

Letter to the Editor

NSERC: A VIEW FROM THE OTHER SIDE OF THE TABLE

Dear Editor,

How does the research (formerly operating) grant system work? To some outsiders, the grant selection committee seems out of touch with the "real" world of science, sending out a message couched in the language of the dollar sign. The role portrayed is adversarial, not supportive, and the annual message can be devastating or exhilarating.

From the other side of the table, the reading and evaluation of some 300 proposals leaves the committee with a great deal of hope. *We have a large number of first-rate Earth scientists in Canada*, and the task of evaluating their applications is inspiring. Although there is a wealth of talent, there is also diminishing financial support in real dollar terms; this is the reality that all of us must face. How the grant selection committee views the NSERC selection process in the face of this dilemma, and their comments for the benefit of the scientific community, are the subjects of this correspondence.

Before dealing with the most frequently asked questions about the review process, some background is provided about recent funding trends. The Earth Sciences committee received an extraordinary injection of funds during the years 1988–1990. At this time, however, new monies for renewal grants are non-existent, and the current level of funding falls far below that needed. As such, the research grant system must be selective in its funding, meaning that the application procedure is truly a competition.

There was a significant change in the budgetary process this year, and we will outline the procedures for 1990–91 and for 1991–92.

1990–91 Budget. New applicants were funded from their own budget that derived from the money released by retiring grant holders and from new money. Renewal applicants were funded on a zero-base budget. Thus, for renewals, the total funds received by all applicants in the competition three years ago was the amount available for allocation in the current competition; there was no adjustment for inflation. What did this mean to the individual? *Any increase in funds allocated to applicant A had to be deducted from the grant of applicant B.* So, if you submitted an application for renewal of funding and your grant was increased, funds had to come from another applicant who was judged to be less "competitive". Similarly, if you at one time held a research grant that was not renewed and you now re-applied, any funds awarded to you came from those who held grants and entered the same competition. Note that in this competition, the new applicants were not in competition with renewal applicants. The success rates in the two groups were ~50% for new applicants and ~90% for renewals in Solid Earth Sciences.

1991–92 Budget. This year, there were 900 new applicants, but only 200 retirees across all of Science and Engineering, and, despite some additional federal funds, the money available for new applicants was completely incommensurate with their number. Solid Earth Sciences had no budget for new applicants this year and, consequently, new applicants had to be funded out of the renewal budget, essentially in competition with renewal applicants. This had the effect of reducing the money available for renewals to 94% of that currently held by these applicants. Thus, the competition this year was far more severe than in previous years. The success rate for new applicants was 42% and for renewals, 92%. We emphasize that in not having any budget for new applicants, the Solid Earth Sciences were not treated unfairly in the overall budget process. We have a relatively small number of new applicants. Committees with far more new applicants did have some new money assigned to them, but, in all cases, had to use more of their renewal budget to augment their new applicant budget.

Given these realities in funding and the increasing numbers of highly qualified Earth scientists requesting support, NSERC, through its grant selection committees, has a difficult task that often prompts the following questions or comments from the research community.

What is the constitution of the grant selection committee? The committee has expertise in most subdisciplines with the Earth Sciences, with representatives from university, industrial and government sectors. Each member normally serves for three years, hence, one-third of the committee changes each year. For three-year grant holders, this means that your next renewal request will be handled by a completely different committee. Nominations are made by the committee members themselves, by universities (usually via the Vice-President (Research)), by the industrial and government sectors, and by individual members of the community. The selection of committee members is made by NSERC staff following extensive consultation with the research community. The general philosophy is that any anomalies will tend to be ironed out by the varied constitution of the committee over a period of time.

What is the role of the grant selection committee? Given a budget for research grants of about the same level as that of three years ago, and a budget for equipment grants equal to about 35% of the total equipment funds requested, it is up to the committee to support and encourage as much high-quality science as possible in Canadian universities. Our system is based on extensive national and international peer review, and supports the researcher to the maximum extent possible in the light of constrained budgets, *irrespective of the research area.* No distinction is made on the basis of applied versus basic research. The committee, in its evaluation, looks at three distinct aspects: 1) the calibre of the individual as a researcher; 2) the nature of the research as outlined in the applicant's proposal; and 3) the demonstrated need for funds. Canada gets kudos from around the world for this system, which is characterized by the relative simplicity of its application procedures, the high percentage of scientists who receive funding (usually in excess of 70% of those who apply) and, *most important*, the flexibility available to the applicants in the use of grant funds.

What is the situation for a researcher starting in the system? About four years ago, it became general policy that new applicants should have enough funds to get their research programs underway. In 1991, an average starter grant was about \$20,000 per year for three years, when funds for the new applicants came out of special NSERC funds and not out of the committee's renewal budget. In 1992, the situation was far more competitive; several new applicants had less demonstrated need for funds than was the case in 1991, and the average starter grant was \$16,500 per year for three years. After their first three years of funding, erstwhile new applicants will enter the competition with all others seeking renewed funding. In the past, *about half of these received a substantial cut or complete loss of funds* after their first three years, because they had not lived up to expectations and were not competitive with other renewal applicants.

During my last granting period, I published five refereed papers, supervised six graduate students, and was an invited speaker at three international conferences, yet my grant remained the same; why? In the last competition, there were 150 applicants in the Solid Earth Sciences who had similar records, and there are no additional funds available for the next three years. There is a strong emphasis on the quality and impact of research produced: the committee makes its judgment based on the papers an applicant submitted to them for review, that applicant's total documented contributions *and* the impact they have had on the Earth Sciences, and the comments by external referees.

My external referees were almost unanimously favourable, yet I received a reduced (or no) award; why? External referee reports are only one of several factors in the evaluation of an applicant and, as such, are neither definitive nor damning by themselves. Most external referee reports tend to be positive and favourable. A balanced review with specific reference to the proposal is more effective than a general, but glowing, review. The grant selection committee must take into account a range of factors, often including the identity of the external referees (some referees *never* give a critical review), the expertise of the referee, the breadth of the subdiscipline, and the objectivity of a critical reviewer who disagrees strongly with the work or conclusions of a colleague. We emphasize that the external referees evaluate the *applicant and proposal* in isolation, whereas the committee evaluates *applicant and application* in comparison with other competing applications and under severe budgetary constraints. For example, a large number of referees urge us to "fund this application in full"; virtually nobody is actually funded in full, as to do so would require at least double our budget.

Are there anomalies in the grant system? Yes, there are anomalies from time to time, because no committee is perfect. Recommendations by the committee are based on the best possible information available, including that provided by the applicants in their proposals and their personal data forms, reports from external referees, site visits, and the collective "wisdom" of the 12–14 committee members who operate by consensus. Grants are awarded to provide the most effective financial support within the constraints of the current budget limitations.

What is the rationale for the new personal data forms? A new personal data form was instituted for the 1991 competition. This gave applicants the chance to be far more explicit about the significance of their contributions to the Earth Sciences. Some used this to their advantage, as was its design. Others were puzzled by the new form and simply re-iterated what was in the body of their application. You can select your five best papers and point out their importance and significance to the entire Earth Science community; many failed to do so, leaving the committee uncertain as to the personal impact of the applicant on the team science. You can emphasize the contributions you made to and derived from your graduate students; this was often left out. As with all NSERC forms, *follow the guidelines using an appropriate font of the right size!* The new personal data form is to familiarize the committee with aspects of your research that are not apparent in your list of publications or research proposal.

What is the purpose of site visits? The site visit is one of NSERC's methods to determine the health of the science and the health of university departments, to explain NSERC policies to the scientific community, and to receive comments from individual scientists. Attendance at the site visit sessions and presentation of a thorough, but succinct, review of your work and its significance are to your advantage.

My NSERC grant is substantially smaller than Joe Smith's or Jane Doe's; why? Many people in the science community wrongly regard the size of a grant as the measure of the quality of the science or the scientific stature of the grantee. A salutary lesson from being on the committee for several years is that *grant size is not directly proportional to quality or stature*. Some of the most original and innovative thinkers have an average or below average grant, in part, because a *grant is also based on need*. Some require only a piece of paper and a personal computer, whereas others require mass spectrometers or helicopter time. When the community considers grant size, it should look at the nature of the proposal, the subdiscipline, and the requirements for doing the research. It should be emphasized that NSERC research grants are intended to *partially support* the programs of most researchers. Complementary parts of a researcher's total program can be funded elsewhere (e.g., via LITHOPROBE, Strategic, EMR, etc.) provided the components of the program are distinct.

My present grant is inadequate and hampering my research; how do I increase my grant? The committee members are on your

side; give them a hand! Write a clear, succinct proposal identifying the significance of your research and its importance to both the Earth Sciences in general and to your subdiscipline in particular. Specific information about *how* and *why* a particular area of research is to be pursued is crucial, especially if it represents a departure from your previous efforts. Outline a specific budget and *do not inflate* the figures; this can be as damaging to your application as inaccurate scientific statements. Identify the individuals whose salaries you intend to underwrite, either by name or role. Because there are only six pages in which to outline and justify your research, spend a number of days preparing your application, thinking about each aspect carefully, editing, revising and re-editing. *Read and follow* the guidelines in the instructions. Remember that your application will be reviewed by more than a dozen committee members who scrutinize every word and go over the import of every line, who scan all your contributions during the previous six years (and particularly during the previous three) and who must make a judgment to the best of their ability, given all the available data. Proposals compete with each other, so that those that are well written and easy to understand have a much better chance than those that confuse or obfuscate.

Where do I stand with respect to the Solid Earth Sciences community? There were 150 applicants for the 1991 Solid Earth Sciences research grant competition of which 74% were funded. About 18% of the applicants were new to the system. This is a high figure and indicates increasing competition in the science marketplace. About 43% of the community have a less-than-average grant (less than \$27,000), including those who received no award. This indicates that a great number of your colleagues are inadequately funded, especially since only 22% of the community have a grant greater than \$30,000.

Many see the role of NSERC as adversarial. The primary role of both NSERC and the grant selection committee is to nurture excellent science, and to provide support and encouragement, with the overriding constraint of budget limitations. In this light, both the committee and NSERC try to be positive and optimistic, and to provide guidance *via* comment letters to applicants whose grants have been significantly reduced or whom the committee feel could benefit from knowing some of the aspects of the committee's discussion of their applications.

NSERC tries to be responsive to the need of the Earth Science research community. The monies at its disposal are limited. Canada spends much less on research (about 1.3% of its Gross National Product) than other industrialized nations. There are bound to be those with larger research grants, as this is inevitable in any system. NSERC tries to sponsor both *little* and *big* science of high quality, and these must go positively hand-in-hand, as the latter is often built on the former. The criticism is often made that NSERC funds primarily the "star" or "high flyers"; a glance at the statistics reveals a different story. For example, if all research grants were limited to less than \$50,000, the grants of the other applicants would rise by \$1600 (for those in the 1991–92 group).

It is important to remember that the system is selective and highly competitive. It is this latter aspect that is most difficult to explain, as only the committee can see with whom you are in competition for funds. However, every member of the committee is concerned that every application is treated in as fair and even-handed a manner as possible. Every serving and past member of the committee is impressed by the integrity of the process; each member of the committee is keenly aware of their responsibility to the community, and the evaluation process is continually monitored by NSERC staff. Yes, errors of judgment obviously do occur despite everyone's efforts, but there is also the appeal process in which compelling cases can be reconsidered. The integrity and effectiveness of the process is high, and is the envy of many other countries.