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Background

With a budget of about \$240 million per year, the Research Grants Program (RGP) is the Natural Sciences and Engineering Research Council's (NSERC) largest program and the main support for basic and applied research in the natural sciences and engineering in Canadian universities. A previous evaluation found that the program's basic structure was sound and that it was operating well. A number of concerns were identified and these issues and others have been examined in this evaluation.

The objective of this evaluation is to address the following evaluation issues:

Relevance – program position within the national S&T context, contribution to the knowledge economy, and perceived role within the university research community.

Impacts and Effects – achievement of program objectives, results, and program strengths and weaknesses.

Design and Delivery – alternative approaches, GSC member selection process, support for high-risk and interdisciplinary research, and the impact of changing demographics.



Evaluation Methodology

The approach to the study built on a number of other separate investigations of various aspects of the Research Grants program, such as the interdisciplinary research, international context and bibliometric studies. A particular challenge for the evaluation team has been the synthesis and integration of the results of these studies into the evaluation. Data collection comprised four main lines of enquiry: literature and document review, interviews, surveys, and case studies. Three surveys were conducted: funded applicants, non-funded applicants, and research users. Interviews (25) were held with representatives of the Grant Selection Committees (GSCs), NSERC management, and representatives of foreign research funding agencies in the US, Germany, Australia, and the UK. Interviews were also arranged with users (10), selected at random from users identified by researchers in the funded applicant survey. The case studies (9) covered four issue areas: high-risk research, interdisciplinary research, socio-economic impact, and high leverage.

Program Profile

NSERC came into existence May 1, 1978. University-based research had previously been supported through the National Research Council. Since then, NSERC has grown from a budget of \$112 million to a budget of \$538 million in 2001-02, of which \$240 million is directed to the Research Grants program (RGP). The program's share of annual NSERC expenditures has fluctuated from a high of 61% in 1978-79 to a low of 39% in 1990-91. The program's current share of NSERC funding (including funding for the Networks of Centres of Excellence) stands at 45%.

The Research Grants program supports new and ongoing programs of research in Canadian universities through several different grant types – individual, team, and project (only for Subatomic Physics). The vast majority of grants, greater than 90%, are individual grants. These grants recognize the creativity and innovation that are at the heart of all advances in research, whether made individually or in groups. Applications are reviewed by GSCs with additional input from external referees.

In providing baseline funding for basic research at Canadian universities, the program opens up opportunities for new and established scientific and engineering researchers to develop their research careers and achieve national and international recognition. The program is also an important source of support for training in research of students at the undergraduate, graduate and postdoctoral levels. The program's objectives are to: promote and maintain a diversified base of high-quality research capability in the natural sciences and engineering in Canadian universities; foster research excellence; and provide a stimulating environment for research training.



Findings and Conclusions

Relevance

The evaluation area of ‘relevance’ examines whether the program continues to be consistent with agency and government priorities, and whether it addresses an actual need. Relevance was looked at in terms of two issues: 1) the national science and technology context, and contributions to the knowledge economy; and 2) the perceived roles of NSERC and the Research Grants program within the Canadian context.

National S&T Context

1) What is the position of the Research Grants program within the national S&T context? How does the Research Grants program contribute to the knowledge economy?

The Government of Canada has made a commitment to making Canada one of the top five countries for research and development performance by 2010. Achieving this goal will require developing highly qualified people and fostering research through the collective action of all participants in Canada’s national innovation system – government, industry, and academia. The Research Grants program provides a fundamental base for the support of university research and training, and therefore is central to Canada’s current S&T context.

In knowledge economies, the production, use, and distribution of knowledge and information are critical to the process of economic growth and development. It is these types of economies that are most successful, and therefore the pursuit of knowledge and its application has become a central theme in most developed countries. Universities are pivotal in the pursuit and application of knowledge because of their role in research and training. The Research Grants program, as the primary mechanism for funding research and the training of researchers in the natural sciences and engineering, is therefore part of the foundation for Canada’s knowledge economy.

Perceived Roles of NSERC and the Research Grants Program

2) What are the perceived roles of NSERC and the Research Grants program within the university research community?

NSERC is one of the federal government’s primary mechanisms for making strategic investments in science and technology. Its objective of strengthening Canada’s economy and quality of life is achieved by supporting a broad base of high quality research in Canada’s universities, and encouraging and facilitating links between the universities and the private sector. The Research Grants program is one of many NSERC programs, but it is the most important in terms of size and support for basic research. Its goals are to support diverse and excellent research, and the training of new researchers. Its attributes of supporting on-going programs of research that are curiosity driven and flexible in light of new research opportunities,



are particularly valued by researchers. It is viewed by researchers as building a stronger national scientific community, and fostering a culture of research.

Impacts and Effects

The evaluation area of ‘impacts and effects’ examines whether the policy, program or initiative is effective in meeting its objectives, without unwanted negative outcomes. Impacts and effects were examined through three issues: objectives achievement, high-risk research and program results.

Achieving Program Objectives

3) To what extent are the objectives of the Research Grants program being achieved? Has the program: promoted and maintained a diverse and high quality research capability in the natural sciences and engineering in Canadian universities; fostered research excellence; and provided a stimulating environment for research training?

The Research Grants program has gone a long way towards achieving its objectives, and Canadians are admired internationally for what they have achieved with limited funding. However, it is questionable whether the program objectives are realistic given the level of funding that is available.

Canadian universities have a diverse and high quality research capability in the natural sciences and engineering. The Research Grants program is seen to play an important role in promoting and maintaining that capability, and the program is seen to be superior in that respect compared to similar programs in other countries. There are regional differences in research capability resulting from differences in provincial funding levels, but the Research Grants program helps to ensure that there are equal opportunities across Canada.

Regarding training, the Research Grants program plays an important role in the training of new researchers. First, it ensures quality training by enabling excellent research in Canadian universities in which students can participate. Second, a substantial portion of research grants is used to directly fund students. Third, to the extent that the program provides opportunities for researchers to work with industry, students are exposed to real-world problems and introduced to future job opportunities. The survey results make clear that researchers consider the program to be very important to the number of students trained and the quality of training they receive.

Finally, with respect to excellence, Canadian research is considered by researchers and research users to be generally excellent, and this is partially attributable to the Research Grants program, in concert with the other research funding and support mechanisms in Canada. Bibliometric findings are also supportive of the notion of the excellence of Research Grant funded researchers, based on a comparative performance of funded, non-funded and international researchers. One of the objectives of the program, however, is to ‘foster excellence’. The evaluation team feels that this implies the active identification, differentiation, and reward of



those who display the potential for excellence.

The evaluation team looked for three things in its consideration of whether the Research Grants program fosters excellence: 1) whether the program identifies the potential for excellence, 2) whether the program differentiates those who have the potential for excellence, and 3) whether the program provides those with the potential for excellence with the resources to reach their full potential. While the program meets the first two criteria (to varying degrees), it does not meet the third.

The Research Grants program certainly has, through its exhaustive peer review process, the mechanism to identify those with the potential for excellence. The program, however, does not clearly differentiate those with the potential for excellence because, even though the potential for excellence is identified and differentiated within the confines of the GSC, the existence of that excellence is not communicated clearly to the outside world. Finally, the Research Grants program is not, by itself, providing the resources for potentially excellent researchers to reach their full potential. Without additional funding, the Research Grants program cannot provide additional resources for researchers with the potential for excellence without reducing the program's ability to support a diversified base of high quality research capability.

There is an inherent tension between the objectives of fostering excellence and maintaining a diverse research base. Most GSCs, given limited budgets, have chosen to emphasize distributing grants widely over rewarding excellence for a more limited number of researchers. It must be stressed that if the program is not fully achieving all three of its objectives, it does not mean that it is failing. Rather, it is questionable whether the program objectives taken together are realistic given the level of funding that is available. The benefits of providing a broad base of support should not be sacrificed in the name of excellence, but with additional funding consideration should be given to rewarding in a significant way those who are truly excellent on a world scale.

High-Risk Research

4) To what extent does the Research Grants program support high-risk research?

In that all research is expected to have an element of risk, there is a range of opinion regarding what constitutes 'high-risk' research. Definitions often refer to differences from convention (in terms of methods, topics, concepts, etc.) and uncertainty of outcomes. Presumably, however, all research should have elements of innovation and uncertainty. High-risk research then, is a matter of degree, and as a result, the definition differs by discipline – the expectations and culture of a particular research community playing a significant role in what is perceived as high-risk. Most researchers view their research as of medium risk. Our conclusion is that the perception of risk is relative and individual.

Whatever definition is used for high-risk research, there are a number of factors, not under the control of the Research Grants program, which will determine whether researchers submit high-risk research proposals to the program. These include researcher interest in high-risk research



and researcher perceptions of: the reception of their research community to high-risk research, the interest of their graduate students in high-risk research, their ability to obtain other sources of funding for high-risk research, and Research Grants program acceptance of high-risk proposals.

Grant Selection Committees are supposed to reflect the research community that they represent. To the extent that this is true, they are probably making decisions that are, on the whole, appropriate for their discipline, although there have been persistent concerns by a minority in the research community that GSC members may sometimes represent the ‘old guard’ and not accept new ideas. Researchers receiving funding from the Research Grants program feel that the program is mildly encouraging of high-risk research, while those not receiving funding feel that the program is discouraging. It is clear that supporting high-risk research is a challenge for other international funding agencies and the universities, as well as NSERC. The issue is less the support provided by the RGP, and more the challenges inherent in the rest of the system – peers, journals, and universities. The evaluation team concludes that beyond ensuring that GSCs are sensitive to the needs of high-risk research, there is little that the Research Grants program can do to alter the propensity of researchers to engage in high-risk research, and the innovation system to support it.

Program Results

5) What have been some of the results of the program? What have been the unintended effects?

The program has had many results, both intended and unintended. Program results include impact on scientific production, scientific and socio-economic impacts of the research produced, impacts on the users of research, and other impacts and effects.

The Research Grants program is viewed as supporting Canada’s image and capability as an advanced science and technology-based economy. It is seen to have increased the extent of collaborative research, the ability to leverage funds from other sources, and the applicability of research. It is also seen to have helped in the attraction and retention of highly qualified people.

Scientific Production

NSERC funds roughly 75% of professors in the natural sciences and engineering in the university sector, and these professors are responsible for 87% of the publications produced by this sector. This is not surprising as NSERC funded researchers generally have higher overall levels of funding than non-funded researchers, and there is a significant positive correlation between the volume of publications and the level of funding – the level of funding has an effect on productivity, and a higher level of funding ensures an even higher ‘rate of return’.



Scientific and Socio-Economic Impacts

Both funded and non-funded researchers reported having made major contributions vis-à-vis indicators of scientific impact. However, funded researchers are more likely to report having made major contributions than non-funded researchers on six indicators in particular: seminal papers; advancement of knowledge; new lines of inquiry, international projects, new collaborations and advances in methodology. Only marginal differences were observed with respect to socio-economic impacts. It is important to note that for funded researchers these impacts stemmed from their Research Grant funded research, whereas for non-funded, impacts stemmed from their overall program of research.

Impacts on Research Users

‘Research users’ are individuals in the private, public, and not-for-profit sectors who have used the results of NSERC funded research. Contact information for these ‘users’ was obtained from researchers in the ‘Funded’ researcher survey.

Users were very satisfied with the quality of the research, accessibility of results, and their usefulness. Research users interviewed reported that they were able to readily find the research capability they required in Canadian universities. The relationships with researchers were also very satisfying, though timeliness of research results and access to highly qualified personnel were the least satisfying aspects of their relationships.

The overall impacts on the users were very favourable, more favourable than funded researchers may think, in fact. There is evidence from the case studies that researchers may be underestimating the value of their contributions to users in instances where the user is benefiting significantly from being able to declare that the research results are produced by a university researcher, and in instances involving expensive infrastructure. There is also evidence from the case studies that cut-backs in federal science-based departments may result in these departments increasing of the degree to which they use university infrastructure. The following benefits to users are presented in order of impact:

- Understanding of scientific advancements
- New products, processes, and services
- Enhanced quality and features of existing products, processes, and services
- Cost savings and productivity improvements to current operations of the organization
- Improved environmental, health and safety considerations in existing operations, products and services
- Improved public policies and/or regulations

Other Impacts and Effects

The Research Grants program is viewed as supporting Canada’s image and capability as an advanced science and technology-based economy. It is seen to have increased the scientific



impacts, the socio-economic impacts, the extent of collaborative research, the ability to leverage funds from other sources, and the applicability of research. It is also seen to have helped in the attraction and retention of highly qualified people.

Design and Delivery

The evaluation area of ‘design and delivery’ examines whether the most appropriate and effective means are being used to achieve the program objectives, relative to alternative design and delivery approaches.

Design and Delivery Approaches

6) What are the strengths and weaknesses of the program? What impact, if any, has program design and delivery (e.g., funding a program of research vs. project research; relatively higher success rates) had on the research environment? Are there alternative design or delivery approaches that could be employed for the RG program that would be more appropriate or efficient? What are the pros and cons of these alternatives?

Most stakeholder interviewees commented that the Research Grants program was uniquely suited to Canadian needs. The advantages of the Research Grants program were viewed as: continuity and stability of support; flexibility in making adjustments to research plans; individual- and not institution-based awards; and peer review-based, not agency-based, decision making. The disadvantages were the comparatively low level of the research grants, and the lack of feedback provided on assessments.

There are a number of characteristics of the Research Grants program that make it relatively unique in Canada and the world, and these are highly valued by researchers. The primary characteristic which differentiates the Research Grants program from other programs is that it supports a researcher’s program of research, in contrast to the project-based funding provided in other countries. This unique approach results in a number of further differences between the Research Grants program and programs in similar agencies in other countries. These characteristics include the following:

- *Researchers can modify aspects or change the course of their research at any time* – Researchers value this flexibility. A number of GSC interviewees commented on how the freedom enjoyed by Canadian researchers in the use of their research grants, and the flexibility of the program made them “the envy of their American and British colleagues”.
- *Continuity and uniformity of funding* – By demonstrating reasonable progress within a research program every four years, researchers are assured of stability and continuity of funding. The sustained funding provided by the program is valued.
- *No guidance is provided as to the topic of research* – In many research support programs, researchers must focus on topics of national or institutional interest. In the Research Grants program, researchers are only influenced by the approval of their peers and not by



political or institutional priorities. This was viewed as a strength of the program according to researchers interviewed.

- *Peer review* – The Research Grants program peer review process is very labour intensive, especially in view of the small grant sizes and low variability in grant size. However, overall, peer review is a highly valued aspect of the program, and researchers want it to be retained.
- *Grant sizes and success rates* – The Research Grants program's success rate is in the range of 70% to 75% and the funding rate (i.e., the amount awarded divided by the amount requested) has tended to fluctuate between 40% and 50%. This success rate is generally much higher and the funding rate lower compared to the programs of agencies in other countries.
- *The weight given to the track-record of the researcher* – There is no published weighting of these criteria, and GSCs appear to have a great deal of latitude in how they are applied. The perception within the research community is that the track-record of the researcher is given the greatest consideration.
- *Researchers are not required to report on the results of their research* – To obtain future grants, researchers must re-apply and demonstrate progress in the area they are proposing. However, this progress is based on their entire research effort and they do not need to specifically demonstrate how their previous Research Grant funds contributed to this progress.

Potential areas of concern and suggestions for improvement are highlighted below.

- *Administrative Effort* – In addition to the administrative effort imposed upon GSC reviewers, there is also a significant administrative burden shouldered by applicants in the preparation of applications. While much of this burden is unavoidable, many people interviewed felt the administrative load of the program could be lightened without diminishing the standards of peer review; the feeling is that attention needs to be given to common resumes, consolidating programs, and electronic submissions and reviews.
- *Evaluation Criteria* – Like NSERC, all agencies examined in the international context study use set criteria that focus on the excellence of the applicant(s) and the quality of the proposal. There is currently no set weighting for the Research Grants program evaluation criteria. However, NSERC appears to put more emphasis on the excellence of the applicant(s) than other nations. The weighting is important. In the interest of transparency and openness, these weights should be specified and communicated to applicants.
- *Application Feedback* – Given the quality of the reviewers, there should be a wealth of information that could be made available to applicants regarding the strengths and weaknesses of their proposal. This information would potentially be invaluable in adjusting research directions and in creating better Research Grants program proposals in future competitions. Both researchers and the program would benefit from such feedback.
- *Grant Size and Success Rates* – Overwhelmingly, the most important weakness of the Research Grants program is seen by researchers to be the amount of funding that it is allocated. Researchers would like to see the government increase the amount of funds available to the program but, failing that, most would prefer to see money directed away



from other NSERC programs into the Research Grants program. Providing additional funding to outstanding researchers, in particular, would enable them to work at full capacity and achieve possible research breakthroughs.

- *'Completion Reports'* – There would be benefits to be gained from the implementation of some form of 'completion reports', which would require researchers to specifically relate their use of Research Grant funds with any subsequent progress. This requirement could, for example: provide evidence to the government and the general public that grant funds are being well spent; document the benefits that are being achieved by the program; provide researchers with information on the activities of their colleagues, and thus perhaps encourage more collaboration and interdisciplinary research; and provide an input to the assessment of subsequent applications for research funding.

GSC Member Selection Process

7) Are there any problems associated with the structure and operation of the Grant Selection Committees? How are Grant Selection Committee members appointed? Are there any impediments to appointing members; is this process open and transparent? What impact, if any, does the discretion of the GSCs have on how funds are distributed?

In general, GSCs are seen to be appropriately structured and to be operating well by most of the researchers receiving funding. Non-funded researchers, however, do not feel the committees have the necessary expertise to evaluate proposals and are not satisfied with their decisions.

In general, researchers feel uninformed about the GSC selection process, which does not appear to be open and transparent. Funded researchers, however, are satisfied with the process, while in contrast, non-funded researchers are not satisfied. There is a problem of peer review fatigue. The discretion of the GSCs appears to have had no adverse impact on how funds are distributed.

Interdisciplinary Research

8) What constitutes interdisciplinary research? Is the research proposed in grant applications becoming increasingly interdisciplinary in nature? Is there any evidence that the current discipline-based GSC structure inhibits interdisciplinary research? To what extent is there a need for NSERC to review the current discipline-based GSC structure? What are the alternatives to a discipline-based delivery system? What are the pros and cons of these alternatives?

Interdisciplinary research “involves interaction among two or more different disciplines” by sharing ideas, concepts, methodologies, procedures, theories, terminology, data, etc.

While the number of applicants to GSC 21, the interdisciplinary GSC, is small, there is evidence that on the whole, research in all GSCs is becoming more interdisciplinary.



Overall, the current discipline-based GSC structure is thought to be slightly positive with respect to its impact on interdisciplinary research. Interdisciplinary research seems to have fared just as well as discipline-based research.

Interdisciplinary research appears to be adequately accommodated within the current discipline-based GSC structure and there is no compelling reason to change the structure to accommodate interdisciplinary research. However, there is a need to educate the community on how interdisciplinary research can be better accommodated within the current structure.

An alternative approach to a discipline-based delivery system is an issue-based system, such as used by the Canadian Institutes of Health Research. Such an approach, however, leaves the researchers with less freedom in defining the objectives of their research.

Demographics

9a) Are the demographics of Research Grants program applicants changing?

The demographics of the RGP are changing, driven by an aging population that is in a state of renewal. Engineering and computer science grantees are now the largest funded group, and they also tend to be younger than other groups. Ontario still receives the largest share of RGP funds, but that share has been decreasing, while the share of Québec has been increasing. The participation of women has not changed significantly yet, but women make up a higher proportion of new applicants than is found in the total population.

Non-Standard Appointments

9b) Is there an increase in non-standard appointments (e.g., professors emeriti, adjunct professors)? How does the program treat non-standard university appointments? Is it appropriate for professors emeriti and other non-standard appointments to be eligible for funding?

There has been an increase in non-standard appointments, especially professors emeriti. In general, non-standard appointments are supported, as they are in the other countries reviewed. The research community agrees with this support.

New Applicants

9c) How have new and recent applicants been faring? What impact will anticipated new hires and retirements have on the funding of new and other applicants?

The continuing aging of university researchers will increase the rate of retirements and therefore the need to accommodate new applicants. Recent initiatives within the program have improved the status of new applicants and their situation is now adequate. Concerns have been raised that mid-career researchers are now the most disadvantaged group.



Costs of Research

10) To what extent, if any, has the purchasing power of the research grant been eroding? What factors have contributed to this? Has the appropriate balance been struck between grant size and the number of applicants funded?

The purchasing power of research grants has been eroding, due primarily to the increasing complexity of research and the increasing costs of personnel and travel.

The balance between grant size and number of awards varies considerably among the GSCs. The general consensus among funded researchers is that the present balance between grant size and number of awards is about right. However, non-funded researchers feel that smaller grants should be given to more researchers.

Recommendations

1. The Research Grants program should receive increased financial support to enable larger research grants and counter the decreasing purchasing power of grants, thereby permitting the research community to more readily engage in world-class research, especially the outstanding researchers, and reinforcing the program's role as the key national instrument in developing Canada's research capacity in the natural sciences and engineering.
2. More emphasis should be given in the awarding of research grants to the Research Grants program objective of 'fostering excellence' in order that outstanding researchers might have the necessary resources to reach their full potential to achieve research breakthroughs. This might include 'rating' researchers to identify the most excellent.
3. NSERC should accelerate the use of electronic tools in the application process for the Research Grants program.
4. The weightings assigned by Grant Selection Committees to the selection criteria under the Research Grants program should be made known to the research community.
5. The level of feedback provided to applicants in the Research Grants program should be increased.
6. Consideration should be given to requiring 'completion reports' from applicants before grants under the Research Grants program are renewed.
7. NSERC should take steps to make the selection of Grant Selection Committee members more open and transparent, while ensuring that the focus on the quality of candidates is not diminished.



8. Steps should be taken by NSERC to make better known to the research community that the Research Grants program encourages interdisciplinary research and the process used to handle interdisciplinary grant proposals.

9. The Research Grants program should maintain funding levels for new applicants to assure adequate replacement of the increasing numbers of senior researchers taking retirement. Professors emeriti and other non-standard appointees should continue to be eligible for funding under the program.

Introduction

In 2003, the firm Hickling, Arthurs and Low completed an evaluation of the Natural Sciences and Engineering Research Council's (NSERC) Discovery Grants Program (formerly Research Grants)¹. The firm's report, *Evaluation of the Research Grants Program – Phase II* (March 5, 2003), highlights the key findings from an impressive amount of data and information collected from clients, stakeholders and various other sources over the course of two years.²

The Federal Government's Innovation Strategy, *Achieving Excellence*, and the Budget 2003 confirmed there is a broad consensus that research in science and engineering is critical to making Canada one of the most innovative countries in the world. The evaluation found that the program provides a fundamental base for the support of university research and training, and therefore is central to Canada's S&T system. Given this overall positive context for the program, our response focuses on the degree to which the program is achieving its objectives and how its design and delivery can be improved. The evaluation identified a number of key strengths and important outcomes of the program, which are highlighted in the discussion below. NSERC's response to the Report's nine recommendations then follows. Areas that require further study are discussed in Appendix 1.

The program's real success is achieved by those it supports: researchers at Canadian universities who make important contributions and cutting-edge discoveries in all areas of the natural sciences and engineering, and have an impact on other researchers and end-users in different sectors. They are mentors for the next generation of highly qualified personnel, and ensure that Canada is seen as a key player in R&D on the world stage. The new knowledge and technologies that are the outcomes of university-based research are at the heart of our country's ability to maintain and enhance our economic prosperity and quality of life, and to understand and protect our natural environment.

Supporting Programs of Research

We believe the strengths and positive impacts of Discovery Grants arise mainly from the program's emphasis on funding high quality, ongoing programs of research, and that this fundamentally unique and defining characteristic of the program should remain unchanged. A number of changes recommended in the Report appear to be more suitable for project oriented grants, but can be effectively adapted in order to fit within the program's philosophy.



The distinction between supporting programs of research, rather than specific projects is important, particularly in the context of the evaluation and NSERC's response. A project grant is for a well-defined research study with specific objectives and milestones that will be completed within a defined timeframe. A researcher can often hold more than one project grant. A program of research may include a series of related projects, long-term as well as short-term goals and broad objectives for the advancement of knowledge. Discovery Grants recognize that creativity and innovation are at the heart of all research advances. Researchers have the freedom and flexibility to use their Discovery Grant to pursue activities that may not have been anticipated at the time of application, but that address the broad and long-term objectives of their research programs. Thus, grant holders can take advantage of unforeseen opportunities and pursue diverse activities. Grants support not only basic research and training in traditional disciplines, but also more targeted and applied research, collaborations with other researchers in Canada and abroad and users from all sectors, as well as interdisciplinary and high-risk research. Researchers can only hold one Discovery Grant at a particular time.

This unique emphasis on supporting programs of research, rather than specific projects, is viewed very positively by applicants and the international community, because of the flexibility and independence afforded to grantees and the stability and continuity of funding over the course of a researcher's career. We believe these characteristics of the program allow researchers to 'do more with less' and maximize the impact of funding, a view echoed by international referees in the recent Discovery Grants' Reallocations Exercise³.

Achieving Our Objectives

- The objectives of Discovery Grants are to assist in:
- Promoting and maintaining a diversified base of high-quality research capability in the natural sciences and engineering in Canadian universities;
- Fostering research excellence; and
- Providing a stimulating environment for research training.

The Report concludes that the program "has gone a long way towards achieving its objectives, and Canadians are admired internationally for what they have achieved with relatively little funding",* but questions whether the objectives are realistic given the level of funding available. The Report states that the objectives regarding the diversified research base and training are being achieved, but recommends that more emphasis be given to the objective of 'fostering excellence'. See our response to this recommendation.

While the program is unique at the national and international level, and is envied by researchers in other countries, the philosophy of the program also addresses Canada's need for a diversified base of high quality research capability. Our country is geographically large but with a relatively small population. We need a critical mass of high quality, productive scientists and engineers if we are going to be known internationally as a key player in R&D and maintain and enhance Canada's position on all fronts where research and training have an impact. The diverse research



activities at universities across the country ensure that faculty members stay current with the leading edge of research and knowledge advancement. This has a significant impact on the quality of teaching in universities across the country and on the ability of all regions to participate in the training of HQP. University research and training are critical factors in the innovation system, and users across the country are able to take advantage of these resources, often locally.

The Report notes that universities train scientists, engineers and technicians, ensuring the continuity of the research base,* and that the training may include exposure to industrial collaborations and applications.* NSERC concurs, but views the importance of training in science and engineering in a broader context, to include exposure to interdisciplinary and international collaborations, cutting edge technologies and methodologies, and the development of professional skills (i.e., communication skills, project management, team work, etc.). We expect that most trainees will move on to careers in fields related to science and engineering in all sectors, but that not all of these careers will focus on research.

Positive Outcomes

- The evaluation notes that the program is NSERC's most important in terms of size and support for basic research and fills a role in Canadian research not addressed by other programs. A number of important outcomes of the Discovery Grants program were also identified in the evaluation. These include:
- Users report being very satisfied with the quality of the research supported by the program, accessibility of results and their usefulness. As well, users rate Canadian university graduates as very good to world class.
- The program has a positive impact on scientific productivity. For example, the bibliometric study showed that funded researchers publish at a higher rate than non-funded researchers in journals with good to very good impact factors. As well, funded researchers report significantly more major contributions of seminal papers, advancement of knowledge, new lines of inquiry, international projects, new collaborations and advances in methodology. These are all indications of research impact.
- The program is seen to play a role in the attraction and retention of faculty.
- Encouraging results were also found for the program's support of collaborative, applied, interdisciplinary and high-risk research.

Recommendation 1

The Research Grants program should receive increased financial support to enable larger research grants and counter the decreasing purchasing power of grants, thereby permitting the research community to more readily engage in world-class research, especially the outstanding researchers, and reinforcing the program's role as the key national instrument in developing Canada's research capacity in the natural sciences and engineering.



Response

NSERC has been making the case for additional funding for research and the Government has increased its support for NSERC regularly since 1998. Since that time, our base budget has increased about 35% (from \$451M to \$611M) and Council has supported funding increases for the program of about 47% (from \$192M to \$281M). Along with significant investments in other funding agencies and foundations, these increases demonstrate, in a very concrete way, that Canada recognizes the importance of research, as well as the need to provide grants at levels required to support internationally competitive research. In the 2003 Budget, additional funds were provided to address the needs of two important areas mentioned in the Report: increasing numbers of new applicants and training more students and other highly qualified personnel.

- The evaluation also identified the following areas as needing increased funding:
- Reward excellence of the most exceptional researchers
- Redress historical funding imbalances for mid-career researchers
- Interdisciplinary and high risk research
- Increased cost of doing research

(Note that all these areas were also identified as priorities by the various disciplines in the 2002 Reallocations Exercise.)

NSERC concurs with the finding that median funded researchers feel they could productively use another \$35,000 in research funding.* This is in line with feedback NSERC received from the Grant Selection Committees (GSCs) in 1997, i.e., that the program's budget could be increased 100% and funds invested effectively in real needs. We also note that the inflation index for university R&D, equipment and supplies, travel and periodicals began to increase steadily during the mid-1990s to 1998 and was higher than the Consumers' Price Index (CPI) (Statistics Canada, Research Associates of Washington, U.S. Bureau of Labor, NSERC). The inflation index for NSERC stipends for postgraduate students and postdoctoral fellows also began to increase in 1998 and was higher than the CPI. Better support for graduate students will encourage more people to continue at the Master's and Ph.D. levels, helping to meet the increasing demand for HQP and contributing to Canada's goal of becoming one of the top five countries in R&D by the end of the decade.

Recommendation 2

More emphasis should be given to the awarding of research grants to the Research Grants program objective of 'fostering excellence' in order that outstanding researchers might have the necessary resources to reach their full potential to achieve research breakthroughs. This might include 'rating' researchers to identify the most excellent.

Response



The Report states that the objectives regarding research base and training are being achieved, but questions whether excellence is being rewarded at a significantly higher level than the norm in order to appropriately differentiate the most outstanding researchers.

Despite increases to the program's budget in recent years, the needs of all meritorious researchers cannot currently be filled. Ongoing growth in the number of qualified applicants and rising research costs continue to be significant pressures on the budget. In this context, we believe it is appropriate to leave the flexibility in the hands of GSCs to place more emphasis on the objective of supporting the broad base, while also fostering excellence to the extent the current budget allows. The Council strongly concurs with the Report's statement that increasing grant levels for the very best researchers should not be done at the expense of adequately funding the base and supporting the growth in the discipline, and that new funding is therefore required to address this need.

Some points to consider are:

- GSCs spend considerable time and effort achieving the right balance between grant size and numbers of researchers supported. NSERC believes that the GSC members, respected researchers from all sectors and from outside Canada, know the needs of their community and can best maximize our investment in research. The Report notes that given current resources, the balance between grant size and the number of researchers supported is considered about right by grantees, and that grantees believe the different funding dynamics between GSCs are necessary and appropriate.*
- Supporting growth in the community has been a priority for increased funding in recent years (see response). We believe there is a positive effect of supporting new researchers at the start of their career. From 1994-1998 the number of grants increased by 3.3% (from 7,056 to 7,293). From 1999-2003, the increase was 17.4%; currently there are 8,649 award holders. Growth has come mainly from significant increases in the numbers of new applicants and new grantees, and there has not been a reciprocal decrease in the number of established researchers receiving ongoing support. Success rates have remained high (currently 74.5% for new applicants and 82% for returning applicants). In this environment it has not been possible to increase grant size significantly. The average grant for first-time award holders has remained fairly steady in the range of \$21-23K, and the average ongoing award has also been fairly steady in the range of \$31K.
- Currently within the program, 'stars' can expect to ramp up at a faster rate to a higher level of funding. In 2003, 7.5% of all grantees (650/8,678) funded through the program received yearly funding of \$60K or more, which is a level that clearly sets them aside from researchers funded close or below the average.
- Discovery Grants are not intended to cover the full costs of research. Researchers at all levels of funding are expected to, and do, reach their full potential by obtaining other sources of funding. Using the data from respondents to the evaluation survey, NSERC found that the average grantee leveraged \$62K from other sources, and had a Discovery Grant of \$31K.⁴ Thus, increases in the size of Discovery Grants may be small relative to what researchers may be able to attract from other sources.



- Fostering excellence involves more than additional funds for the best researchers. The program assists in fostering excellence; it is one mechanism among many that helps to achieve this objective. The most exceptional researchers are recognized through awards from societies and universities, invitations to make prestigious lectures, membership on NSERC and other committees, and so on. A very small number of exceptional researchers receive additional recognition and support through other prestigious national and NSERC programs designed specifically for this purpose, Canada Research Chairs, E.W.R. Steacie Memorial Fellowships, Gerhard Herzberg Canada Gold Medal. Indeed, many award holders' CVs demonstrate that NSERC supported them throughout their training and early careers.
- The very best, internationally recognized researchers need the broad research base to achieve their own full potential. The base provides a critical mass of researchers, students and other HQP in Canada, and new knowledge to build upon within the innovation system. The program is one of many ways fostering excellence, but it is one of only a few mechanisms in Canada supporting the base.
- Researchers who apply for a Discovery Grant have already been determined to be of high quality as they have gone through a rigid selection process simply to get a faculty appointment.

Being more proactive in developing and promoting international leaders is positive, and was identified as a priority area for increased funding in some Reallocations submissions. The implications of adopting an approach for the entire program that puts more emphasis on rewarding excellence at significantly higher levels, and how it could best be achieved and implemented, require more study and discussion.

While funding level certainly impacts on a grantee's research program, NSERC emphasizes that grant size should not be equated with researcher's excellence. Other criteria⁵ are also considered, such as the cost of research and the capacity for training HQP. The evaluation concluded that the amount awarded is a poor indicator of excellence, because not enough of the truly excellent researchers are funded at significantly higher levels. The evaluation proposed a 'rating scheme' to identify the most excellent researchers publicly (grantees would be assigned a rating of A, B or C), provide an incentive for researchers to work hard in the pursuit of excellence and increase prestige.* We do not agree with this specific rating mechanism or any rating scheme for researchers as it could have a negative impact on researchers labelled B or C, hindering their collaborations, for example. However, we see merit in conveying a clear message publicly about quality that would take the emphasis away from grant size. NSERC will consider other ways to highlight the accomplishments of the very best researchers (news, mid-career and senior) in each year's competition.



Recommendation 3

NSERC should accelerate the use of electronic tools in the application process for the Research Grants program.

Response

The Council wide initiative *Lightening the Load* started in 2001 and focused on reducing workload in the application and peer review processes. Recent improvements that reduce workload for applicants include:

- *eSubmission*: February 2003 was the first competition where applications could be completed and submitted to NSERC on-line. Twenty per cent of applicants submitted proposals electronically. The electronic proposal is designed to ‘walk’ researchers through the application process, thus making it easier for them to complete the form correctly. As improvements are made to the system we hope that the number of applicants using it will increase, providing opportunities for NSERC to manage more information in the application and peer review process electronically.
- *Five-year grants*: The normal grant period has been extended from four to five years, reducing how frequently grant holders have to reapply, and decreasing the workload of GSCs and external referees by about 20%.
- *Common CV*: NSERC was a partner in the development of the Common CV project, with 16 other funding agencies, and Discovery Grants will likely begin using the CV within two year’s time (it is now being piloted by the Networks of Centres of Excellence). Applicants will be able to store their key CV data in one databank and generate the specific Personal Data Form for NSERC (and other agencies) from it.

The Report also concludes that ways need to be found to reduce the level of effort required for peer review. Five-year grants will have some impact, as fewer applications will be reviewed in each annual competition. NSERC staff and GSCs are also working to increase the pool of reviewers. NSERC will continue to monitor the peer review workload, and explore ways to streamline the process, while ensuring the quality of decisions is maintained. The time spent on peer review allows for necessary discussion and debate of important issues. Grant levels may not change significantly, but it is the whole grant that is reviewed, justified and confirmed. The decision not to renew a grant or not to support a new applicant can have serious implications on the career of a researcher and the ability to train students. Also, the GSCs’ deliberations have an impact on the dynamics of entire fields of research (balancing grant size and success rates, supporting new researchers, supporting specific areas and types of research activities).

Recommendation 4

The weightings assigned by Grant Selection Committees to the selection criteria under the Research Grants program should be made known to the research community.



Response

Currently there are no specific, fixed weights assigned to criteria. GSCs have the flexibility of which criteria to emphasize to take into account individual circumstances (e.g., comparing new and established researchers, reasons for delays in productivity, etc.) and make judgements. Weightings, on the other hand, make the review process more formulaic. In the current system, applicants have the opportunity to make their case according to their own situation and needs. However, weighted criteria could further improve the openness and transparency of the peer review system as it would be clearer to all on what basis proposals are judged; this could assist in providing feedback to applicants. NSERC will study this recommendation further. Any system of weighted criteria would have to allow GSCs some flexibility in judging proposals and making funding recommendations, and be clearly communicated to applicants.

Recommendation 5

The level of feedback provided to applicants in the Research Grants program should be increased.

Response

NSERC's practice was to provide feedback to all applicants who are unsuccessful, who receive a major cut (>20%) to their grant, or who are given a grant of shorter duration than normal. These individuals also receive their external evaluation reports, while other applicants need to request these reports. Realizing that some of the burden of increased feedback will fall on GSC members, NSERC will still explore ways to improve feedback so as to help researchers prepare better applications. We need to identify what feedback is most useful to applicants, and what factors contribute to them being responsive to it. NSERC will obtain input from applicants, referees and GSC members on how feedback to applicants (referee reports and GSC comments) can be improved.

In the meantime, NSERC has taken steps to provide feedback to more applicants in the last two years. This year, all applicants will receive their referee reports, and those that were unsuccessful or received a noticeable reduction in their grants will receive comments from the GSC as well.

Recommendation 6

Consideration should be given to requiring 'completion reports' from applicants before grants under the Research Grants program are renewed.

Response

Accountability for the use of public funds is a cornerstone of NSERC's operations and Council has confidence in the current reporting requirements for grantees and universities. All NSERC awards are paid to universities on the grantees' behalf, and managed through university



administration systems that follow NSERC policies and regulations. For example, universities submit annual Statements of Accounts for all NSERC grants. Also, achievements from the past granting period are highlighted in the researcher's Personal Data Form (e.g., list of contributions with brackets to indicate primary source of funding for each, five most important contributions, contributions to training) and in the Grant Application (Progress Report section) the next time he/she applies for funding.

Discovery Grants support ongoing programs of research that evolve and change. As there is no specific completion dates, completion reports per se are, therefore, not suitable for the program. However, to help capture evidence of wise investments, benefits and achievements of the program, NSERC will examine how the instructions to the Progress Report section of the application can be improved to obtain more specific information about the outcomes from the last grant in such a way that is value-added to the peer review process.

Recommendation 7

NSERC should take steps to make the selection of Grant Selection Committee members more open and transparent, while ensuring that the focus on the quality of candidates is not diminished.

Response

Council is concerned that researchers feel uninformed about how members are selected for GSCs. A review of NSERC's program literature and Web site shows that while the criteria for membership are publicly available, the selection process is not well described. We will take advantage of opportunities to better explain the process for selecting committee members. We hope the community will then make more nominations for GSC membership.

Recommendation 8

Steps should be taken by NSERC to make better known to the research community that the Research Grants program encourages interdisciplinary research and the process used to handle interdisciplinary grant proposals.

Response

NSERC already began work on this issue in parallel with the evaluation. NSERC's Advisory Group on Interdisciplinary Research (AGIR) was established in 2000 to provide advice and make recommendations on the treatment of interdisciplinary research in the Reallocations Exercise and the program in general. AGIR's first report (2002) included recommendations on enhancing the reputation and stature of the Interdisciplinary GSC and educating reviewers and GSCs. Some of the recommendations have already been acted upon (e.g., NSERCC*Contact* article highlighting the Interdisciplinary GSC and an interdisciplinary researcher, sharing data on interdisciplinary applications with GSCs, and publishing new *Guidelines on the Preparation and*



Review of Applications in Interdisciplinary Research). AGIR recently started to examine the existing joint funding mechanisms and interdisciplinary areas that involve other granting agencies (Social Sciences and Humanities Research Council, Canadian Institutes of Health Research, Canada Foundation for Innovation, and Canada Council for the Arts).

Interdisciplinary research appears to be adequately accommodated within the current discipline-based GSC structure, as noted in the Report and by AGIR. The GSCs respond to the changing research environment and the increase in the diffusion of concepts and methods between disciplines. NSERC will continue to work with the community and the GSCs to ensure that our programs and policies are responsive to changes within and across the disciplines.

Recommendation 9

The Research Grants program should maintain funding levels for new applicants to assure adequate replacement of the increasing numbers of senior researchers taking retirement. Professors emeriti and other non-standard appointees should continue to be eligible for funding under the program.

Response

Growth in New Applicants

The ongoing growth and renewal in the university community represent an important challenge for the program, NSERC, universities and indeed the entire innovation system in Canada. In the 2003 competition, there were 894 first-time applicants (up from 759 in 2002 and 641 in 2001). Half of these are proven researchers with track records in academia, industry or government research (NSERCCContact, January 2003, page 2). High quality people are being attracted to our universities; they want to do research and are qualified to do so. We have to provide adequate resources early in their career for them to be productive and to develop stimulating training environments.

NSERC's analysis of the supply and demand data for professors in the natural sciences and engineering for this decade suggests that the available supply of PhDs may not meet demand. The university sector may have to compete with others to replace retiring faculty and ensure growth in the professoriate. In this context, we believe the program will become increasingly important nationally and internationally to help attract and retain qualified professionals in universities, particularly new professors.

The program has a critical role to play in supporting the renewal of the research base and supporting our Government's strategy to "develop the most skilled and talented labour force in the world". Thus, our Government and Council have made funding for new applicants a priority. Increases to NSERC's budget have allowed Council to commit a separate funding envelope of \$12.5M per year for new applicants for 2002-2005. Council's commitment is demonstrated by the following competition statistics: for new applicants, a total of \$20M was awarded in 20036;



up from \$6.6M in 1999. During the same period, the average grant for new applicants increased from \$19.8K to \$23.8K, and the success rate increased from 65.6% to 74.5%. NSERC is unique in placing so much emphasis on new applicants within the program, a known place to start for young researchers. New applicants fare quite well within the program, and the impact of this investment is significant, with the productivity of new grantees doubling during their first grant and that of non-funded new researchers stagnating.*

Women in Science and Engineering

An important finding noted in the Report is that new researchers have a higher proportion of females than the total applicant population (about 20% of new applicants in the last four competitions versus about 15% of all applicants).* There are increasing numbers of women starting careers as university researchers and the proportion of women in all degree programs (from undergraduate to Ph.D.) has been rising steadily. There is a wave of women in science and engineering progressing through the Canadian university system, and by the end of the decade there will be many more women professors in these areas (NSERCContact, Fall 2002, page 3). This is particularly important given the predicted increase in demand for PhDs in all sectors during this decade.

NSERC compared the success rates and average grants for men and women who were new applicants to the program from 1999-2003. In 1999, the success rate for women in this category was lower than for men (55.5% versus 69.3%), but from 2000-2003 the success rates for both groups were higher and more similar to each other. The overall success rates for that four-year period were 75.5% for men and 72.3% for women. Similarly, there has been very little difference in the average grant size for men and women during the five-year period. The overall average grant for men was \$22.4K and for women it was \$21.9K. NSERC will continue to monitor the treatment of women applicants in the program and we will work to ensure that women are fully included in science and engineering research.

Non-standard Appointments and Eligibility Criteria

NSERC continues to consider Professors Emeritus and Adjuncts eligible for funding. We have looked at this issue many times over the years, particularly in the early 1990s when there was a significant increase in retirements and the number of applications from Professors Emeritus. The situation now appears stable, with the proportion of these applications being consistently small (Adjuncts represented 4-6% and Professors Emeritus 3-5% of applications from 1999-2003). NSERC carefully monitors these categories of applicants, a unique approach compared to other programs internationally. Our policies and guidelines for these applicants do not allow for special treatment, but rather ensure that they are able to compete on a level playing field against others according to the four criteria.

We concur with interviewees that those with non-standard appointments should not be excluded in principle providing they are productive* and that their appointments meet NSERC's eligibility criteria.



Appendix 1 – Areas for More Study

The findings for three outcomes of the program (support for high-risk research, socio-economic impacts in engineering and applied science, and leveraging of funds from other sources) require further study.

1. High-risk research

The Report found that funded researchers feel that the program is mildly encouraging of high-risk research, and unfunded researchers feel it is discouraging. Analyses conducted by NSERC suggest that in fact the program may be encouraging of high-risk research.

The Report did not address the three main questions regarding high-risk research (what is high-risk research, will researchers submit proposals for high-risk research to the program, and does the program award grants for high-risk research?) because no agreement emerged on the definition of high-risk research.

NSERC views research that is far ahead of the leading edge of established knowledge as having a higher risk of a negative result, much higher than research done to improve existing results or to fill gaps in existing knowledge. Such research is worthwhile, because there is a greater chance of making large leaps in knowledge if successful. Moreover, negative results of competent research are often also valuable as they identify ‘dead-ends’, but because negative results are not published, too few other researchers are informed of them (NSERCContact, Fall 2002, page 2). The flexibility in the thrust of the research allowed through the Discovery Grants makes it possible for researchers to conduct some high-risk research. As this might not always be evident to applicants, NSERC will investigate ways to better communicate and consider this aspect as part of the application process.

Interestingly, the evaluation found that research that is self-assessed as high risk is not always perceived as such by others,* thus making any objective assessment of high-risk research particularly challenging. While the self-assessment data do not provide an objective measure of high-risk research, they likely provide a relative indication of degree of risk (i.e., on the whole those researchers who view their research as high-risk probably do higher risk research than those who rate their research as low risk). On a scale of 1-7 (1-low, 4-medium and 7-high) most grantees rate the risk of their research activities in the 4-6 range, with small percentages rating their research as high risk or low risk. NSERC found that this pattern was very similar across all five discipline groupings. This distribution seems to be appropriate given the program’s objective of training HQP. We would not expect Discovery Grants to always support high-risk research, but certainly the program should not discourage it where appropriate.

Using the self-assessment data obtained in the evaluation, the percentage of researchers holding a grant and average grants across low risk, medium risk and high-risk research groups were compared. We found that over 90% of researchers who rate their research as high-risk (6-7/7)



hold a grant. This percentage was the same as, and sometimes slightly higher than, the percentages of researchers holding a grant in the low-risk and medium-risk categories (1-5/7). Also, the grant average for self-identified high-risk researchers is significantly higher than that of low and medium-risk researchers (the average grant in the low risk category was about \$24,000 compared to about \$35,000 for high risk). These are very encouraging results that warrant more study.

2. Socio-economic Impacts

The Report found only marginal differences between funded and non-funded researchers' reports of the socio-economic impacts of their work, with non-funded researchers citing slightly more major contributions. It should be noted that non-funded researchers reported socio-economic impacts of all their activities, whereas grantees reported impacts only from research funded by the program.

As noted in the Report, socio-economic impacts are not an explicit objective of the program, but are obviously important and meaningful long-term outcomes of basic research. In the Report, socio-economic impacts included the type of contributions that would be expected in engineering and applied sciences (i.e., patents and licenses, new or improved products or processes, changes to policies or standards, etc.).

Not surprisingly, NSERC found that funded researchers in Engineering and Computing were more likely than those in other disciplines to report major contributions to the development of new/improved products/processes, creation of spin-off companies, patents and licenses, changes to policies/standards, and further R&D investments. For health prevention/treatment the Life Sciences and Interdisciplinary group was the most likely to report minor and major contributions, followed closely by Engineering and Computing. Funded researchers in Engineering and Computing were slightly more likely than their unfunded counterparts to report major contributions to the following: spin-off companies, patents and licenses, further R&D investments, health prevention and treatment and benefits for society (although the differences were sometimes very small).

These trends for socio-economic indicators suggest that further study would help to clarify the important contributions and impact of funded researchers in engineering and applied science.

3. Leveraging

The program is generally thought to have a positive impact on researchers' ability to leverage funding from provincial governments, the federal government and industry.

While we are pleased that the quantitative data in the evaluation confirm this is true for Engineering and Computing and Mathematics and Statistics, we recognize that there are considerable differences between disciplines and that leveraging can be more limited in some disciplines. We are surprised that in the Life Sciences there appears to be no impact, with non-



grantees' total funding exceeding that of grantees. In the Physical Sciences the effect was essentially neutral (grantees and non-grantees had about the same total funding from all sources).^{*} Further studies will be conducted to find out more about this discrepancy. Discipline groupings are quite broad and it may be instructive to look at leveraging trends within specific GSCs to determine if this is an issue only in specific areas. Also, the analyses in the evaluation excluded about 7% of funded respondents who reported having total funding of \$500K or more. The leveraging trends for this exceptional group should also be examined.

1 The program's name was changed to 'Discovery Grants' during the course of the evaluation. The report from Hickling, Arthurs and Low refers to 'Research Grants'. In this response, 'the program' or 'Discovery Grants' is used.

2 NSERC program data included in the study was for the year 2000-2001.

3 Periodically, up to 10% of the program's budget is reallocated amongst the GSCs based on priorities in written submissions from the various discipline communities. These submissions are reviewed by international experts and Canadian users, as well as by NSERC's broadly-based Reallocations Committee.

4 Researchers with total funding from all sources of \$500K or more were excluded from this analysis.

5 The selection criteria are: Scientific or Engineering Excellence of the Researcher(s), Merit of the Proposal, Contribution to the Training of Highly Qualified Personnel, and Need for Funds.

6 \$12.5M from the envelope for new applicants; \$2.3M from reallocated funds earmarked for new applicants; and the remaining \$5.2M from the existing budget for all applicants.