a new process based on two elements:

Population or GSC Dynamics

Discipline dynamics is usually defined as the variation in the number of individuals applying to and receiving grants within the Discovery Grants program over time. NSERC considers that the number of FTAs applying to the Discovery Grants program, together with the number of grantees that are leaving the system (i.e., retirements, etc.) represent the simplest and most valid means of assessing discipline dynamics.

Furthermore, this method will facilitate the integration of the Reallocations mechanism into the allocation process for new applicants.

Cost of Research

The cost of research will be the second factor that will serve as a basis for the reallocations or the allocations of funds. For the allocation of new funding to First-Time Applicants in the Discovery Grants program, NSERC has recently implemented a cost-based methodology used in conjunction with the demand affecting each of the Grant Selection Committees.

The costs included are divided into:

- ★ HQP (graduate, undergraduate, PDF),
- ★ technicians/research assistants,
- ★ materials,
- ★ equipment operation and maintenance, and
- ★ travel (including field trips).

Several indicators have been identified to measure these various costs; some of the metrics are based on data available in Canada (e.g. from Statistics Canada) and abroad (e.g., NSF) while others are based on expenditures pattern from NSERC grants.

Pending the outcome of the GSC Structure Review (see tab 3.1), this methodology will need to be refined to establish a cost factor for Broad Area Panels (rather than for the narrower GSCs). The factor would then be multiplied by the number of applicants in each Panel, and the result would in turn be used to proportionally allocate funding among Panel. It is important to mention that the calculation of this cost factor takes into account several components, including the supply of highly qualified personnel through the support of students and the inclusion of enrolment data.

In parallel NSERC is also exploring funding models used in other countries. We have already engaged in discussion with the DFG (where allocation is in large part proportional to the amount requested by applicants) and over the next few months we will expand our comparison to other countries in Europe, US and Australia.

Priority Setting

Council has agreed that its strategic planning and priority setting components be done at a corporate level rather than through the Discovery Grants program. Recent examples of NSERC strategic decisions in basic research include the funding of initiatives related to the International Polar Year through the Special Research Opportunities program as well as the approval of an NSERC Innovation Platform in Quantum Computing. Furthermore, NSERC also approved the new strategic research themes that will guide the Strategic Grants program for the next five years, some of which overlap with the government priority areas. These higher level decisions are considered to be more effective than initiatives funded through the previous Reallocations Exercises, where impact was limited.

3 NSERC Initiatives

3.1 GSC Structure Review

Background

In 2004, NSERC initiated a project to ensure that the peer review system of the Discovery Grants Program will be able to cope with the evolutionary changes in the traditional areas of research, the growth of new research areas and the increasing degree of collaboration between researchers in interdisciplinary and multi-disciplinary research. Preliminary studies led to the appointment of a project manager and the creation in 2007 of an external Advisory Committee (See Appendix 3.1.A) to oversee the review project.

Recent Activities

During the past year, NSERC undertook extensive consultation activities including meetings with deans, scientific societies and department chairs and Grant Selection Committees. Comments from these groups were also requested in writing, and there was a web survey of grant applicants that had a high participation rate. Most respondents were quite happy with the current system, but a significant minority – approximately 20% – reported that the current structure is not in line with today's research environment (gaps); as well almost 30% stated that there was at least one other GSC that was competent to review their proposal (overlaps).

The Advisory Committee had several day-long meetings to define a set of principles and specific goals (see Appendix 3.1.B) and develop draft recommendations, which were presented to NSERC in November, 2007.

Draft Recommendations

The key recommendations include:

- Widespread adoption of a two-tiered committee structure called the “conference model” (See Appendix 3.1.C for details). Ten to 12 Broad Area Panels would replace the current 28 GSCs. Members of these Broad Area Panels serve on various Topic Groups, the structure and membership of which can be adjusted easily to reflect the changes to the mix of applications received.
- Science assessments will result in letter or numeric grades rather than a continuum of dollar amounts. **Subject to discussion with the International Review Committee**, it is proposed that a separate process, involving the Topic Group Chairs, possibly a small number of Topic Group Members and NSERC's Standing Committee on Grants and Scholarships (COGS) be used to translate these grades into a funding recommendation according to a locked-step discipline-appropriate funding grid (See Appendix 3.1.D for preliminary details).

- Improvements to the external reviewing process.

Recommendations regarding funding decision procedures will follow.

Plans to Completion

In mid-March 2008, NSERC will convene several focus groups composed of scientists and engineers to fine tune the Broad Area Panels and Topic Groups. Based on this input, we will improve the model and then initiate a second round of consultations with the community. Implementation is planned for the 2010 competition.

NSERC will implement any changes necessary as a result of the International Review Committee recommendations as part of the new structure.

**NSERC GSC Review
External Advisory Committee Membership**

Adel Sedra (Chair)	Dean of Engineering, University of Waterloo
Elizabeth Cannon	Dean of Engineering, University of Calgary
Nils Petersen	Director General, NINT, Edmonton
Susan Pfeiffer	Dean of Graduate Studies, University of Toronto
Mario Pinto	Vice President-Research, Simon Fraser University
Gary Slater	Dean of Graduate Studies, University of Ottawa
Patrick Desjardins	Professeur, CRC, École Polytechnique
Carolyn Watters	Dean of Graduate Studies, Dalhousie University
Nick Cercone	Dean of Science and Engineering, York University
Warwick Vincent	Professeur, Université Laval; NSERC Committee on Grants and Scholarships
Nancy Van Wagoner	Associate VP Research, Thompson Rivers University
Peter March	Director, Mathematics Division, NSF
Mark Bisby	Former VP Research, CIHR
Michael Gibbons	Sussex University; Association of Commonwealth Universities

GSC REVIEW – PRINCIPLES AND GOALS

Fundamental Principles:

The GSC Structure Review project will examine the peer evaluation and funding recommendation process for the Discovery Grants Program to ensure that it:

1. achieves the objectives of the Program within NSERC's Vision of helping to make Canada a country of discoverers and innovators for the benefit of all Canadians by:
 - promoting and maintaining a diversified base of high-quality research capability in the natural sciences and engineering in Canadian universities;
 - fostering research excellence;
 - providing a stimulating environment for research training.
2. is transparent to applicants and reviewers, and can be easily explained to NSERC stakeholders.;
3. is expert, fair and efficient.
4. effectively allocates funding.

Specific Goals:

The preceding Principles will be applied to meet the following goals:

1. A grant evaluation structure that is based on a comprehensive analysis of the current research environment.
2. Protocols that maintain confidence in the Program from the research community by ensuring that:
 - the Committees and their operations are recognized to be designed appropriately and to work effectively;
 - all proposals are assessed by peers who have an appropriate mix of expertise and background; and
 - the topics reviewed by the various committees are clearly defined and published.

3. A dynamic and flexible structure that responds to a changing research environment, with the expectation that:
 - there will be a comprehensive review, and if warranted a re-design, approximately every 10 years; and
 - minor fine-tuning can occur at any time.
4. Consistently high quality Committee review of proposals in established as well as new and emerging areas, that thereby:
 - eliminates any gaps in the ability to review proposals;
 - minimizes overlap between committees; and
 - expertly handles proposals at the interface with other Councils.
5. In-depth review of all proposals through innovative and flexible processes, while ensuring a manageable workload for Committee members, referees and staff.
6. Effective communication of exciting Canadian research.
7. Keeping of administration costs reasonable.

CONFERENCE MODEL

Currently, NSERC uses nearly 30 standing Grant Selection Committees to cover the range of disciplines funded by the Discovery Grants Program. Members are selected for three-year terms, appointed on a staggered basis. If it is not obvious which GSC should be handling an application, the GSC Chairs meet to discuss this and the outcome could be a transfer to another GSC, or a consultation from another GSC. As workload increases, the GSCs have traditionally split into new, more specialized GSCs, for example Mechanical Engineering A and B.

Increasingly, NSERC is moving to a “Conference Model” which has been quite successful since it was first established by the Evolution and Ecology GSC. Under the Conference Model, committees are not split when workload increases. Rather, committee members meet in different combinations to discuss applications grouped into a number of topics. These topics are determined before the meeting, based on the applications received in a given year. For example Cell Biology might be divided into a dozen themes.

Typically, half the committee will discuss one topic while the other half of the committee discusses a second topic, of similar size depending on their areas of expertise. Once completed, the members reform into two different groups to discuss two different topics. This is somewhat like following various tracks when attending a large scientific conference.

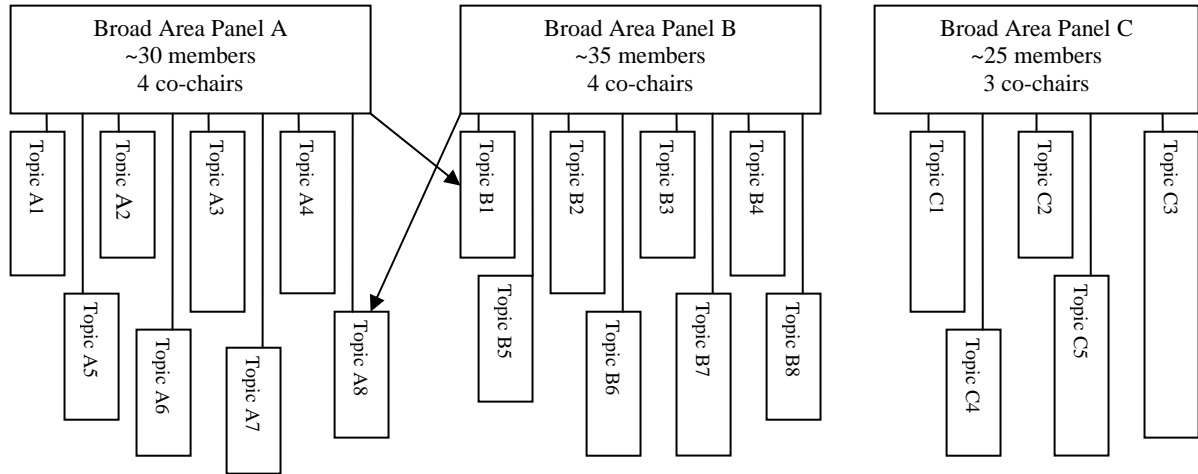
As an alternative to splitting and to ensure quality review of emerging fields, this Model brought several advantages:

- Accommodated Interdisciplinary Applications: Since the membership of the parent GSC is larger than that of a split GSC, it is more likely that expertise can be found on the larger GSC to review an application that spans more than one area
- Focused Peer Review: proposals are not discussed by the whole GSC but just by those members, whose expertise most closely match the topic, participating in a particular topic discussion
- Flexibility in Composition of Topic Groups: the Groups are put together each year depending on the applications received
- Enabled Disciplines to Remain Together:

The basic concept is similar to the different tracks in a conference with parallel sessions. In the current NSERC implementation (adopted by 4 GSCs), there are two parallel sessions, each one typically lasting half a day. Each session treats a specific topic,

requiring a specific combination of expertise from GSC members. Scheduling is complex but feasible.

The Advisory Committee recommends a significant expansion of the use of this model, and envisages the research topics split among approximately 10-12 Broad Area Panels.



Notes:

- We would replace the current 28 GSCs with approximately 10-12 Broad Area Panels (BAP)
- The BAPs are somewhat like the current Conference Model already implemented by 4 GSCs, but with double the membership and double the number of parallel sessions
- Three to four parallel sessions means we will need three or four co-chairs in each BAP
- Each “topic” or sub-panel would have 6 to 8 members to ensure an appropriate depth of expertise and account for conflict and linguistic capabilities
- Members of one BAP can serve as full members on a topic under another BAP (as the arrows are meant to indicate) for topics relevant to two BAPs (e.g., computational biology or materials, which requires input from experts from different fields)
- Funding for BAPs will be dealt with separately
- As competition sessions under the conference model are inherently more logistically challenging to manage, we will obtain assistance from operations research experts to help optimize the logistical aspects of these conference sessions.

PRELIMINARY

Though the Advisory Committee's focus to date has been on structure and scientific assessment, it has started to discuss how the "binning" into letter or number grades might be translated into a funding recommendations. One model proposed (but not yet discussed in great depth) is as follows:

- Topic Groups would use a forced distribution to rate applications according to a 5 or 7 point quality scale common to all BAPs and on the relative cost of research (normal for the area, higher or lower than normal).
- Applications in the lower 'fundable' bins would be ranked within their respective bins in case funds are insufficient to fund them all.
- The lists from the various Topic Groups would be merged at the BAP level (most members would serve on multiple Topic Groups, thus ensuring consistency of review between Groups).
- The Topic Group Chairs (and possibly a small number of BAP Members) and COGS members would meet with Program Directors and Team Leaders to agree on the funding assigned to each 'rating bins', e.g. .in one BAP, a 1-High rating may correspond to \$185,000 and a 3-Low to \$50,000; in another BAP, the amounts for these ratings may be \$80,000 and \$20,000 respectively.

3.2 CREATE

Background

In 2002 NSERC held a series of workshop on Highly Qualified Personal (HQP) across the country to identify specific needs for the training of highly educated and skilled researchers, which emphasized the need to better integrate the development of appropriate professional skills (project management, teamwork, communication, entrepreneurship, etc) during graduate studies.

In spring 2007, NSERC consulted key stakeholders on options for a strategic investment in HQP through the suite of Scholarships and Fellowships programs (direct support to students and postdoctoral fellows). Although there was agreement among respondents that NSERC should continue to support research activities performed by undergraduate students, graduate students and postdoctoral fellows, there was no consensus about the balance of funding that should be allocated to each level. One interpretation of this is that there was not *one* research community but *many*, each defined by a set of conditions, and that NSERC should provide flexible funding mechanisms that can be tailored to the specific needs of the various research communities across Canada.

New Program

In order to meet the challenges of training tomorrow's discoverers and innovators across Canada, NSERC developed a new program by which it could continue to support outstanding students (both undergraduate and graduate) and postdoctoral fellows, as well as encourage Canadian institutions to provide innovative and internationally competitive research and training environments for these individuals. This new program (see program description in Appendix 3.2.A) is also designed to encourage the acquisition and development of important professional skills that complement academic qualifications and technical training of students and postdocs. The key professional skills in question will be outlined in a tri-agency Statement of Principles currently in preparation (see Appendix 3.2.B).

In developing this program, NSERC has reviewed innovative mechanisms developed abroad and in Canada. The National Science Foundation's Integrative Graduate Education and Research Traineeship (IGERT), the German Research Foundation's Research Training Groups (RTGs) and the Canadian Institutes of Health Research (CIHR) Strategic Training Initiative in Health Research (STIHR) have all proven to be effective mechanisms to better prepare students for the workforce.

With the expansion of the Canada Graduate Scholarships Program, NSERC saw an opportunity to shift a portion of its current scholarships and fellowships investments towards an innovative mechanism focused on enabling enriched training environments. This will enable NSERC to strengthen cross-disciplinary research at the frontier with CIHR and the Social Sciences and Humanities Research Council of Canada (SSHRC), hence combining the strengths of the various disciplines to achieve the greatest impact. Where appropriate, this can also provide a new effective mechanism to attract top

doctoral students and postdoctoral fellows from abroad and foster international collaboration.

Implementation

Following consultation with universities and other key stakeholders, final approval for the CREATE Program will be sought from NSERC's Council in March 2008. This consultation also serves to inform universities about the upcoming call for Letters of Intent (LOIs) to be sent out shortly after Council approval. We anticipate a deadline for LOIs in the spring of 2008, followed by a deadline for full applications in the fall. The announcement of the first award winners should be made in March 2009. This will be an annual competition with funding for approximately 20 awards per year.

DRAFT PROGRAM DESCRIPTION

Collaborative Research and Training Experience Program

Objectives

The Collaborative Research and Training Experience (CREATE) Program supports the training of teams of outstanding students and postdoctoral fellows from Canada and abroad through the development of innovative training programs that:

- encourage collaborative and integrative approaches, and address significant scientific challenges; and
- facilitate the transition of new researchers from trainees to productive employees in the Canadian workforce.

These innovative programs will encourage one or more of the following:

- The acquisition and development of important professional skills among students and postdoctoral fellows that complement their qualifications and technical skills;
- Student mobility—either nationally among universities or between universities and other sectors, or internationally; and/or
- Interdisciplinary research within the natural sciences and engineering (NSE), or at the interface between the NSE and health and/or the social sciences and humanities.

Description

The CREATE Program will provide an enriched integrative experience for the next generation of researchers in the NSE, and will help develop the professional and personal skills needed to build capacity within Canada's research community to address significant research challenges. The program, therefore, will help better prepare new researchers for their future careers—whether they be in academia or in other sectors.

Successful applicants will consist of a group of accomplished researchers, who will work collaboratively to offer a defined research training program to a group of trainees. This environment will provide trainees with experience relevant to both academic and non-academic careers. The research training experience can target any trainee level—undergraduate students, graduate students (master's and doctoral) and postdoctoral fellows. Successful applications will be those best able to demonstrate the benefits of their proposed research training experience to their targeted trainees.

Supported training programs will be recognized nationally for:

- their innovative nature to create a rich research training environment;
- the excellence of the researchers, and their success in training highly skilled and educated personnel for all sectors—including academia, industry and government;
- their capacity to raise the standard for best practices in research training and development of professional skills of new researchers; and
- encouraging international awareness and mobility among participating Canadian and international students.

Eligibility Information

Eligibility criteria for applicants and institutions apply. Refer to NSERC's Web site under Eligibility Criteria and Institutional Eligibility Requirements. CREATE grants are tenable only at NSERC-eligible Canadian universities. Other organizations can be involved as collaborators.

The following conditions also apply:

1. In the case of multi-organization collaborations (academic, industrial, government and/or not-for-profit sectors), the applicant must be from an NSERC-supported field at an NSERC-eligible university. The applicant's university will be the lead institution.
2. The majority of the group must be from NSE fields, but co-applicants from outside the NSE may be incorporated into proposals.
3. The focus should be on new training initiatives. Existing initiatives must justify the incremental value that will accrue from the CREATE Program.
4. There is a limit of four Letters of Intent per lead institution per year. As well, an individual may only be the applicant on one proposal. However, there is no limit to the number times an individual or an organization may participate as a co-applicant/collaborator.
5. Each training program will have a program committee responsible for overseeing the progress of the program and its future directions. The applicant may not be the Chair of the program committee.
6. The approval of each annual report by the program committee Chair will be required for NSERC to release grant funds for the following year.

Award Information

Funding of up to \$150,000 in the first year, and of up to 300,000 per year in subsequent years, will be provided by NSERC for a total period of six years. Partners may contribute additional funds. The full application must provide a detailed justification of all expenses.

The allowable expenses are limited to:

1) Stipends

- At least 80 per cent of the CREATE grant must be used for trainees' stipends.
- Up to 30 per cent of this portion can be distributed to trainees who are not enrolled in the NSE.
- Stipends for students and fellows are based on NSERC scholarships and fellowships, as follows:
 - Undergraduate - \$4,500 for 16 weeks;
 - Master's - \$17,300 p.a.;
 - Doctoral - \$21,000 p.a.;
 - Postdoctoral - \$40,000 p.a.
- Scholarship support for graduate studies through NSERC, including stipends from CREATE grants, is limited to a lifetime maximum of four years full-time equivalent for each individual. NSERC will include any graduate-level support offered by SSHRC and CIHR, and taken up, in the calculation of available support.
- CREATE stipends to postdoctoral fellows are normally limited to two years of support. Three years of support is acceptable, when justified, to attract exceptional foreign candidates. The three-year appointment must be offered up front and reported to NSERC with a written justification within one month of an offer being accepted.

Up to 20 per cent of the CREATE funds may be used for the following expenses:

2) Training program structure

- Funds towards the development and the coordination of the training program structure, format and content, including the salary of a program coordinator, in the first two years of the grant. Universities and/or other partners are expected to assume any such costs after this initial period.
- Advertising and trainee recruitment costs.
- Costs associated with short-term training related to professional skill development for trainees.

3) Travel

- If the program involves more than one institution, funds for the travel of trainees between locations.
- Travel and accommodation expenses of trainees for exchanges nationally among universities, between universities and other sectors, and/or internationally.

- Air travel must be claimed at the lowest rate available, not to exceed full economy fare.
- Travel cancellation insurance.
- Travel health insurance for trainees who do not receive any such benefits from their institution and/or other sources.
- Safety-related expenses (for trainees) for fieldwork, such as protective gear, immunizations, etc.
- Entry visa fee (for trainees) when required for the purpose of research.

4) Dissemination of training materials and research results

- Funds for the development and dissemination of training materials.
- Costs of developing Web-based information, including Web site maintenance fees.
- Costs associated with the dissemination of findings (i.e., through traditional venues as well as videos, CD-ROMs, etc.).
- Costs of holding a workshop or seminar, the activities of which relate directly to the funded research (including non-alcoholic refreshments or meal costs).

5) Services and miscellaneous expenses

- Networking costs (non-alcoholic refreshments or meals) for networking purposes in the context of formal courtesy between the grantee and guest researchers and research-related activities in the context of assemblies that facilitate and contribute to the achievement of the research objectives (e.g., grantee meeting with partners and stakeholders).

Research related items are not eligible (e.g., other salaries, materials and supplies, field work, other travel, publication costs). These are the responsibility of researchers through their research grants.

Evaluation Process

The first phase of the application process involves the submission of a Letter of Intent (LOI) and the second phase involves the evaluation of a full application.

One or more multidisciplinary committees will review the full applications. The committee(s) may be drawn from NSERC's pre-existing committees or may be established specifically for the CREATE Program applications.

Selection Criteria

The training program's excellence will be assessed in relation to its innovative, collaborative, and integrative character, its capacity to better prepare trainees for the workforce, as well as its potential to support teams of outstanding students and postdoctoral fellows. In arriving at an overall rating for the application, the committee will take into consideration the factors listed below.

1. Merit of the proposed training program (40 per cent)

Applicable to all proposals:

- The extent to which the program will provide a high quality of training, and facilitate the transition to the workforce;
- The extent to which the program will allow trainees to analyze, synthesize and harmonize links within and between disciplines into a coordinated and coherent whole;
- The research program's focus and clarity of objectives, both short- and long-term; and
- How the research relates to the current scientific and/or technical developments in the field with references to the current literature.

As appropriate to specific proposals:

- The extent to which the program will encourage the trainees to develop professional skills;
- The extent to which the program will promote interaction of the trainees with non-academic sectors, such as private companies, industry associations, not-for-profit organizations, government departments, etc.; and
- How the training will benefit from the mobility of students and fellows between academic institutions and organizations within Canada or abroad.

2. Excellence of researchers (40 per cent)

See the [Policy and Guidelines on the Assessment of Contributions to Research and Training](#).

- Quality and impact of team members' past contributions on their respective areas of research;
- Complementarity of expertise of the members of the group; and
- The quality and extent of past contributions to the training of highly qualified personnel.

3. Program management and long-term sustainability (20 per cent)

- The appropriateness of the proposed management structure, including the composition, the role, and the responsibilities of the program committee;
- The reliability of the project management plans for the implementation of the training program, and for the evaluation of the program's performance against stated objectives;
- The recruitment strategy for attracting a high quality and diverse group of trainees, as well as the appropriateness of the various level of trainees involved (undergraduate to postdoctoral level); and
- Evidence of institutional commitment to facilitate and further the plans and goals of the CREATE Program, during and beyond the term of the grant.

Contacts for Further Information:

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SUMMARY

**Tri-agency statement of principles on key professional skills
for researchers**

Increasingly, funding agencies, universities, employers of highly qualified people, and many researchers themselves recognize the importance of professional skills that go beyond disciplinary expertise.

To develop a collective understanding and raise national awareness on the development of professional skills for researchers, the three granting agencies are preparing a Statement of Principles identifying a specific set of professional skills considered to be of critical importance for Canadian researchers. The Statement is developed in close collaboration with the Canadian Association of Graduate Studies (CAGS) and the Society for Teaching and Learning in Higher Education (STLHE), following open discussion and wide consultation with various stakeholders.

This initiative represents the beginning of a process rather than an end. The idea is not for all researchers in all disciplines to master all these skills but instead to obtain training in those most appropriate for their chosen fields and to the appropriate depth..

The detailed Statement will include a description and examples of expression of the 9 key skills:

1. Communication and interpersonal skills
2. Critical and creative thinking
3. Personal effectiveness
4. Integrity and ethical conduct
5. Teaching competence
6. Leadership
7. Research management
8. Knowledge mobilization and knowledge translation
9. Societal/civic responsibilities