



# CMS NOTES de la SMC

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**Miroslav Lovric**

*Chair, Education Committee*

[Note: in this article, when we say “mathematics” we mean “mathematics and statistics”.]

According to the CMS page, “The CMS Education Committee is involved in a wide range of activities, from supporting mathematical education in secondary schools, universities, colleges and cegeps, to encouraging the public and young people to appreciate and engage with mathematics.” In this article I plan to comment on some of these activities, and share my thoughts and ideas about the work of the Committee.

There are two distinct populations related to mathematics education at the university level. Population 1 consists of a large number of faculty (based in mathematics departments) involved in teaching university courses in mathematics, most of whom are not engaged in mathematics education research. This population can be further divided into those whose primary duties involve research in mathematics (“research faculty”) and those (“teaching faculty”) who are primarily teaching, such as teaching stream, lecturers, contractual, sessional, and part-time faculty. Population 2 consists of faculty members based in faculties of education, who are primarily researchers in math education (at K-16), and who (with possibly a very few exceptions) do not teach university mathematics courses. The collaboration between these two populations is desired, has been shown to be mutually beneficial, and it does exist on a small scale.

The primary role of the CMS education efforts must be to serve population 1, and in particular, the teaching faculty. A major reason is that the research faculty from population 1 and population 2 members have a well-developed infrastructure of organizations, conferences, grant support, publications, etc., that serve their needs and interests. Population 1 teaching faculty members have very few of these opportunities within Canada. For instance, whereas a large majority of university research mathematicians and population 2 members are able to cover their conference expenses through their grants, their university math teaching faculty colleagues have to combine their professional development funds with their own money – for some, the CMS membership fee, CMS conference registration and travel already add up to more money than what they have available in their professional development funds for an entire year.

In order to enable this large population of teaching faculty to attend the in-person meetings, I believe that CMS should rethink the conference registration prices, and significantly reduce them for this population. As well, there is a concern I've heard many times: CMS membership fees are high, but what are the benefits of being a CMS member? Definitely something to think about.

The Meetings Oversight Committee is in charge of education sessions at the in-person Summer and Winter CMS Meetings, and organizes the annual, two-day Math Education Online Meeting. Education sessions have become a fairly standard feature of CMS in-person meetings: a typical meeting has about 2-3 education sessions, with anywhere from 20 to 70-80 participants. The Math Education Online Meeting easily attracts close to a hundred people. Although attendance numbers look sound, a critical look suggests that there is space for improvement.

First, there is very little to no quality control of the education session proposals (basically almost every proposal is accepted). The well-intended attempts at introducing scrutiny into evaluating proposals were not welcomed, and thus had to be abandoned.

In the absence of adequate quality control, a number of issues will (and do) surface. For instance, the roster of actual education session presenters is often quite different from the list of presenters submitted with the session proposal. This means that there is no way to control for diversity in participation (some time ago one of the education sessions was criticized for lacking diversity). As well, often we see the same people present at education sessions, or an entire session consisting of presenters from 3 or 4 (big) universities. Not only does the quality of presentations suffer, but also their relevance – I've been at talks that had very little to do with the theme of a session. Similar issues have surfaced in the CMS Math Education Online Meeting.

Hopefully, with a renewed composition of the Meetings Oversight Committee, we will see a more proactive approach to organizing education sessions at CMS in-person meetings.

Until recently, the Excellence in Teaching Award Selection Committee was part of the mandate of the Education Committee. Due to a concern communicated to the CMS leadership that the Award Committee would (and did) select one of their own (meaning someone from the Education Committee) for the award, the Excellence in Teaching Award Selection Committee has been made into an independent committee. Operating outside of the Education Committee means that the Education Committee members are now eligible to be nominated for the Excellence in Teaching Award. However, in forming a new Excellence in Teaching Award Selection Committee a bias was created – all its members are research mathematicians, i.e., there is no faculty member who is associated with mathematics education (imagine using four math education researchers tasked to select a Krieger-Nelson Prize winner). Modifying the composition of the Teaching Award Selection Committee is one of the goals that we need to pursue.

Another issue related to the Excellence in Teaching Award selection is the fact that there is a number of highly qualified individuals whose accomplishments are hard to rank. For instance, compare an excellent instructor who is a math researcher with a teaching-stream faculty who is, besides teaching, involved in outreach, teaching community, and publishing. The Education Committee has considered two teaching awards in a year, but so far has come to no consensus as to how the two awards would be distinguished. In my view, no matter how it is done, one award must be reserved for teaching faculty.

A subcommittee which is not active at the moment is Committee on Education Materials on the CMS website. This committee, consisting of creative, hard-working individuals, was developing a plan was to use the CMS server as a repository for a variety of educational materials (textbooks, videos, apps, etc.) that they have created and/or collected, and that would be collected. Without going into detail – with a good amount of frustration, the committee members decided to abandon the work on this project. At the time when I'm writing this, it is not clear if this work will resume.

In conclusion, there is work to be done, to rethink things, make them better, and to possibly start some new initiatives.

**Miroslav Lovric**

*Chair, Education Committee*

[Note : dans cet article, lorsque nous parlons de « mathématiques », nous entendons « mathématiques et statistiques »].

Selon la page de la SMC, « Le Comité d'éducation de la SMC participe à un large éventail d'activités, allant du soutien à l'enseignement des mathématiques dans les écoles secondaires, les universités, les collèges et les cégeps, à l'encouragement du public et des jeunes à apprécier les mathématiques et à s'y engager. » Dans cet article, j'ai l'intention de commenter certaines de ces activités et de partager mes pensées et mes idées sur le travail du Comité.

Il existe deux populations distinctes liées à l'enseignement des mathématiques au niveau universitaire. La population 1 est constituée d'un grand nombre de professeurs (au sein des départements de mathématiques) qui enseignent les mathématiques à l'université et qui, pour la plupart, ne participent pas à la recherche sur l'enseignement des mathématiques. Cette population peut être divisée en deux catégories : ceux dont les tâches principales consistent à faire de la recherche en mathématiques (« professeurs de recherche ») et ceux (« professeurs ») qui enseignent principalement, tels que les professeurs, les chargés de cours, les contractuels, et les professeurs à temps partiel. La population 2 est constituée de membres du corps professoral basés dans les facultés d'éducation, qui sont principalement des chercheurs dans le domaine de l'enseignement des mathématiques (de la maternelle à la 16<sup>e</sup> année) et qui (à quelques rares exceptions près) ne donnent pas de cours de mathématiques à l'université. La collaboration entre ces deux populations est souhaitée, s'est avérée mutuellement bénéfique et existe à petite échelle.

Le rôle principal des efforts d'éducation de la SMC doit être de servir la population 1, et en particulier ceux qui sont professeurs. L'une des principales raisons est que les professeurs chercheurs des populations 1 et 2 disposent d'une infrastructure bien développée d'organisations, de conférences, de subventions, de publications, etc. qui répondent à leurs besoins et à leurs intérêts. Les membres du corps professoral de la population 1 n'ont que très peu de ces possibilités au Canada. Par exemple, alors que la grande majorité des mathématiciens chercheurs universitaires et des membres de la population 2 sont en mesure de couvrir leurs frais de conférence grâce à leurs subventions, leurs collègues professeurs de mathématiques universitaires doivent combiner leurs fonds de développement professionnel avec leur propre argent – pour certains, les frais d'adhésion à la SMC, l'inscription à la conférence de la SMC et les déplacements totalisent déjà plus d'argent que ce dont ils disposent dans leurs fonds de développement professionnel pour une année entière.

Afin de permettre à cette large population de professeurs d'assister aux réunions en personne, je pense que la SMC devrait repenser les prix d'inscription à la conférence et les réduire de manière significative pour cette population. Par ailleurs, il y a une préoccupation que j'ai entendue à maintes reprises : Les frais d'adhésion à la SMC sont élevés, mais quels sont les avantages d'être membre de la SMC ? Il s'agit là d'une question à laquelle il faut réfléchir.

Le Comité de supervision des réunions est chargé des sessions d'éducation lors des réunions d'été et d'hiver de la SMC, et organise la réunion annuelle de deux jours sur l'enseignement des mathématiques en ligne. Les sessions d'éducation sont devenues une caractéristique assez standard des réunions en personne de la SMC : une réunion typique comporte environ 2 à 3 sessions d'éducation, avec entre 20 à 70-80 participants. La réunion en ligne sur l'enseignement des mathématiques attire facilement près d'une centaine de personnes. Bien que les chiffres de participation semblent bons, un regard critique suggère qu'il y a de la place pour l'amélioration.

Tout d'abord, le contrôle de la qualité des propositions de sessions d'éducation est très limité, voire inexistant (en fait, presque toutes les propositions sont acceptées). Les tentatives bien intentionnées d'introduire un contrôle minutieux dans l'évaluation des propositions n'ont pas été bien accueillies et ont donc dû être abandonnées.

En l'absence d'un contrôle de qualité adéquat, un certain nombre de problèmes apparaîtront (et font déjà surface). Par exemple, la liste des présentateurs des sessions d'éducation est souvent très différente de la liste des présentateurs soumise avec la proposition de session. Cela signifie qu'il n'y a aucun moyen de contrôler la diversité de la participation (il y a quelque temps, l'une des sessions d'éducation a été critiquée pour son manque de diversité). En outre, nous voyons souvent les mêmes personnes participer aux sessions d'éducation, ou une session entière composée de présentateurs de 3 ou 4 (grandes) universités. Non seulement la qualité des présentations s'en ressent, mais aussi leur pertinence – j'ai assisté à des présentations qui n'avaient pas grand-chose à voir avec le thème de la session. Des problèmes similaires sont apparus lors de la réunion en ligne de la SMC sur l'enseignement des mathématiques.

Il est à espérer qu'avec une composition renouvelée du Comité de supervision des réunions, nous verrons une approche plus proactive de l'organisation de sessions d'éducation lors des réunions en personne de la SMC.

Jusqu'à récemment, le Comité de sélection du Prix d'excellence en enseignement faisait partie du mandat du Comité de l'éducation. En raison d'une inquiétude communiquée à la direction de la SMC selon laquelle le Comité du prix choisirait (et a choisi) l'un des siens (c'est-à-dire quelqu'un du Comité de l'éducation) pour le prix, le Comité de sélection du prix d'excellence dans l'enseignement a été transformé en comité indépendant. Le fait de fonctionner en dehors du Comité d'éducation signifie que les membres du Comité d'éducation sont désormais éligibles pour être nommés pour le Prix d'excellence dans l'enseignement. Toutefois, la formation d'un nouveau comité de sélection du prix d'excellence dans l'enseignement a créé un biais : tous ses membres sont des mathématiciens chercheurs, c'est-à-dire qu'aucun membre n'est associé à l'enseignement des mathématiques (imaginez quatre chercheurs en enseignement des mathématiques chargés de sélectionner la lauréate du prix Krieger-Nelson). Modifier la composition du Comité de sélection du Prix de l'excellence en enseignement est l'un des objectifs que nous devons poursuivre.

Un autre problème lié à la sélection du Prix d'excellence en enseignement est le fait qu'il existe un certain nombre de personnes hautement qualifiées dont les réalisations sont difficiles à classer. Par exemple, comparez un excellent professeur qui est un chercheur en mathématiques avec un professeur qui, en plus d'enseigner, est impliqué dans des activités de sensibilisation, dans la communauté éducative et dans la publication. Le Comité d'éducation a envisagé de décerner deux prix d'enseignement au cours d'une même année, mais n'est pas encore parvenu à un consensus sur la manière de distinguer les deux prix. À mon avis, quelle que soit la méthode retenue, l'un des prix doit être réservé aux professeurs.

Un sous-comité qui n'est pas actif pour le moment est le Comité sur le contenu éducatif du site web de la SMC. Ce comité, composé de personnes créatives et travailleuses, élaborait un 2

plan était d'utiliser le serveur de la SMC comme dépôt pour une variété de matériel éducatif (manuels, vidéos, apps, etc.) qu'ils ont créé et/ou collecté, et qui serait collecté. Sans entrer dans les détails – avec une bonne dose de frustration, les membres du comité ont décidé d'abandonner le travail sur ce projet. À l'heure où j'écris ces lignes, il n'est pas certain que ce travail reprenne.

En conclusion, il y a du travail à faire, pour repenser les choses, les améliorer et éventuellement lancer de nouvelles initiatives.

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**Robert Dawson** (Saint Mary's University)

*Editor, CMS Notes*

The great Oscar Wilde, during his time in Reading Gaol, is said to have commented "If this is the way Queen Victoria treats her prisoners, she doesn't deserve to have any." *Se non è vero, è ben trovato...*

Prisoners have little choice, but others can sometimes vote with their feet. In the years leading up to the Second World War, many German citizens — many, but not all, Jewish — reacted to the intolerable conditions developing there under the Nazis by emigrating. Canada, to our shame, did little to help. Among the refugees and migrants were many notable scientists: the countries that took them in, the United States in particular, were the richer for doing so.

In the 1950s, the United States was in the grip of McCarthyism. Universities were one particular target of the "Red Scare," and a number of American intellectuals decided that their country was no longer a hospitable or safe place to live and work. Some moved to Canada, among them the mathematicians Lee Lorch and Chandler Davis. This time, America's loss was Canada's gain.

Today we see, almost daily, stories from south of the border describing government attacks on academic freedom. Universities are being bullied into suppressing free speech on campus; research programs are being shut down because some twenty-year old coder thinks he has found a red-flag word in a project description. (Don't laugh too hard... in the 1990s Randy White, Reform MP for Fraser Valley West, read that somebody had been given a research grant to study "Lie theory." Mr. White reckoned that there was quite enough "lying" going on in the world without NSERC's help, and denounced the research grant as a waste of taxpayers' money. The United States does not by any means have a monopoly on the ultracrepidarian and underinformed.) Important work on epidemiology and vaccine development is apparently being obstructed to please the anti-vax movement.

Will we see another wave of American academics hoping to move to Canada? News stories suggest that the movement has already begun. But in science as in so many other areas, the United States has long been a world powerhouse, a role that the Trump government is today putting at risk. If Canada can potentially attract some leading American scientists who are no longer getting the support of their own government, by providing a better working environment, it might be a good thing, one worth some judicious investment on the part of our government.

Let me be clear: there are others with far stronger humanitarian cases for entry to Canada. This would not be a refugee program — absolutely no funds should be diverted away from assisting the truly desperate for this. Rather, it would be a business decision, a way to strengthen our universities and research institutes. If some top researchers can no longer work effectively in the US, and could do so here, should Canada seize the opportunity? No doubt there are arguments against this as well, but it's probably a debate worth having.

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**Robert Dawson** (Saint Mary's University)

*Editor, CMS Notes*

Le grand Oscar Wilde, lors de son séjour à la prison de Reading, aurait déclaré : « Si c'est ainsi que la reine Victoria traite ses prisonniers, elle ne mérite pas d'en avoir ». Se non è vero, è ben trovato...

Les prisonniers n'ont guère le choix, mais les autres peuvent parfois voter avec leurs pieds. Dans les années qui ont précédé la Seconde Guerre mondiale, de nombreux citoyens allemands – souvent juifs, mais pas tous – ont réagi aux conditions intolérables qui régnaient sous le régime nazi en émigrant. Le Canada, à notre grande honte, n'a pas fait grand-chose pour les aider. Parmi les réfugiés et les migrants se trouvaient de nombreux scientifiques de renom : les pays qui les ont accueillis, les États-Unis en particulier, en sont sortis grandis.

Dans les années 1950, les États-Unis sont en proie au maccarthysme. Les universités étaient une cible particulière de la « peur rouge », et un certain nombre d'intellectuels américains ont décidé que leur pays n'était plus un endroit hospitalier ou sûr pour vivre et travailler. Certains s'installent au Canada, comme les mathématiciens Lee Lorch et Chandler Davis. Cette fois, la perte des États-Unis a été le gain du Canada.

Aujourd'hui, nous voyons presque quotidiennement des histoires provenant du sud de la frontière décrivant les attaques du gouvernement contre la liberté académique. Les universités sont poussées à supprimer la liberté d'expression sur le campus ; des programmes de recherche sont interrompus parce qu'un jeune codeur de vingt ans pense avoir trouvé un mot à risque dans la description d'un projet. (Ne riez pas trop fort... dans les années 1990, Randy White, député réformiste de Fraser Valley West, a lu que quelqu'un avait reçu une bourse de recherche pour étudier la « théorie de Lie ». En Anglais, bien sûr, « lie » signifie « mensonge », et M. White a estimé qu'il y avait suffisamment de « mensonges » dans le monde sans l'aide du CRSNG et a dénoncé cette subvention de recherche comme un gaspillage de l'argent des contribuables. Les États-Unis n'ont pas le monopole de l'ultracrepidarité et de la sous-information, loin s'en faut). Des travaux importants sur l'épidémiologie et le développement de vaccins sont apparemment entravés pour satisfaire le mouvement anti-vax.

Verrons-nous une nouvelle vague d'universitaires américains souhaitant s'installer au Canada ? Des articles de presse suggèrent que le mouvement a déjà commencé. Mais en science comme dans tant d'autres domaines, les États-Unis sont depuis longtemps une puissance mondiale, un rôle que le gouvernement Trump met aujourd'hui en péril. Si le Canada peut éventuellement attirer certains scientifiques américains de premier plan qui ne bénéficient plus du soutien de leur propre gouvernement, en leur offrant un meilleur environnement de travail, cela pourrait être une bonne chose, qui mérite un investissement judicieux de la part de notre gouvernement.

Je tiens à préciser qu'il existe d'autres personnes dont les arguments humanitaires en faveur de l'entrée au Canada sont bien plus solides. Il ne s'agirait pas d'un programme de réfugiés – absolument aucun fonds ne devrait être détourné de l'assistance aux personnes vraiment désespérées. Il s'agirait plutôt d'une décision commerciale, d'un moyen de renforcer nos universités et nos instituts de recherche. Si certains chercheurs de haut niveau ne peuvent plus travailler efficacement aux États-Unis et peuvent le faire ici, le Canada devrait-il saisir l'occasion ? Il ne fait aucun doute qu'il existe également des arguments contre cette idée, mais c'est probablement un débat qui vaut la peine d'être mené.

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**Egan J Chernoff** (University of Saskatchewan)

*Education Notes bring mathematical and educational ideas forth to the CMS readership in a manner that promotes discussion of relevant topics including research, activities, issues, and noteworthy news items. Comments, suggestions, and submissions are welcome.*

**Egan J Chernoff**, University of Saskatchewan ([egan.chernoff@usask.ca](mailto:egan.chernoff@usask.ca))

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I have been attending conferences in my field of research, mathematics education, since 2006. The past nearly twenty years has resulted in many trips to many conferences in many amazing locations around the world (I am privileged that way, yes). Also resulting from the past few decades of conference travel, my very own conference attendance checklist. To be clear, I am not referring to a 'seize the day' checklist which helps me make the absolute most out of each and every day of attendance while at a particular conference. Rather, I am referring to the checklist (which, at times, borders on a flowchart) that I use to help me determine whether or not I will attend a particular conference.

As you might expect, my checklist does change with the times (e.g., to attend hybrid events or not is a relatively new item on my list), but I have found that the main items are still the main items. For example, the field of mathematics education is replete with conferences all over the world on an annual basis, which means one main item on my list is the conference itself. Closely related is the scope of the research findings that I have to present, and whether or not they align with the particular conference I have under consideration. At one extreme, certain conferences require just a short abstract, which results in a conference presentation, but no conference publication. At the other extreme, certain conferences require an eight-page research report, which, if accepted (after going through the double-anonymous peer-review process), results in a forty-five-minute conference presentation and publication in the subsequent conference proceedings. With the conference and my potential role(s) at each potential conference established, there are a few more items to check on/off my list.

Finance, of course, is a main item on my checklist. Whether derived from the procurement of internal (to the university) or external research grants, professional expense funds or otherwise, funding begets those closely related, other main items on the list. The ability or inability to support graduate students and postdoctoral researchers attending the conferences, the location of the conference and the time of the year in which the conference is held, for example, are the other main items on the checklist. As I mentioned earlier, the main items have remained the main items over the years.

I should point out, here, that the main items of my checklist, that is, *Conference*, *Research Findings*, *Research Funding*, *Graduate Student Support*, *Where* and *When* are not necessarily considered in the linear fashion in which they have been presented, and the list items presented are not exhaustive. For example, I have had research findings that were better aligned with a conference being held on the other side of the world; however, I submitted the findings to a different conference, one held much closer to home, which afforded me the opportunity to bring a graduate student to the conference, as well, and introduce them to all my wonderful colleagues early in their graduate student journey. In terms of a less noble example, I must admit that I have, first, considered where a conference was being held, then if I had enough money to attend, and all before ever considering when it was taking place, whether my findings best aligned with the conference, and only after all that, did I remember that I had graduate students who probably also wanted to attend. For shame, Egan. For shame.

The other day, one of my current graduate students inquired about attending the annual conference of the North American Chapter of the International Group for the Psychology of Mathematics Education, which is known acronymically as PME-NA. In the past, I would have immediately entered checklist mode. Knowing PME-NA (read: Conference) well and having attended many times, I would have, in the past, asked whether we would be submitting an 8-page Research Report or 4-page Brief Research Report (read: Research Findings). In the past, while discussing the length of our proposal, I would double-check the balance of my funding (read: Research Funding), and then do a cursory search of airline ticket and hotel accommodation costs (read: Where and When) to make sure I had enough money for both of us to attend (read: Graduate Student Support) the conference. Like I said, however, that's all in the past. I have, just recently, made a major tweak to my conference attendance checklist and, now, I have one checklist item that trumps all others: Is it in the states?!

The new administration in the USA has been causing Canadians consternation. Repeated references to Canada becoming the '51st state' are not going unheard north of the border. (A nonstarter, for the record.) The repeated annexation ramblings, 25% tariff threats, retaliatory tariffs and actual tariffs on steel and aluminum have Canadians now conducting small acts of resistance. Whether it's booing the American anthem before a hockey (or basketball) game, boycotting US products or otherwise, these acts of resistance are becoming common place here in Canada.

Speaking of boycotting US products, walk around the grocery store or the liquor store and you'll see signs of economic nationalism taking hold. My wife and I, we're trying to do our part. Sure, it takes a bit more time to check all the labels on our groceries, but not that much time. And, sure, there are a few things that are very, very hard to go without, for example, California Zinfandel. However, when you see Canadian professional hockey players, ones that live their lives playing for teams in the United States, near tears during the singing and booing of the U.S. National Anthem, followed by the singing of the Canadian anthem, followed by three fights in the first nine seconds of the game, it's clear that the relationship between Canada and the United States is strained. It's because of this strained relationship, one that we did not start, that it's not just my grocery list that has been updated, my conference attendance checklist, too.

I'll say it, the new administration in the USA is causing me conference attendance consternation. To deal with this consternation, I have decided to try and exercise a bit of academic nationalism (for lack of a better term), and will only be attending mathematics education related conferences held here in Canada for the foreseeable future. This means that I will, likely, have to miss the 2026 International Congress of Mathematicians to be held in Philadelphia, USA from July 23 to July 30, 2026, which is a shame because I was so looking forward to

Section 19, Mathematical Education and Popularization of Mathematics section. If I am going to make sure that the carrots that I buy are from Canada then it just wouldn't make sense to head to ICM 2026. I just don't see a way around this for me at the time of this writing.

Fortunately, here in Canada, there are many ways for me to scratch my conference itch. I look forward to us perhaps crossing paths at the 2025 Statistical Society of Canada Annual Meeting in Saskatoon (May 25-28) or the 2025 Annual Meeting of the Canadian Mathematics Education Study Group in Lethbridge (Jun 13-17) or one of the MathEd Forums held by Fields (The Fields Institute for Research in Mathematical Sciences). I also look forward to us definitely crossing paths at the 2025 CMS Summer Meeting in Quebec City (June 6-9) and the 2025 CMS Winter Meeting in Toronto (December 5-8). By the way, if you do see me at ICM 2026 then something major has happened, either with the current strained relations between Canada and the USA or I have found some spectacular alternative to reducing the carrot/conference cognitive dissonance I am currently experiencing.

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*CSHPM Notes brings scholarly work on the history and philosophy of mathematics to the broader mathematics community. Authors are members of the Canadian Society for History and Philosophy of Mathematics (CSHPM). Comments and suggestions are welcome; they may be directed to the column's editors:*

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Learning a discipline by reading the original writings of the field's most important and innovative thinkers is a long and honored tradition in the humanities and social sciences. What better way to grapple with postmodern historiography than by reading [Michel Foucault](#)? What would one read other than the [Dialogues](#) to become familiar with the ideas of Plato? Why would someone even try to learn about Shakespeare's [plays](#) and [sonnets](#) without reading them oneself?

But what about learning mathematics? Can you imagine asking your students to read [Cantor](#) in an introductory topology course? What about reading [Cauchy](#) in a course on linear algebra? And how about reading [Gauss](#) in a second semester calculus course? Oh my! And yet this is precisely what the members of a small but growing community of mathematics instructors in North America have not only been proposing *should* be done for several decades now, but are actually doing themselves, using classroom modules known as Primary Source Projects (PSPs) [1].

Based on a guided reading approach to primary sources, PSPs are intended to replace the standard textbook treatment of core topics in the undergraduate mathematics curriculum, and to do so in about the same amount of time as a typical textbook-lecture approach to teaching a given topic [2]. Each project melds excerpts from primary sources with carefully-crafted tasks that interrupt students at specific points in their reading of the source material. This design lends itself especially well to student-centered instructional strategies (e.g., small-group discussions) as an alternative to lectures. PSPs also include commentary on the historical context and mathematical significance of the questions that the historical author set out to explore.



It is known that the quantity  $a^n + 1$  always has divisors whenever  $n$  is an odd number or is divisible by an odd number aside from unity. Namely  $a^{2m+1} + 1$  can be divided by  $a + 1$  and  $a^{p(2m+1)} + 1$  by  $a^p + 1$ , for whatever number is substituted in place of  $a$ . But on the other hand, if  $n$  is a number which is divisible by no odd number aside from unity, which happens when  $n$  is a power of two, no divisor of the number  $a^n + 1$  can be assigned. So if there are prime numbers of this form  $a^n + 1$ , they must all necessarily be included in the form  $a^{2^m} + 1$ . But it cannot however be concluded from this that  $a^{2^m} + 1$  always exhibits a prime number for any  $a$ ; for it is clear first that if  $a$  is an odd number, this form will have the divisor 2.



**Figure 1.** Primary source excerpt from Euler's 1738 article "Observationes de theoremate quodam Fermatiano aliisque ad numeros primos spectantibus" ("Observations on a theorem of Fermat and others concerned with prime numbers"), featured in the 2017 TRIUMPHS Primary Source Project "Primes, Divisibility, and Factoring," by Dominic Klyve. [Digital Commons at Ursinus](#).

Since 2005, the development and classroom testing of PSPs has been supported by three grants from the US National Science Foundation, the latest of which was *TTransforming Instruction in Undergraduate Mathematics via Primary Historical Sources (TRIUMPHS)*. As a result of TRIUMPHS' efforts, approximately 100 PSPs were developed for use in university mathematics courses ranging from beginning algebra to topology, all of which are freely available for download and classroom use at <https://blogs.ursinus.edu/triumphs/>. Through these projects, students are given the opportunity, for example, to study the [derivatives of the sine and cosine functions directly from Euler](#), [uniform convergence of function series from the writings of Abel](#), and [ideals directly from the words of Dedekind](#). Classroom testing of these and other PSPs by over 120 university mathematics instructors in 200+ classrooms at a wide variety of institutions across the US and Canada also took place under the auspices of the TRIUMPHS grant [3].

Of course, teaching with primary sources is not without its challenges . . . but neither is it without its benefits, for students and instructors alike. For instance, here are just a few of the

benefits of using PSPs that instructors who served as site-testers under the TRIUMPHS grant reported:

- Certainly students were more likely to discuss their own difficulties in interpreting problems from the PSP than they are in discussing difficulties on the other problems in our class. (Since it was acknowledged that these were “different” problems.) So hearing the students’ concerns and difficulties was beneficial.
- I think the students also learned some virtues of persistence, since there was more “groping around in the dark,” and they didn’t believe that I had the absolute right answer ready to deploy. (As opposed to the course notes, which I wrote myself.)
- Many students remarked that they really liked reading from a primary source (as opposed to the textbook, I presume) because it made the math seem more humane. I interpreted this as evidence that reading the primary source helped students begin to break down their static views of mathematics.
- As an instructor, I experienced that students can do more than what we think. It’s hard for Calculus I students to read and understand math articles, but they did it!
- Both the students and I gained a deeper understanding and appreciation of the historical development of basic ring theory. The students also gained a deeper understanding of the concepts.
- I didn’t anticipate it, but implementation of the PSP led to several conversations about how mathematics is developed, what research mathematicians do, and going on to do graduate studies in mathematics.
- It gave both me and my students a chance to pause amidst the early onslaught of analysis definitions and theorems to discover what motivated them historically. This course can be relentless in its pace, and this time spent, however brief, on background was enlightening to my students.



**Figure 2.** Founding members of the TRIUMPHS Society. Back row (L to R): Adam E. Parker, Michael P. Saclolo, Kathleen M. Clark, Mark Watford, Kenneth M Monks. Front row (L to R): Daniel E. Otero, Dominic Klyve, Janet Heine Barnett. [TRIUMPHS Society website](https://triumphssociety.org).

Building on the success of TRIUMPHS and its predecessor grants, the recently-formed TRIUMPHS Society aims to:

- bring together practitioners and others interested in the use of primary historical sources in the teaching and learning of mathematics;
- encourage and support the development and use of classroom resources based on primary historical sources;
- share teaching experiences and publicize research based on the implementation of such resources; and
- promote the proliferation of primary source-based pedagogy in mathematics through conversation and professional development.

Society activities to date have included workshops and other presentations at annual MAA MathFest meetings (see, for instance, the materials from our 2024 workshop “[On the Shoulders of Giants](#)”), as well as the [International 2024 History and Pedagogy of Mathematics conference](#) in Sydney, Australia (sponsored in part by the Society). Through its peer-reviewed journal, *The Annals of the TRIUMPHS Society*—edited by Michael Saclolo (St. Edwards University) and Kenneth M Monks (College of Southern Nevada)—the Society further intends to publish PSPs and similar classroom-ready materials designed to teach specific mathematical topics by engaging students with excerpts from primary sources, artifacts related to the development of such projects, and articles on scholarship related to the use of such materials. If a topic is related to teaching and learning mathematics with primary sources, then it is potentially of interest to the journal!

So, how can you become part of this exciting movement? Find out more about teaching and learning with PSPs by joining us at our next workshop, “Engaging and inspiring students in the mathematics classroom by teaching with Primary Source Projects,” to take place during [MathFest 2025](#) in Sacramento, CA (August 6–9). And for more information about the new TRIUMPHS Society and journal, including how you can become a member for just US\$12 annually, visit <https://triumphssociety.org>.

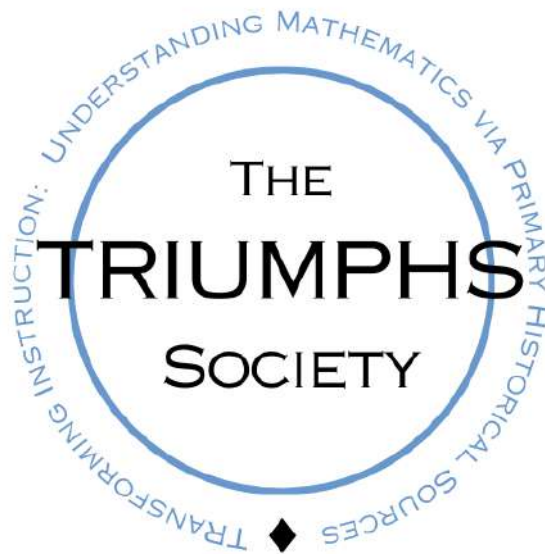


Figure 3. TRIUMPHS Society logo. TRIUMPHS Society website.

## Notes

[1] Calls to incorporate original (primary) source readings into mathematics education have occurred on the international level for some time as well; see, for instance, Jahnke, H. N., A. Arcavi, E. Barbin, O. Bekken, F. Furinghetti, A. El Idrissi, C. M. S. da Silva, and C. Weeks. (2000) [The use of original sources in the mathematics classroom](#). In *History in mathematics education: The ICMI study*, edited by J. Fauvel & J. van Maanen, 292–328. New York: Kluwer Academic.

[2] The genesis of this approach is due largely to Toronto-born [David Pengelley](#) (New Mexico State University, emeritus) and described in Barnett, J. H., J. Lodder, and D. Pengelley. (2014) [The pedagogy of primary historical sources in mathematics: Classroom practice meets theoretical frameworks](#). *Science & Education* 23, 7–27. See also Jankvist, U. T. (2014) [On the use of primary sources in the teaching and learning of mathematics](#). In *International handbook of research in history, philosophy and science teaching*, edited by M. R. Matthews, 873–908, on pp. 887–888. Dordrecht: Springer. Additional justification and background is available in Barnett, J. H. (2018, December) [Why Use Primary Sources in a Mathematics Classroom?](#) *Notes of the Canadian Mathematical Society* 50(6), 16–17.

[3] Additionally, the seven-institution TRIUMPHS grant (2015–2023) researched the impact of PSPs on students and instructors. For a report of some of the key results related to TRIUMPHS research goals, see Clark, K. M., C. Can, J. H. Barnett, M. Watford, and O. M. Rubis. (2022). [Tales of Research Initiatives on University-level Mathematics and Primary Historical Sources](#). Special Issue on Exploring the Significance of the History of Mathematics in Mathematics Education: Recent Developments in the Field. *ZDM—Mathematics Education* 4, 1507–1520.

*Janet Heine Barnett is emerita professor of mathematics at Colorado State University Pueblo, and she has written and taught with primary source projects for over two decades. She currently serves as an officer of the TRIUMPHS Society (the Mersennes Outreach Coordinator), along with Jennifer Clinkenbeard (California State University, Monterey Bay), Dominic Klyve (Central Washington University), Danny Otero (Xavier University), and Adam Parker (Wittenberg University).*

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## Call for Nominations: Editor-in-Chief (EIC), Crux Mathematicorum

Calls for Nominations

March 2025 (Vol. 57, No. 2)

The CMS invites expressions of interest for the **Editor-In-Chief (EIC) of Crux**; one EIC is being solicited, with a five-year term scheduled to commence **January 1, 2026**. Funding from the CMS is available for this EIC position.

Since 1975, Crux Mathematicorum has published problems and solutions, aimed primarily at secondary and undergraduate students. First by subscription, and now as a free online publication, Crux provides a valuable resource to students and educators around the world. For more on the publication, see the website: <https://cms.math.ca/publications/crux/>

Expressions of interest should include a cover letter, your curriculum vitae, and an expression of views regarding the publication including any proposed changes or new directions in policy. Please also include an indication of support from your home institution.

Please submit your expression of interest electronically to [communications@cms.math.ca](mailto:communications@cms.math.ca) before July 15, 2025.

To view the terms of reference for this position, please visit: <https://cms.math.ca/about-the-cms/governance/terms-of-reference/>

. . .

La SMC invite les manifestations d'intérêt pour le poste de **rédacteur en chef (REC) de Crux** ; un REC est recherché, avec un mandat de cinq ans prévu pour débiter le **1er janvier 2026**. Un financement de la SMC est disponible pour ce poste de rédacteur en chef.

Depuis 1975, Crux Mathematicorum publie des problèmes et des solutions, destinés principalement aux étudiants du secondaire et du premier cycle. D'abord par abonnement, et maintenant en tant que publication en ligne gratuite, Crux fournit une ressource précieuse aux étudiants et aux éducateurs du monde entier. Pour en savoir plus sur la publication, consultez le site Web : <https://smc.math.ca/publications/crux-fr/> Les manifestations d'intérêt doivent comprendre une lettre de motivation, votre curriculum vitae et une expression de votre point de vue sur la publication, y compris toute proposition de changement ou de nouvelle orientation des politiques. Veuillez également inclure une indication du soutien de votre institution d'origine.

Veuillez soumettre votre manifestation d'intérêt par voie électronique à [communications@cms.math.ca](mailto:communications@cms.math.ca) avant le **15 juillet 2025**.

Pour consulter les termes de mandat de ce poste, veuillez vous rendre sur le site Web : <https://smc.math.ca/apropos-de-la-smc/la-gouvernance/termes-de-mandat/>

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## Call for Nominations: 2025 Adrien Pouliot Award

Calls for Nominations

March 2025 (Vol. 57, No. 2)

The Canadian Mathematical Society (CMS) is currently accepting nominations for the 2025 Adrien Pouliot Award. This award was inaugurated to recognize individuals or teams of individuals who have made significant and sustained contributions to mathematics education in Canada.

The CMS aims to promote and celebrate diversity in the broadest sense. We strongly encourage department chairs and nominating committees to put forward nominations for outstanding colleagues regardless of race, gender, ethnicity or sexual orientation.

Please submit your nomination electronically, preferably in PDF format, to [apaward@cms.math.ca](mailto:apaward@cms.math.ca), **before April 30, 2025**. No nominations will be accepted beyond this deadline.

For more information, please visit <https://cms.math.ca/awards/adrien-pouliot-award/nomination-information/>

. . .

La Société mathématique du Canada (SMC) accepte actuellement les mises en nomination pour le prix Adrien Pouliot 2025. Ce prix rend hommage aux personnes ou aux groupes qui ont fait une contribution importante et soutenue à l'enseignement des mathématiques au Canada.

La SMC a pour but de promouvoir et de célébrer la diversité au sens le plus large. Nous encourageons fortement les directrices et les directeurs de départements et les comités de mise en candidature à proposer des collègues exceptionnels sans distinction de race, de genre, d'appartenance ethnique ou d'orientation sexuelle.

Veuillez faire parvenir votre mise en nomination par voie électronique, de préférence en format PDF, à [prixap@smc.math.ca](mailto:prixap@smc.math.ca), **avant le 30 avril 2025**. Aucune mise en nomination ne sera acceptée au-delà de cette date.

Pour de plus amples renseignements, veuillez consulter <https://smc.math.ca/prix/prix-adrien-pouliot/informations-de-mise-en-candidature/>

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2025 CMS *Summer* Meeting  
Réunion *d'été* 2025 de la SMC  
QUÉBEC (QUÉBEC) | JUNE 6-9 JUIN



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**Canadian Mathematical Society** — 616 Cooper St., Ottawa, ON K1R 5J2, Canada

The Canadian Mathematical Society's Awards banquet will be held in Wendake at the Hôtel-Musée Premières Nations on Saturday, June 7, 2025, from 7:00 PM to 9:30 PM. The event will feature a reception (7:00 PM – 7:30 PM), followed by the awards ceremony and dinner (7:30 PM – 9:30 PM), highlighting achievements in mathematical research and education. A local Pow-Wow jingle bell dancer will perform before the awards. The hotel offers a unique First Nations cultural experience with amenities like a restaurant featuring Aboriginal cuisine and is located on the Akiawenrahk' River. Guests are encouraged to arrive early to explore The Huron-Wendat Museum, a national institution dedicated to preserving and promoting the history, culture, and arts of the Huron-Wendat Nation and their relationship with other First Nations. Guided tours are available. Shuttle service will be provided from Laval University before the dinner.



2025 CMS  
*Summer*  
 Meeting  
 Awards Banquet

June 7

Wendake, at the Hôtel-  
 Musée Premières Nations

**BOOK NOW**

<https://summer25.cms.math.ca/banquet>

The Canadian Mathematical Society (CMS) invites you to submit an abstract to participate in one of the planned sessions at the 2025 CMS Summer Meeting which will take place from June 6-9.

The Canadian Mathematical Society has created an open abstract submission process to support session organizers in their important work and in their efforts towards inclusivity and diversity. We encourage applications from members who identify as part of traditionally under-represented groups, including, but not limited to: Women, Indigenous Peoples, Persons with Disabilities, Members of Visible Minorities and/or Racialized Groups, and members of the LGBTQ+ Community. The CMS also welcomes applications from Graduate Students.

If you are already an invited speaker, please do not submit your abstract through our submission system. Submit your abstract here for invited speakers.

### Deadlines:

Candidates are required to submit their abstracts for approval by the session organizers by using our abstract submission form by no later than **May 2, 2025**. Please submit your abstract for only one session.

The CMS encourages organizers to review submitted abstracts on an ongoing basis and to accept all eligible speakers. Successful applicants (invited speakers) must register for the meeting and submit their abstract to the CMS website by May 16, 2025.

### To Submit your Abstract:

To submit your abstract to a session, please click the button below. This will direct you to the abstract submission form.

Submit

• • •

La Société mathématique du Canada (SMC) vous invite à soumettre un résumé pour participer à l'une des sessions prévues lors de la réunion d'été 2025 de la SMC qui aura lieu du 6 au 9 juin.

La Société mathématique du Canada a créé un processus ouvert de soumission de résumés afin de soutenir les organisateurs de sessions dans leur travail important et dans leurs efforts d'inclusion et de diversité. Nous encourageons les membres qui s'identifient comme faisant partie de groupes traditionnellement sous-représentés, y compris, mais sans s'y limiter, les femmes, les autochtones, les personnes handicapées, les membres de minorités visibles et/ou de groupes racialisés, et les membres de la communauté LGBTQ+, à soumettre leur candidature. La SMC accueille également les candidatures d'étudiants de troisième cycle.

Si vous êtes déjà un orateur invité, ne soumettez pas votre résumé par le biais de notre système de soumission. Soumettez votre résumé ici pour les orateurs invités

### Dates limites :

Les candidats doivent soumettre leur résumé à l'approbation des organisateurs de la session en utilisant notre formulaire de soumission de résumé au plus tard le **2 mai 2025**. Veuillez soumettre votre résumé pour une seule session.

La SMC encourage les organisateurs à examiner les résumés soumis de manière continue et à accepter tous les orateurs éligibles. Les candidats retenus (orateurs invités) doivent s'inscrire à la réunion et soumettre leur résumé sur le site Web de la SMC au plus tard le 16 mai 2025.

### Pour soumettre votre résumé :

Pour soumettre votre résumé à une session, veuillez cliquer sur le bouton ci-dessous. Vous serez dirigé vers le formulaire de soumission de résumé.

Soumettre





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CMS Student Committee

The Margin is a bi-annual, bilingual publication intended for a wide mathematical audience. It features a variety of content, including concise research articles, opinion pieces, math-related stories, as well as puzzles and riddles — all of which are meant to be accessible to the entire mathematical community, starting from the senior undergraduate level. It is delivered electronically to all student members of the Canadian Mathematical Society, and you can download a .pdf version of the latest issue by clicking on the cover below. You can also read the issues in your browser through the [CMS Student Issue page](#), and physical copies of the Margin are available at CMS Meetings and at the CUMC.



# NOTES FROM THE MARGIN

## Construction de la largeur n-Kolmogorov

By: Philippe Petitclerc (Université Laval)

La linéarisation est un outil essentiel en théorie de l'approximation, intervenant dans diverses méthodes pour traiter des systèmes non linéaires. Par exemple, en méthodes numériques, la méthode de Newton permet d'approximer la solution d'un système d'équations non linéaires. En équations différentielles, on linéarise autour d'un point fixe pour simplifier l'étude des comportements locaux. De même, l'approximation d'une fonction par un développement de Taylor d'ordre un repose sur l'hypothèse d'un comportement linéaire local de la fonction. L'hypothèse est que localement, la fonction exprime un comportement linéaire. De manière similaire, dans le cadre des espaces vectoriels, on peut chercher une approximation par des sous-espaces linéaires. On essaierait alors d'approximer un espace vectoriel  $V_N$  de dimension  $N$  par un sous-ensemble  $V_n$  composé de **combinaisons linéaires** d'une base de dimension  $n$ . Possède-t-on des outils nous permettant de prédire la capacité d'approximation de tels espaces de dimension  $n$ ? Un outil fondamental est la largeur  $n$ -Kolmogorov qui nous donne une mesure de la qualité possible de l'approximation de  $V_N$  par  $V_n$ . Construisons ensemble cette métrique.

Soit un espace de dimension infinie  $V$  possédant une structure d'espace vectoriel et un produit scalaire qui définit une norme sur  $V$ . Soit  $V_N$  inclus dans  $V$  de dimension  $N$  et compact, et soit  $V_n$  inclus dans  $V_N$  de dimension  $n$  plus petit que  $N$ . Étant donné un élément  $v_N$  de  $V_N$ , définissons sa distance avec un  $V_n$  donné par :

$$d_1(v_N; V_n) = \inf_{v_n \in V_n} \|v_N - v_n\|_V. \quad (1)$$

La distance entre  $v_N$  élément de  $V_N$  et le sous-

espace  $V_n$  est alors donnée par l'élément le plus proche de  $v_N$ , à  $v_n$ , ce qui, j'espère, est intuitif. On quantifie la pire possible meilleure approximation de  $V_N$  par  $V_n$  par :

$$d_2(V_N; V_n) = \sup_{v_N \in V_N} d_1(v_N; V_n). \quad (2)$$

On observe alors que l'équation 2 nous renseigne sur la distance entre  $V_n$  et  $V_N$  puisqu'elle est déterminée par le pire scénario. Étant donné un  $V_n$ , l'équation 2 nous donne la distance de l'élément le moins bien approximé de  $V_N$  par  $V_n$ . La largeur  $n$ -Kolmogorov de  $V_N$  nous procure finalement la métrique recherchée, définissant l'espace qui minimise la distance à l'équation 2 :

$$\begin{aligned} d_n(V_N; V_n) &= \inf_{\substack{V_n \subset V_N \\ \dim(V_n)=n}} d_2(V_N; V_n) \\ &= \inf_{\substack{V_n \subset V_N \\ \dim(V_n)=n}} \sup_{v_N \in V_N} d_1(v_N; V_n) \\ &= \inf_{\substack{V_n \subset V_N \\ \dim(V_n)=n}} \sup_{v_N \in V_N} \inf_{v_n \in V_n} \|v_N - v_n\|_V \end{aligned} \quad (3)$$

En général, plus la largeur  $n$ -Kolmogorov est grande, moins l'espace  $V_N$  peut être bien approximé par un sous-espace de dimension  $n$ . En effet, cette quantité représente la meilleure précision possible dans la norme  $V$  quand tous les éléments de  $V_N$  sont approximés par des éléments d'un sous-espace linéaire  $V_n$  de dimension  $n$ . Cette métrique est très importante en théorie de la réduction de modèle et dans la théorie de l'approximation afin de trouver des espaces linéaires d'approximation de faible dimension. ◀

Volume XVII · 2024



Philippe Petitclerc

Si tout est possible, l'impossible est-il possible ? ◀



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## CONNECT WITH US ON DISCORD!

Be part of the conversation!

The CMS student committee is launching a platform for students across the country to discuss throughout the whole year! Join our vibrant community of math enthusiasts from across Canada on Discord. Engage in stimulating discussions, share resources, and stay updated on upcoming events and opportunities. Join our Discord server. We look forward to seeing you there!



# CUMC 2025

## JUNE 23-27

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Learn about all the diversity that Mathematics has to offer. Featuring talks from esteemed professionals, CUMC 2025 invites you to learn and explore the field of Mathematics like never before.

#### SPEAKERS

Grace Yi

Myrto Mavraki

Debbie Leung



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MATHEMATICS

## Call for posters AARMS-CMS Student Poster Session

CMS Student Committee

March 2025 (Vol. 57, No. 2)

### CMS Student Committee

Dear students in mathematics and statistics,

Are you working on a mathematical project that you want to share with your fellow math enthusiasts? Then sign up for the AARMS-CMS Student Poster Session at the 2025 CMS Summer Meeting, hosted by Université Laval. We accept abstracts from both graduate and undergraduate students.

At the poster session, you will be asked to give a short (3-5min) presentation of your poster to judges and answer any questions about your research. Each participant will receive a book of their choice from the CMS-Springer series. Three winners will be selected based on content, organization, and presentation. Each winner will receive two complimentary tickets to the banquet as well as \$100 and a framed award certificate. Moreover, every participant will get the chance to choose one free book from the library of the CMS!

Please fill out this form to submit your abstract: <https://www2.cms.math.ca/Events/summer25/abs/Create/>

For guidelines and poster tips please visit: [https://studc.math.ca/wp-content/uploads/2023/02/poster\\_tips.pdf](https://studc.math.ca/wp-content/uploads/2023/02/poster_tips.pdf)

To register for the 2025 CMS Summer Meeting, please visit: <https://summer25.cms.math.ca/> and click "REGISTER".

We look forward to seeing you at the meeting!

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## Call for abstracts CMS Student research session

CMS Student Committee

March 2025 (Vol. 57, No. 2)

### CMS Student Committee

Dear members of mathematics community,

The Canadian Mathematical Society Student Committee invites undergraduate and graduate students to present their research at the Student Research Session during the 2025 CMS Summer Meeting in Quebec City. The meeting will take place from June 6th to June 9th.

Applicants must submit their presentation abstracts in either English or French to us through [email](#) no later than **May 2nd**. Abstracts will be reviewed on a rolling basis, and space is limited, so interested students are encouraged to submit their abstracts as soon as possible. Please note that all presenters must be registered for the meeting.

The proposed presentation should introduce the student's research to a general mathematical audience. We welcome submissions from all areas of pure and applied mathematics, statistics, and mathematics education. For more information, please visit the [meeting's website](#), [student event page](#), or contact the [Student Committee](#).

*Best regards,*

*Kateryna Tretiakova and Daniel Zackon*

*CMS Student Committee*

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