Biochemistry and Cell Biology

OPEN ACCESS | Editorial

20 years of choices: a fight for increased funding for graduate students

Fabian Rohden[a,b], **Thomas Bailey**[c,d], **and Sarah Laframboise**[d,e,f]

[a]Canadian Society for Molecular Biosciences (CSMB), Ottawa, ON, Canada; [b]Department of Microbiology, University of Manitoba, Winnipeg, MB, Canada; [c]Department of Physics, University of Ottawa, Ottawa, ON, Canada; [d]Ottawa Science Policy Network (OSPN), Ottawa, ON, Canada; [e]Support our Science (SOS), Ottawa, ON, Canada; [f]Institute of Systems Biology, University of Ottawa, Ottawa, ON, Canada

Corresponding authors: **Fabian Rohden** (email: rohdenf@myumanitoba.ca) and **Sarah Laframboise** (email: slafr074@uottawa.ca)

Abstract

After 20 years of stagnation, federal scholarships have finally been increased within the new budget of the Canadian government. Tuition fees, inflation, and costs of living kept rising, which has resulted a rising number of graduate students in the life sciences living below poverty line, despite working far more than 40 h a week on science research in Canada. This does not only negatively affect the students research projects and thus science and innovation in Canada, but also their downstream decisions on whether to continue a research career in Canada and what jobs and economic endeavors to pursue. Graduate students are not just a line item in the budgets of universities, but integral for science and innovation, as well as the future high-quality personnel of the country. This importance should be reflected in all stipends and salaries of graduate students, not just the ones with a government scholarship.

Key words: science funding, graduate students, science policy, Tri-Council

The financial struggles faced by Canadian graduate students and postdoctoral scholars have been featured prominently in the media, showing students living in cars, accessing clinical trials for additional funds, or dropping out of their studies entirely. Luis Ramirez, a master's student at Simon Fraser University told CBC News in May: "We have to pay rent, we have to pay tuition, and we have to pay groceries and clothing and so on. So it is almost impossible to continue with this." With their average income sitting below the poverty line, the majority of these next-generation researchers are struggling to pay for basic costs of living. Graduate students and postdoctoral scholars make up our future workforce of engineers, healthcare researchers, and climate scientists. Their academic pursuits investigate solutions for the grand challenges of today and tomorrow. Canada should treat them as an investment rather than an expenditure. While the remainder of this article will focus on graduate students, the situation for postdoctoral scholars has many similarities.

How did we get here?

The federal granting councils, composed of the Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council (NSERC), and the Social Sciences and Humanities Research Council (SSHRC), offer federal scholarships for graduate students at the Master's and PhD level, as well as fellowships for postdoctoral scholars. The awards, set to internationally competitive values in 2003, originated as a way to increase high-quality research training and ensure a reliable supply of highly qualified personnel for Canada's knowledge economy. Over 20 years later, these awards had fallen by 35% in real terms, due to inflation, while tuition has risen (in physical and life sciences). As these awards help set a benchmark level of the appropriate financial support for all researchers—including the vast majority who receive funding indirectly through research grants—this has helped contribute to pushing increasing numbers of graduate students deeper below the poverty line. In addition, there is a wide variety in the standards of funding available to students both by their institution and area of research—with those in the social sciences and humanities often living with much less security and lower funding levels.

Previous efforts have pushed for increases to these awards over the last 10 years, including the #Students4TheReport movement following David Naylor's Fundamental Science Review in 2015, which resulted in a small increase to the number of Master's level federal scholarships. However, without adjustments for inflation the value of these awards continued to erode, especially following the pandemic. In 2022, Support Our Science was born out of a need for a unified grassroots movement advocating for increased funding to graduate students and postdocs. The group held rallies in Ottawa and Montreal in 2022, as well as a nation-wide walkout

on 1 May 2023. This brought together 10 000 graduate students, postdocs, faculty, and supporters to walk out of 46 institutions across Canada. Since then, a series of events have put increased pressure on the government to provide tangible solutions for a community that has been left behind for too long. This includes two studies by the Standing Committee on Science and Research, titled Retaining Top Talent and Graduate Student Scholarships and Postdoctoral Fellowships, as well as Frédéric Bouchard's Report on the Federal Research Support System. The Ottawa Science Policy Network also released a study on the financial challenges facing graduate students in 2023 providing quantitative data on graduate student financials in Canada. All of them highlighted the concerns for our next-generation researchers.

Recently, this amalgamated into a Coalition for Canadian Research that brought together several prominent organizations, such as Evidence for Democracy, Universities Canada, and U15. This unified front drafted an open letter to Prime Minister Trudeau and Chrystia Freeland calling for increased funding to scholarships, fellowships, and grants. The combined advocacy efforts for increased funding to research and next-generation researchers, have highlighted a critical oversight in the Canadian research ecosystem. Neglect in funding has reached a tipping point and is starting to cause a fallout of effects throughout the system. Decisions are being made at all levels of government and academia to cope with the low funding levels. These decisions and adaptations are necessary in the short term to keep Canadian research operating, but all too often they leave behind our next generation of researchers. Therefore, our innovators, researchers, and scientists are moving their talents abroad. "I couldn't continue in science unless I left the country after my PhD. It just wasn't financially feasible. What people don't realize is the way that funding structures in Canada work is really not sustainable." , said Dr. Sivani Baskaran, a postdoc at Norwegian Geotechnical Institute university in Oslo, Norway, told the Globe and Mail. The article states that federal scholarships for postdocs are at CAD$45 000 a year, compared to US$53 000 in the United States (equalling CAD$70 000).

The continuous and joint efforts from all stakeholders within the Canadian scientific community have led to some results, with an increase to federal scholarships and fellowships, as has been announced in the federal Budget 2024. Tri-Councils scholarships for individual students will be set to the following amounts per year:

Master students:	$27 000	(before: $17 500)
PhD students:	$40 000	(before: $21 000–$35 000)
Postdoctoral fellows:	$70 000	(before: $45 000)

While these increases are huge and a big victory for science in Canada, one must keep in mind that the values above only make Canada catch up with the current funding levels in the United States, highlighting the large disparity that had been created by 20 years of negligence. In addition, only a fraction of graduate students received a federal award. While these are important signals by which every student stipend is measured for most students there will be no direct change.

Canada is not fostering its next generation of researchers

Rising tuition and inflation, combined with stagnating funding, have made the financial situation of graduate students worse compared to previous years and peer countries, yet the number of graduate students in Canada has been continuously increasing. The continuous growth in graduate students has two main factors: First, there is the general trend of increasing levels of education, creating a situation where a graduate level qualification fulfills a similar economic and cultural role that an undergraduate degree did several decades ago. Second, there has been a sharp rise in international students at Canadian universities, from 6786 PhD students in 2004 to 23 760 in 2022. This push factor stems from the fact that developing countries have growing middle classes, resulting in a larger pool of people interested in and able to obtain a degree and/or a permanent residence within a developed country, especially one that has English as their primary language. This demand has enabled the continuing rise of tuition fees, which coupled with the stagnation of stipends, is creating a shift where only the most financially privileged are able to pursue graduate studies.

The positive effects of this trend are a highly educated society, immigration of highly skilled and motivated workers, and more revenues for universities. However, graduate students themselves have been a victim of the unseen consequences of these trends. For the average graduate student, the financial situation has worsened and students are six times more likely to suffer mental health issues than peers of the same age who are not attending university. It starts with the lack of money, which forces students to take up loans and/or do other work, either within the university (teaching assistant, test marking, etc.) or outside. This is particularly difficult as graduate studies are not a typical 40 h/week job; you have to be mentally fully engaged and often spend the evenings and weekends working as well. Every work hour spent at another job is an hour not going into research, thus increasing the chance of a degree taking longer. Scholarships for students are given for the idealized time frame to finish a degree, e.g., 3 years in the case of a PhD student. These funding cycles mean that students often do not get paid (or in the best case receive significantly less) at the end of their degree while still performing research and paying tuition.

Aside from trying to obtain a degree while making ends meet, students often are starting a family and/or are trying to obtain permanent residency, two things that also come with a significant time tax. At the same time there is a push toward being more productive and innovative. Policymakers are rightfully disappointed when they do not see that an increase in science funding translates into a clear increase in economic return. In response universities are establishing offices and initiatives to increase the number of startups, industry collaborations, and patents coming out of the universities. These are good goals, but the foundation for all this, and the guaranteed return on investment in research, is a highly trained workforce of graduate students. If a student is already facing financial challenges and their future in the job market

is unstable, they will not have the ability, financially or mentally, to spend their extra time starting a business. Students should be challenged, but even the best and most motivated simply cannot walk the extra mile on top of a marathon. The biggest loser in the system may not be the graduate students, but Canada's capacity for excellency in research and innovation.

Choices of stakeholders within the system

While we fully support the increase in science funding from the government, money alone cannot fix all problems. The role of different actors within the Canadian science funding ecosystem and the choices they (must) make are of equal importance.

The vast majority of funding for research comes from the Federal Government and is allocated through the Tri-Councils of CIHR, SSHRC, and NSERC. These agencies are responsible for the distribution of several billion dollars each year with the mandate to "promote and assist research" in Canada. This broad mandate must be interpreted to balance the sometimes competing needs of producing research of scientific excellence, building the capacity of the Canadian research community, and ensuring that the maximum value for the taxpayer can be obtained. These are all worthy objectives but ultimately mean the Tri-Councils are responsible for the generation of scientific research in total and cannot have the financial wellbeing and sustainability of graduate students as their only priority. Professor Maydianne Andrade from the University of Toronto noted in the Globe and Mail that the scholarship she received "more than 20 years ago, roughly $21 000, was worth about the same as some of the federal awards available today" (before the new budget announcement).

As such, Tri-Councils must make decisions every year about what the best use of their budgets is. For example, they must decide how many scholarships to award and what the value of these scholarships should be. Given the rise in the numbers of graduate students in Canada, priority has been given to expand the number of students able to benefit by increasing the number of scholarships, e.g., by additional 500 master's and 167 three-year doctoral scholarship awards through the Canada Graduate Scholarship in the federal budget of 2019. This, however, also meant that the individual scholarships have been eaten up by inflation and rising tuition.

Compounding this, every dollar that is not allocated toward scholarships is a dollar the Tri-Councils are able to instead put toward other grants supporting research in Canada. And while a significant proportion of these grants are used indirectly to support graduate students—to win these competitive awards group leaders must show a record of and plan for future research excellence. This has the incentive to encourage research groups to maximize the number of students (to enable the production of more research and increase the chance of winning future grants), forcing supervisors to pay the minimum possible to each student. The "minimum possible" is often a minimum amount set by departments or graduate programs, but these values are often below poverty line, especially after taking tuition and cost of living into account. Even when group leaders push against these incentives and are committed to providing their graduate students with a fair stipend, this can be held against them in the grant review process—with some reviewers reportedly considering $30 000/year for a PhD student an excessive expenditure that is not providing value for money to the taxpayer.

The Tri-Councils are also finding themselves partly responsible for patching up the lack of provincial support that universities are receiving. Many departments or professors set minimum funding levels net of tuition as this reflects the actual amounts that their students receive. As tuition has been increased by universities (partly to compensate for stagnating or declining provincial support), this has led to an even larger share of research grants being effectively funneled into university budgets—providing an implicit federal subsidy for what is nominally under provincial jurisdiction. While in principle this is not problematic—universities do provide significant infrastructure to enable effective research to be carried out in Canada—it also suggests that there could perhaps be a greater federal role in overseeing university decisions affecting graduate students, especially with regard to tuition fees.

At the university level, these institutions are centered around undergraduate and course-based master's students. They make up the vast majority of students and thus the tuition income of universities. Tuition in turn is the source of income that universities can easily increase to pay for their expenses, with the exception of Ontario where there is a freeze on national tuition in place. Universities have grown at a rapid pace and the demand for new buildings, larger classrooms, laboratories, additional food courts, increased gym space, and so on has turned universities into permanent construction sites. The same counts for the number of administrators employed. The quality and quantity of services offered by universities has been increasing, from campus security, recreation and childcare to international centers, time management workshops, and unconscious bias awareness classes. Universities are in a race to the top to provide the largest and best amount of services to attract students as they need their numbers and tuition to sustain the whole system.

On the balance sheets of university accounts, science research-focused graduate students are, like scientific research in general, often a net expenditure to the university. While tuition may be higher for a graduate student than for an undergraduate, the latter can be stacked up in classrooms by the dozen and must take many courses for which they pay additional fees. As graduate students are working at the university all day, they pay less tuition for courses and worse, require a lot of space. In terms of students/m^2 no office or laboratory can compete with a lecture hall. Taken together, all this means that graduate students are not and will not be a financial priority for universities.

In most cases, graduate students are being paid by the professor for whom they are conducting research. This money comes from the research funds of the professor, which are

required to keep their laboratory running. Every dollar spent on a graduate student is a dollar not spent on equipment, reagents, or other lab expenses. This puts professors in the uncomfortable position of having to decide how much to pay their students and how much of her own funds to use for other expenses instead. The choice can often be along the lines "do I pay three students $20 000 or instead pay four students $15 000 a year." The answer will mostly tilt toward the second option, as more graduate students mean more research output. High research output is needed to maintain a professor's research fund, as applications for research grants are highly competitive and previous research output being the main parameter for the Tri-Council to decide who will get money. Professors hence must be frugal with their allocated research money and often are unable to be overly generous.

Graduate students are highly skilled and since they work far more than the usual 40 h a week, they can do duties like lab maintenance and management or grant writing on the side. This often works out for the laboratory, but it puts yet more workload on the students that does not go into their thesis research. And in the bigger picture, it increases the number of graduate students while at the same time reducing the amount of jobs within academia these graduate students can apply for after their graduation.

Where do we go from here?

The federal government provides a benchmark for graduate student and postdoc pay since it sets the values for direct scholarships and fellowships provided through the Tri-Councils. These scholarships, which are received by less than one third of all graduate students, had to change first to set a standard for stipends coming through the other funding streams. Many graduate students and postdocs receive their salaries indirectly through grants given to their professors. These types of funding can originate from federal, provincial, academic, and industrial sources. **Decisions must be made at all levels to ensure that any increases in funding are able to reach next-generation researchers.** With the federal budget for 2024 having set new standards for the direct scholarships, this now needs to tickle down to the indirect grants (which will also see significant increases over the next 5 years). Instead of $30 000/year for a PhD student being considered "excessive'', professors should be able to ask for $40 000/year for a PhD student in their grant applications, without getting scolded or having this number reduced without reasonable justification.

Improving the situation does not have to purely be in the form of additional funding. Creative regulations and incentives are also needed to ensure sustainable changes to the funding system as a whole. For example, universities and departments could be encouraged to have their internal minimum stipends publicly available on their webpages, together with information on tuition, costs of living around their campus, and the respective monetary values of grants/awards typically available to a student. This would provide much needed data on the large disparities between cities, universities, and departments, as every outcry about graduate student's financial situation gets blocked by the arguments of "there is a lot of variation" and "there is not enough data". It would also put the spotlight on departments and universities whose settings of minimal stipends is way below the poverty line. Having more transparency would help to get a clear picture and allow for surgical action where action is needed the most.

This funding crisis has also highlighted a systemic problem of lack of engagement of scientists in parliamentary process and decision making. We need more champions of science at all levels of government, academia, industry, and beyond. The salaries of graduate students and postdocs are directly impacted by research funding policy changes yet there are no dedicated positions on Tri-Councils for these next-generation researchers. Representation of these groups is required to create diverse and sustainable systems that work for the communities they serve. Most graduate students living below the poverty line and accumulating debt will not result in a vanishing of graduate studies. Rather, getting a graduate degree will continue to become more and more dependant on the financial situation of the student than of her capabilities. On top of this equity issue, after graduating, these high-quality personnel will more and more opt to work in secure jobs within government and administration to pay of their debt and start a life. They will not join start-ups and young companies, continue their scientific career as a postdoctoral fellow (at least not in Canada), or engage in other jobs that are less secure and/or have comparatively low salaries. While underpaying graduate students is beneficial for both university and government budgets, these choices will negatively impact the economy and innovative power of Canada in the long run.

Article information

History dates
Received: 12 February 2024
Accepted: 24 May 2024
Version of record online: 27 August 2024

Data availability
This manuscript does not report data. All statements cited in this study stem from publicly available sources provided via hyperlinks within the text.

Author information

Author ORCIDs
Fabian Rohden https://orcid.org/0000-0002-9650-1269
Sarah Laframboise https://orcid.org/0000-0003-1731-4391

Author notes

Fabian Rohden, Thomas Bailey, and Sarah Laframboise contributed equally to this work.

Author contributions

Conceptualization: FR, TB, SL
Writing – original draft: FR, TB, SL
Writing – review & editing: FR, TB, SL

Competing interests

The authors declare there are no competing interests.

Funding information

There are no funding sources for this manuscript, but the authors thankfully acknowledge that this article is made open access through the Canadian Research Knowledge Network (CRKN).