IN THIS ISSUE

Reflections from the President-Elect

Cover Article   September 2023 (Vol. 55, No. 4)

Barbara Csima (University of Waterloo)

President-Elect, CMS

As the new President-Elect of the CMS, let me continue the tradition of introducing myself to those who don't know me, and sharing my thoughts on our amazing society of mathematicians.

I grew up in Mississauga, Ontario, and attended the publicly funded Catholic school. My dad, Joseph Csima, was a combinatorist who was a Professor at McMaster University, and shared with me his love of mathematics. I was one of four girls (three named Barbara) on our high school "Math League" team. I thought Math League was a lot more fun than math contests, in which I participated somewhat more reluctantly. Encouraged by my dad, I attended the University of Toronto for undergrad, where I did a Specialist in Mathematics, and also did a Major in Actuarial Science. Encouraged by one of my instructors at U of T, I attended the University of Chicago for grad school. My advisor was Robert Soare, and I learned much more from him than just Computability Theory. His care for this students, his field of research, and the community, were inspiring. After Chicago, I did a post-doc at Cornell University under the mentorship of Richard Shore. I am so grateful for the many hours of instruction, mathematical advice, and life advice that I received from my mentors over the years, and I aspire to pay it forward in some way.

It was always my goal to return to Canada, and in 2005 my dream came true. I came to the University of Waterloo as an Assistant Professor, and was a recipient of an NSERC UFA. Shortly after arriving, I was encouraged by senior department members to join the CMS. I cheerfully purchased my lifetime membership with my start-up funds. My research area is unfortunately not well represented in Canada. Without the CMS, I would have been isolated; getting to know only my colleagues at Waterloo and those in my research group from elsewhere in the world. Through the CMS, I've been able to connect with more members of our mathematical community across the country, which has been very valuable to me.

The CMS does many things. One of our main attractions is our semi-annual meetings. The meetings are a great way for us to gather and exchange ideas. We exchange ideas about mathematics, ideas about math education, and the state of mathematical research in our country. But like all great things, they are not easy to achieve. It costs money to put on a meeting. We need access to a quality venue. We want AV equipment in many rooms, close to each other. We want coffee and treats. We want to be able to dispose of our trash into containers that are not overflowing. We want there to be a good schedule, that is posted in advance. We want to be told where to stay nearby, and how to get there. At a small meeting, maybe you can get a free room on the weekend that nobody is using. You grab some cookies and a fruit platter from the grocery store. You buy some coffee pods and folks stand in a short line to use the machine in the break room. Nobody notices that you filled all the garbage bins to the brim on a Saturday. You're all in the one room, everyone knows each other, so there's no need for nametags or a well organized schedule. But this is all completely different at our large scale CMS meetings! The logistics are complicated, and we need to pay staff to arrange it. We need to have the food delivered. We need to pay for rooms. We need to pay for AV rental. We even need to pay for garbage removal. But it is worth it. It is worth it to have a meeting where we all come together. Where each of our organizational loads is small, because the CMS has taken care of the logistics. Where we have advertising to make sure everyone is aware of what is going on, so that those we didn't realize were interested can get to know us and exchange ideas with us. So next time you think: "Why should I have to pay a registration fee, I'm a speaker?" Or: "Why should I have to pay a registration fee, I'm an organizer?" Or: "Why should I have to pay a registration fee, I'm not even speaking or organizing; I'm just sitting in on a few talks and only grabbed a cookie when they were about to throw them out?" Please also reflect: If the speakers, organizers and people who aren't speakers or organizers all don't pay, then how will the meetings keep happening? Of course, the CMS gets sponsorships whenever possible, but it is also important to keep our independence from our sponsors, so that we can choose how to run our meetings, and what we discuss.

Another of the CMS's more visible endeavors is our commitment to mathematical outreach. We do a great job with our math contests and math camps, and we were able to get support from the Intact Foundation to keep our Crux Mathematicorum going as a free online publication. However, exposing young Canadians from around the country to high level mathematics remains a challenge. My kids are currently elementary school students in Ontario. They no longer run math contests through their school. High school math has been de-streamed in grade 9. Of course, for my own kids, I can certainly download materials from the internet, and sign them up for external math contests. But what about the kids whose parents don't know where to look, or don't have the time? How will kids get noticed in a high school classroom, where the teacher is struggling with kids at all different levels? As a community of mathematicians, it falls to us to brainstorm how it can be done better. How do we achieve equitable access to excellence? How do we make sure that it's not too late for one child to catch on to math, without holding another child back? Working together, I

hope we can come up with various options for programs that teachers, parents, or other interested parties can run through their schools in a way that's manageable for them.

As I have mentioned, I have very much enjoyed my involvement with the CMS over the years, and mainly getting to know and work with many different people from across the country. Already, having been announced as President-Elect at the recent Ottawa meeting, many of you have introduced yourselves and shared your thoughts and concerns about a variety of issues. I'm looking forward to getting to know more of you over the coming years, and working together to share the beauty of mathematics, at all levels, with as many people as possible, while also encouraging excellence and cutting edge breakthroughs in our subject.

Dear Sir or Madam, Will You Read My Paper?

Editorial   September 2023 (Vol. 55, No. 4)

Robert Dawson (Editor)

Editor, Notes

Last December I wrote about spam graduate school applications, in which a student sends an email to random faculty members asking to work under their supervision. The letters always praise the recipient's research program to the skies–and betray complete ignorance of what research the recipient might be doing.

As an editor (not so much here, though it happens, but mainly as articles editor for *Crux Mathematicorum* I see a lot of another flavor of spam: the paper submitted to a totally inappropriate journal. I do not speak here of a paper that might be appropriate if it was at a slightly higher level: that's a subjective matter, and any proud author might rate their paper a little more highly than the referee does. And I'm not even talking about the truly fractoceramic submissions, the ones purporting to square the circle (and prove the Riemann conjecture for dessert) via two pages of metaphysical bafflegab and a few crudely-typeset equations.

At *Crux*, there's also a string of first efforts from high school students. Many of these would be worthy of praise in a school science fair, but don't have sufficient novelty or depth for general publication. This is probably a specific quirk of *Crux*: it's the first mathematical periodical that many budding mathematicians learn about, and we're proud of that. Moreover, we do expect the articles we publish to be accessible to the brightest high school students–but that's not our only criterion! I don't imagine that the *CJM* or *Annals* have this problem often.

Today I'm thinking of the papers that quite possibly have a modest home waiting for them somewhere, but whose authors seem unaware that not all math journals are isomorphic. Just this week a submission to *Crux* arrived: I won't mention the title, or even the precise topic, to spare the author's blushes, but it was an applied math paper most unlikely to interest the typical *Crux* reader (whom we understand to be a devotee of math puzzles or contest problems.) While it was outside my area of expertise, it seemed to be quite possibly correct and possibly even of some value. Moreover, it had a list of references to articles in various journals. In short, it was clear that the author knew that the world contains numerous math journals. So how did they end up sending it to *Crux*?

I can only assume that the ease of submission, in this age of the Internet, is such that some authors figure that random submitting is easier than reading the Notes to Authors (or even a few articles) to find out what a journal normally publishes. Unfortunately, this is a bad idea. In a related development, in the last twenty years a truly horrifying number of predatory journals with standards best measured using imaginary numbers have sprung up; and the sort of scattergun stochastic submission that gets an applied-math paper sent to a problem-solving journal is not likely to find it a good home, or one that does any credit to its author.

Computing Machines and the Philosophy of Mind

Jessie Hall (Institute for the History and Philosophy of Science and Technology, University of Toronto)

Artificial intelligence and cognitive science seem to share a common assumption: that computers and minds might be similar in some respect or other. Whatever respect this might be, the notion of artificial *intelligence* takes it that a computer *could be like* a mind in the sense that the cognitive capacity of *intelligence* could be attributed to an artificial computing machine. Cognitive science, or more specifically, computational theories of mind (CTM), take it that the mind *is like* a computer, in that the mind—thought, or more scientifically, cognition——is constituted of computational processes performed by the brain. These might seem like perfectly intelligible claims, but they are so only if it is clear what it is to be a computer (or, what it is for a physical system to compute). For the last few years, I have been preoccupied with the revelation that, in fact, what it is to be a computer is far from clear. The effort to make sense of this unclarity has spanned the philosophy of mind, philosophy of language, and philosophy of mathematics.

In the recent philosophical literature on the subject, a variety of attempts have been undertaken to make sense of computers as *physical machines* [e.g.**,** 6; 8; 4; 9; 3]. The conception of a physical machine at hand is heavily influenced by the 21st-century tradition of the 'new mechanical philosophy' or *new mechanism*. New mechanism takes machines to be not just those mechanisms built by human beings for a variety of purposes, but *any* physical system whose behaviour is understood as a (sometimes exceedingly complex) arrangement of parts and subparts causally related to one another and couched within a broader causal nexus.

A preliminary hope for any account of physical computing machines (what I refer to alternatively as 'computers') is that the account coheres with our intuitions about the machines we already *call* 'computers'. Unfortunately, intuitions do not always agree. For instance, among such machines, some but perhaps not all cognitive scientists count brains. Whether we count brains as computing machines or not, the relevant question to ask is: What must a physical machine be like, to be called a computer? One of the most frequently encountered answers takes the form of what is often called a 'mapping' account of computation: A physical machine is a computer if it implements a computable function, and a machine implements a computable function if there is a *mapping* between that machine and the function.

It is a sensible-sounding view, especially in light of the fact that the concept of a computable function—computability itself—is most famously articulated in terms of a machine, the Turing machine (TM). This Turing machine is named for Alan Turing (1912–1954, Figure 1), the British mathematician who first described the machine in 1936—in his terms, the automatic machine or 'a-machine'. The TM was a preliminary formalism for addressing a vexing foundational problem in mathematics, familiar to contemporary computer scientists as the 'halting problem'. Turing machines are not *physical* machines, but *notional* ones. It would be an infelicitous leap to conflate the a-machine described in [10; 11] with the physical 'machines' as construed above. It is a substantial question to ask: *When does* a physical machine implement a Turing machine? [12] The mapping view says that a physical machine *P* implements a TM when there is a mapping from *P* to the TM.

Figure 1. Alan Turing in 1935. *Wikimedia Commons*, CC BY-SA 4.0.

Unfortunately, this basic picture has led to significant and highly unintuitive consequences. The philosopher Hilary Putnam (1926–2016, Figure 2) has shown that under this simple mapping account of computation—one that identifies computation with the implementation of computable functions, and implementation with a mapping from machine to automata—*every ordinary open system implements every finite state automaton* (FSA). Loosely, an open system is any system where matter and energy can traverse the boundary of the system—most, if not all meso-scale physical mechanisms are of this sort (for instance, a granite rock might have a clear enough boundary, but its formation, cooling, and erosion constitute matter changes, while e.g. the heat of the sun impinges on its mean kinetic energy). Finite state automata are a subclass of Turing machines—a subclass of computable functions. In other words, every (open) meso-scale physical system is a computer, under the simple mapping account of computation [7, Appendix]. This thesis is called 'pancomputationalism', and the version articulated by Putnam is one of the strongest; every system computes *every* FSA. Other philosophers [see, for example, 1; 2] admit only a more limited version of pancomputationalism: every physical system computes *at least one* FSA.
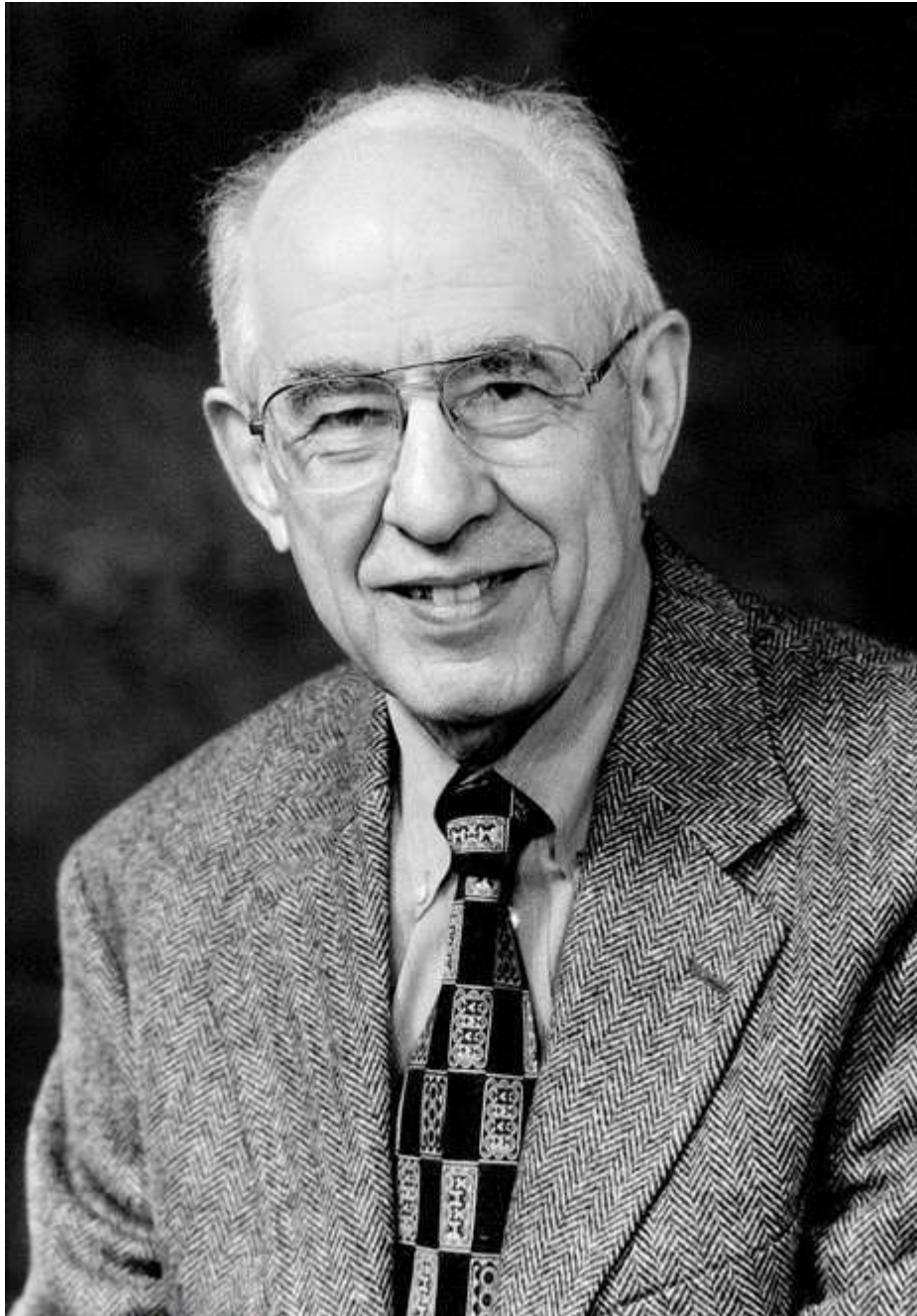
Figure 2. Hilary Putnam in 2006. *Wikimedia Commons*, CC BY-SA 2.5.

The way in which pancomputationalism arises under these 'mapping' views of computing is a consequence of at least one of its basic commitments. Mapping accounts are composed of three basic ingredients:

1. Automata; (models of) the species of expressions captured by Turing computability (TMs and FSA are the preferred formalisms);
2. The implementation relation, which involves a mapping from physical system to automaton model;
3. What is often hidden from view but essential: a model of the physical system that is to be mapped to the automaton—the source domain of the mapping from physical machine P to automaton A.

One popular strategy for avoiding Putnam's unlimited pancomputationalism is to constrain (2) by placing conditions on those implementations considered to be legitimate. The strategy has revealed an opposition between those who believe that computation essentially involves semantic

properties, and those who believe that semantic properties are not essential to computation, that computers can be individuated without appeal to semantic properties. Under the semantic view, the only legitimate implementations are mappings from physical machine *P* to automaton *A* that meet certain representational constraints. Under non-semantic views, physical machine *P* implements automaton *A* only when the automaton to which the physical system is mapped meets any one, or a combination, of the following:

- The mapping between *P* and *A* supports counterfactuals regarding *P*'s behaviour;
- *A* reflects the causal organization of *P*;
- *A* respects and/or mirrors scientific explanation of the behaviour of *P*.

Defenders of the latter view seem to be motivated by the conviction that computing machines must be naturalizable, by which they usually mean explicable in terms of, or even reducible to, physical properties, their causal interactions, and organization. Semantic properties, on the other hand, seem resistant to explication or reduction of this sort, and thus threaten the kind of naturalizability pursued by new mechanists. Typically, strategies of the non-semantic sort make two assumptions. First, that there is one model of a given physical system (3), and second, that pancomputationalism arises primarily from spurious mappings from that model (3) to automata (1), mappings which are spurious in virtue of failing to preserve the mechanistic properties of the system given by the model (3). This strategy has been unsuccessful at evading pancomputationalism, and, in my view, unsuccessful in virtue of the assumption regarding (3). The problem does not arise from spurious mappings from a given model of a physical system to many different automata, but because the physical system itself can be modelled in a variety of ways, all of which map to (are in fact isomorphic with) automata that fulfill the non-semantic implementation constraints.

One might suppose that there is a *correct*, and maybe even a *singular* correct model of a physical system, which is given by a scientific theory of that system. Unfortunately, real science does not bear out that supposition. For example, the mechanism of ATP production in cellular respiration might be explained in terms of macronutrients and chemical compounds (e.g., Krebs cycle), or alternatively, in terms of the biokinematics of motor proteins (e.g. the myosin 'walk').

For a simpler illustration of this idea, I've devised an example of a pendulum (Figure 3). We can just as easily talk about the states of a pendulum given by thermodynamics—e.g., the mass P heating up and cooling down under the sun—as we can the states of the pendulum given by kinematics, and even a kinematic treatment of the pendulum can produce a multitude of models. The pendulum shown in Figure 3 might have its behaviour described in a variety of ways. One way might be to define the states of the pendulum in terms of the velocity of mass P, and define the inputs in terms of the force F_P on P (a function of Θ).
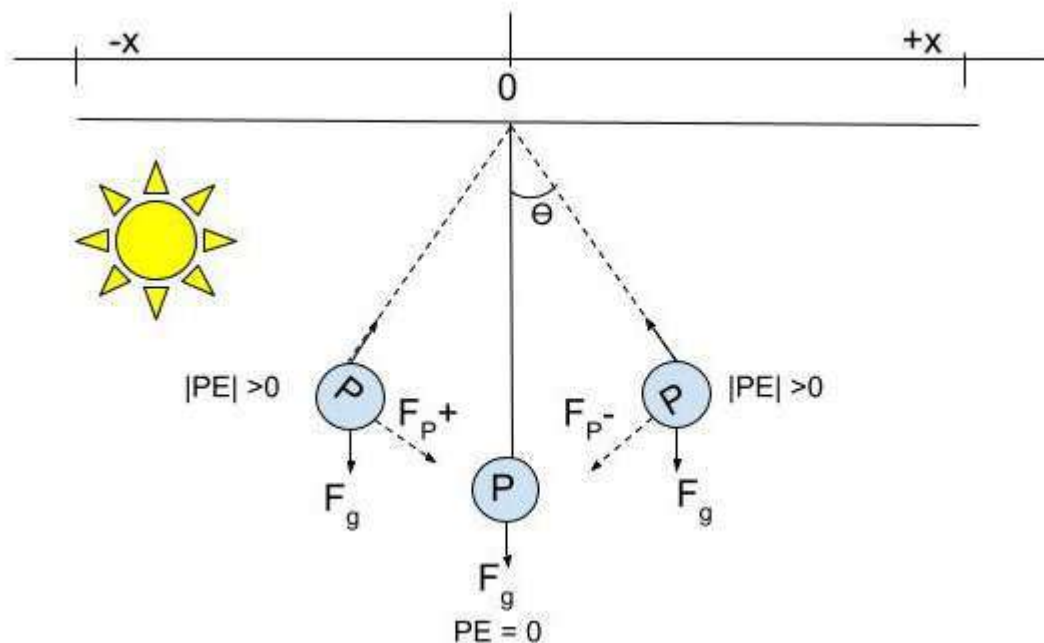

Figure 3. States of a pendulum. Diagram created by author.

Alternatively, the pendulum's states might just as well be defined in terms of the potential energy (PE) of mass P, and the inputs defined in terms of positions along the x-axis. Yet another model of the pendulum might define its states in terms of the relative temperature of mass P as a function of time, and the inputs as the angles of the sun relative to mass P. Figure 4 illustrates a model of the pendulum behaviour under the first description.
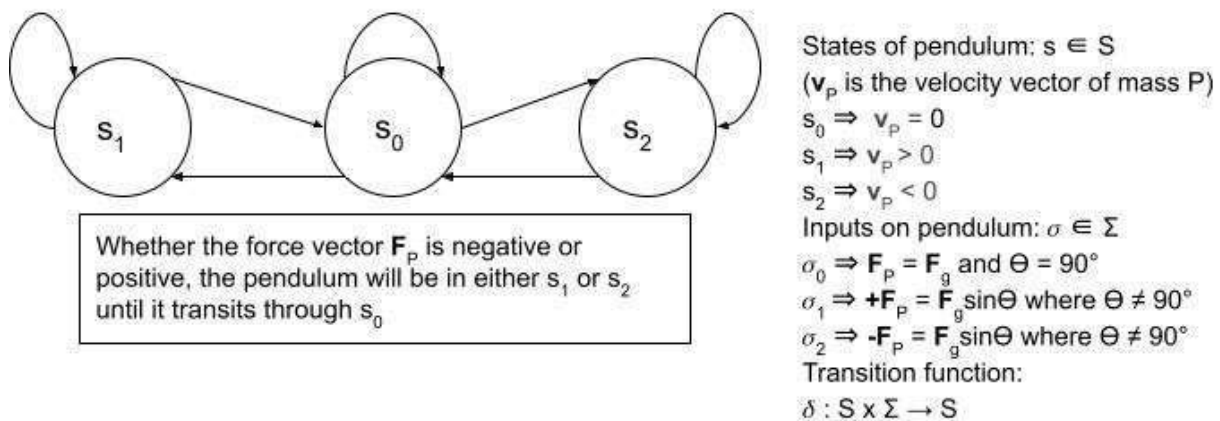

Figure 4. Alternate model of states of a pendulum. Diagram created by author.

While opinions may diverge on whether a pendulum ought to count as a computer, unfortunately such models—which conform to scientific theories pertinent to the behaviour of a mechanism, and support counterfactuals regarding possible transitions—can be devised for *any* mechanism. One and the same mechanism can have a variety of behaviours amenable to a multitude of models, and any given (causally explicated, counterfactual-supporting) behaviour can be modelled in a variety of ways. The result is that any given machine implements—that is, maps to—a variety of automata, simply in virtue of being a machine. Unless we are prepared to capitulate to pancomputationalism, a better account of computers must be formulated.

The alternatives found in the semanticist camp—those who take semantic properties to be essential to the individuation of computing machines—have a different set of problems (which may very well include pancomputationalism). Chief among them is that it is not entirely clear what it means to be individuated by semantic properties, nor indeed, what a semantic property even is. 'Semantic properties' might be construed as *relations* between expressions and their extensions (e.g., reference, synonymy, truth), but they might also be construed as whatever it is that is taken to *fix* those relations. Theorization over both construals of semantics constitutes a vast and contested literature.

Supposing this problem can be addressed, there is still the problem of naturalization. On the one hand, one might reject a notion of naturalization that conforms to the strictures of new mechanism—by rejecting the notion that everything 'natural' is reducible to or explicable in terms of physical properties, their causal relations, and organization. On the other hand, either the semantic theory undergirding the individuation of computers must itself be (mechanistically) naturalizable, or it must be accepted that computers are simply not naturalizable.

One might, at this point, simply wish to give up on explaining what a computer is. Unfortunately, as suggested at the outset, there are stakes to giving up. If computing in physical systems remains unaccounted for, then claims that certain physical systems, such as brains, are computers, are claims without substance. Likewise for claims that certain machines, in virtue of their computational properties, could be intelligent; their subject matter is a mere mirage.

There are two possible outcomes from here. In one scenario, the approaches just detailed are hopelessly misguided, but out there somewhere is a correct account of computers that does not suffer from any of the problems just canvassed. In the other scenario, one or more of the problems above persists—pancomputationalism, (non-)naturalizability—in which case our claims about brains and AI must be reassessed: If everything computes, what does it mean to say a brain does? If every mechanism computes, and computation in a machine is sufficient for intelligence, then does every mechanism have (some form of) intelligence? If computation is semantic, can it still be naturalized? And so on. These are among the questions that will be waiting in the wings for any account of computing machines.

Note: The subject of the present essay is classified in the Mathematics Subject Classification System (MSC2020) under the headings of 'computer science', 'theory of computing', and 'artificial intelligence'. In older versions of MSC the heading 'logic in the philosophy of science' also appears. Some of the sources below are reviewed in *Mathematical Reviews* (*MR*), and for other sources closely-related publications by the authors are reviewed. The *MR* identifier is provided below for sources that are reviewed in *MR*.

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[11] Turing, A. M. (1938) On computable numbers, with an application to the Entscheidungsproblem. A correction. *Proceedings of the London Mathematical Society*, ser. 2, 43(1) 544–546.

[12] It is important here to note two senses of the term "Turing machine". In the broad sense, "Turing machine" refers to the a-machine described in Turing (1937) consisting of a read/write head that can move left and right, and read and write symbols, and an infinite tape, divided into squares, upon which the read/write head writes and reads symbols. In the narrower sense, a 'Turing machine' might refer to a 'machine description' which specifies the (finite) list of steps that the a-machine follows for producing a particular sequence.

Jessie Hall is a doctoral candidate at the Institute for the History and Philosophy of Science and Technology at the University of Toronto. Her research examines the influences of mathematical (Turing) computability, functionalism, and various stripes of reductionism on conceptions of physical computational systems, brains as computing systems, and 'abstract' computing.

Tips for New (and Seasoned) Instructors

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Editor-in-Chief, CRUX & Chair of Equity, Diversity and Inclusiveness Committee

Chelsea Uggenti (University of Waterloo)

Do you ever feel overwhelmed in your role as a new instructor? If the answer is yes, then welcome to the club! New instructors have many demands, such as learning institutional and departmental expectations, teaching courses for the first time, creating course materials and assessments and developing teaching practices/styles. It may seem daunting at first, but there are many simple steps that you can take to alleviate some of these burdens to maximize your time, energy and overall enjoyment of teaching. The following tips are a combination of lessons learned from experienced colleagues that we are delighted to share with you.

Do not reinvent the wheel or start from scratch

Don't hesitate to reach out to your fellow instructors who have previously taught the same course. Kindly ask them to share their teaching materials, such as lecture notes, worksheets, problem sets, and assessments. Many instructors are more than willing to offer their course materials which can help guide you in your course preparation. You can then adapt the shared materials to your teaching style, bring your own perspective to the classroom, introduce your own examples, activities and creative touches that showcase who you are as an instructor. On the flip side, share your own successful teaching materials and experiences to benefit fellow math instructors.

Our colleagues are our most valuable assets. It may take several months to feel comfortable in a new job, so ask questions, seek help and find out what supports are available to you.

Find a mentor

Ask a colleague who has previously taught the same course or a similar course to be your mentor. They can provide you with invaluable insights into student demographics, learning habits as well as potential challenges or specific misconceptions that students often encounter in a course. They can share instructional approaches and teaching resources that have proven successful in the past. They can help you develop proactive strategies to address common stumbling blocks and overall better address the specific needs of your students. They've been through it all and can guide you through the maze of hardships and delights that students face.

Creating effective assignments, quizzes and tests requires both time and practice, so if possible ask your mentor to review your assessments. They can offer feedback to ensure that your assessments are written clearly, aligned with course learning outcomes, and test the material at an appropriate level for your specific student population.

Acknowledge the time and effort your mentor has given you. And remember, when you're in a position to do so, pay it forward. Share your own experiences and support fellow educators on their journeys. Together, we can build a community that thrives on knowledge, growth, and collaboration.

Use the '+1' method

We can spend hours upon hours improving our notes, slides, assessments and other teaching materials; however, it is important to consider how these efforts translate to our students' learning experience. While it may be tempting to perfect every detail, you will soon hit the point of diminishing returns and waste a lot of time and effort that might be best spent elsewhere. Work on a class until you arrive at an inflection point when materials have reached a high level of quality and effectively support your teaching objectives. At this point, shift your focus from refining existing content to incorporating new elements that can enhance the learning experience.

You will be tempted here again, this time to try out many different ideas. From the student perspective, too many new tasks and activities can be overwhelming due to the constant context switching. From the instructor perspective, you need enough information to assess the impact of each new addition on student engagement and comprehension (not to mention practice running a specific activity). So use the '+1' method: add one new thing, such as an active learning activity or a different type of assessment, each time you teach a course. This incremental approach will ensure you understand how the modifications affected the learning experience. It will also allow you to make deliberate and gradual adjustments in future courses and continuously improve your teaching practice over time.

Get student buy-in

Student buy-in is crucial for creating a supportive classroom atmosphere and an effective learning environment. Take time to explain why you are using a particular teaching technique: perhaps it is a strategy you believe will enhance their understanding of a concept or it is an activity that will improve their communication. By sharing your rationale, you can help students understand the purpose and relevance of the approach, which will increase their motivation and willingness to engage with it.

It is also important to acknowledge that trying something new might not work as you expected, so have an honest discussion about that in advance of the activity, following it, or both. Gathering student feedback will not only help you fine-tune the approach for future iterations, but it also allows students to play an active role in shaping their own educational experience, creating a sense of ownership and investment in their learning journey. Moreover, students often appreciate the opportunity to contribute to the improvement of the course and help their future peers.

Survey your class throughout the term

Do not wait until the end of the term to collect student feedback as you can likely address many common concerns during the term. Do a survey a few weeks into a course or incorporate regular surveys into the semester. Make sure to include both content-specific and general questions: while understanding how well your students are comprehending the material is crucial, it is also important to seek their feedback on other parts of your teaching practice. Ask about your handwriting (in size and clarity), speech (loudness, speed, clarity), course structure (frequency of assessments). Address the feedback in class and highlight how you plan to implement the changes so students understand that their voices are being heard and their opinions matter.

Do not take it personally when students don't do well

As an instructor, you will work with a diverse group of students with various learning preferences, abilities and backgrounds, each with their own strengths, weaknesses and personal experiences. In reality, this means that no matter how hard you try, you simply won't be able to please everyone or ensure that every student succeeds. It's just not possible. This is why it is crucial to remind yourself that an instance of poor student performance or a piece of negative feedback is not a reflection of your worth as an educator or quality of your teaching as a whole.

Of course, it is important to diversify your teaching techniques and be open to feedback that can help you grow professionally and personally. But it is essential to separate your worth as an educator and a human from the outcomes or feedback you receive. Remember, each student's journey is influenced by many factors that are completely out of your control. Focus on finding creative ways to meet the diverse needs of your students and keep nurturing that passion for growth and learning within yourself, your peers and your students.

Take notes

There are often many moments throughout the term that we want to make note of. Did that class run smoothly? Did the student enjoy the example? Was the midterm too long or too difficult? Was this particular topic hard for students to grasp? We may notice these important questions

and answers, but we often don't write them down. Our minds and schedules are busy enough without having to remember all of these tiny (yet crucial) details. One way to combat this is to take notes.

As much as possible, take notes on what went well and what did not go well. These notes will help you to make adjustments during a course and, most especially, changes to the course for the next iteration. This is important if you are not due to teach the course again for many terms/years.

Do peer teaching observations

One of the best ways to gain new insights and fresh ideas for your own teaching is by attending other instructor's classes. By observing how other educators engage with their students, present the material and manage classroom dynamics, you can gather valuable inspiration that you can adapt and incorporate into your own teaching style. Imitation is the sincerest form of flattery after all.

Moreover, observing the class from the non-instructional position is a transformative experience: the perspective from the back of the room offers a completely different vantage point. Many institutions have a Centre that focuses on teaching and learning and they may offer formal versions of peer teaching observations. Check out if yours does and give it a try.

As a new instructor, you face a multitude of demands and responsibilities that come with the role. However, by implementing some simple strategies, you can make the most of your time and energy both in and out of the classroom. Finding a mentor to guide you, fostering student buy-in, seeking feedback and surveying your class early on are just a few tips to enhance your teaching journey. Always remember that you are not alone in this adventure. Welcome to the amazing world of teaching!

If you are looking for more resources with ideas to apply to your teaching, here are a few of our recommendations:

- "How Learning Works: Seven Research-Based Principles for Smart Teaching" by Susan A. Ambrose, Michael W. Bridges, Marsha C. Lovett, Michele DiPietro, Marie K. Norman
- "Teaching in Higher Ed" podcast with Bonni Stachowiak
- Rabbit Math project for inspirational ideas https://www.rabbitmath.ca
- First Year Math and Stats network, seminars and various resources https://firstyearmath.ca

Empowering Mathematics: Access for All, Not Just the Elite

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Zohreh Shanbazi (University of Toronto Scarborough)
Teaching and learning Mathematics have tremendous potentials for promoting equity, diversity and inclusivity (EDI). I hold this belief primarily because the process of mathematical thinking involves identifying common characteristics amongst seemingly different structures, making connections, and generalizing and unifying previously known facts to derive new results. Such a process values flexibility as well as the ability to change frameworks, which aligns with my understanding of EDI. While the nature of knowledge construction in mathematics inherently encourages inclusive teaching and learning practices, it is essential to acknowledge that there are serious gaps in our current approaches toward math education when it comes to promoting EDI. These gaps can hinder the provision of equal opportunities for all learners to flourish and reach their full potential.

In this note, I begin with some examples that illustrate why I believe mathematical concept and knowledge development align with the EDI principles. I also discuss certain factors demonstrating that teaching and learning in mathematics may not be as inclusive as it should be, and they can, at times, be detrimental to the learner's confidence in their thinking capabilities. Finally, I will address a specific area of focus that requires attention to enhance the teaching and learning environment with respect to EDI.

First, let us examine four examples within the realm of mathematical concepts, which highlight the benefits of making connections and embracing the inclusion of diverse ideas.

1. Euler Formula

The Euler formula is widely regarded as one of the most beautiful equations in mathematics. One may wonder what exactly makes it so captivating? Let us try to explore some of the reasons behind its beauty.

The Euler formula elegantly combines five significant numbers, namely, 0, 1, e, i, and π, through the basic arithmetic operation of addition and the concept of equality. This seemingly simple formula manages to encapsulate our entire understanding of the number system through a concise representation. It denotes a harmonious relationship between different mathematical concepts, capturing the essence of the interconnectedness that mathematics is built upon.

2. Spacetime Framework

In the Minkowski framework, space and time are intricately connected through a four-dimensional manifold. This model assigns three dimensions to represent spatial location and one to represent time. Remarkably, such a four-dimensional manifold of space-time has demonstrated significant predictive capabilities of illuminating workings of the natural world. The fusion of space and time exemplifies the extraordinary flexibility of our thinking process. By combining these two seemingly distinct concepts, we gain a more profound understanding of our universe. This integration allows for perceiving the interplay between spatial dimensions and the progression of time, enabling us to explore phenomena in a more comprehensive and holistic manner. It is through such a versatile and interconnected perspective that we can unravel the mysteries of our world, and make meaningful predictions about its behavior.

3. Non-Euclidean Geometries

The conventional Euclidean geometry taught in the high-school is based on a set of five axioms that are universally accepted to be intuitively true. These axioms form the foundation upon which logical reasoning and previously proven facts are applied to derive the results of geometry. There is a certain fascination with the unquestionable nature of such axioms—facts that cannot be disputed. However, what happens if we dare change one of these axioms? Surprisingly, by altering a single axiom, we create new geometries with distinct sets of results, essentially constructing new frameworks. These new geometric structures can lead to novel applications. For instance, hyperbolic geometry emerged when the usual parallel axiom was modified. In hyperbolic geometry, given a point outside a line, there exist infinitely many possible parallel lines passing through the

point, in contrast to a single parallel line in Euclidean geometry. Consequently, the conventional results of Euclidean geometry no longer hold on a hyperbolic plane. Notably, for example, the sum of the angles in a triangle on a hyperbolic plane is always less than 180 degrees. By exploring alternative geometries beyond Euclidean geometry, we gain a deeper understanding of the possibilities inherent in different frameworks. These discoveries broaden our perspective, and enable us to make valuable insights in various fields, from practical applications in navigation to profound implications in our understanding of the fundamental nature of space and the universe.

4. The Unified Land of Mathematics

Mathematics encompasses a wide range of subfields, each dedicated to solving specific problems using unique approaches and methods that may not be commonly employed in other areas. However, there are instances where the solutions to certain problems require the integration of methods from two or more seemingly unrelated subfields. It is through discovering certain relations between diverse subfields that we may be able to uncover the unified mathematical landscape, defined by the inherent symmetry of nature, rather than a patchwork of isolated fragments. Maryam Mirzakhani, a renowned mathematician, exemplifies the ability to establish such connections. In her work, she successfully bridges the gap between disciplines such as hyperbolic geometry, complex analysis, topology, string theory, and dynamical systems. By drawing on the tools and concepts from these disparate areas, she was able to make significant advancements and contributions to mathematics.

Mirzakhani's achievements highlight the power and potential of interdisciplinary exploration within mathematics. By actively seeking out connections and integrating methodologies from different subfields, we can enhance our understanding of the subject as a whole. These interconnected discoveries not only deepen our appreciation of the underlying unity of mathematics, but also pave the way for groundbreaking insights and solutions to complex problems.

My point in providing the above four examples is to highlight the processes and methodologies of mathematics knowledge production, rather than focusing on the individuals who produced the knowledge. It is crucial to recognize that, at least for the first three examples, the mathematicians involved were predominantly European males, leading to a lack of diversity in the body of knowledge producers. Indeed, one of the significant weaknesses in the field of mathematics is the tendency to concentrate knowledge among certain individuals, and discourage the contribution of others, perpetuating a culture of elitism. This exclusivity can stifle creativity and innovation by limiting diverse perspectives and fresh ideas from emerging within the mathematical community. Allow me to share with you a relevant personal anecdote here, highlighting some of the struggles that a learner might face in the field. During the first year of pursuing my Ph.D., I eagerly attended office hours of my course instructors to ask questions about the content and seek their guidance on challenging problems. However, one of my course professors seemed to be unable to understand my genuine passion for learning, and regarded me inattentively, possibly due to my visible minority status. During one of the sessions, he went so far as to tell me that "*mathematics is for the elites only*." As a learner whose mother tongue was not English, I was prompted after the session to contemplate on what exactly he meant and the meaning of the word "*elites*." Discovering the implications of his statement left me shocked, but it also fueled my determination to prove the professor wrong, and showcase my true talent and capabilities in the subject.

There are certain factors indicating that the current approach to teaching and learning mathematics is still far from being genuinely equitable, diverse and inclusive.

First, there is often a lack of student engagement in the formal mathematics education, majorly due to the failure in creating an interactive learning environment that values diverse perspectives and encourages active participation from all students.

Secondly, there is a promotion of an elitist culture, which implies that only a select group of learners possess exceptional thinking skills, while others are considered as unfit to advance their knowledge in and contribute to mathematics. Such a culture perpetuates inequality. It is crucial for educators to foster a growth mindset, and create opportunities for all students to develop their mathematical thinking skills.

Thirdly, educators need to actively work towards understanding the gaps in students' knowledge, and providing adequate support for helping them enhance their learning. This requires a commitment to customizing instruction, differentiating learning strategies, and addressing the unique needs of each student, through the implementation of the principles of Universal Design for Learning.[1]

Lastly, assessment methods that do not align well with the taught materials can hinder students' performance. Penalizing students for poor results without critically examining the assessment tools and their coherence with the intended learning outcomes can further marginalize certain groups of students. In a recent study that I conducted about the assessment methods in mathematics learning, I employed the notion of Community of Inquiry [2] as a theoretical framework for analyzing the experience of students and instructors with assessment practices. One noteworthy finding

of the study was the students' mention of the irrelevance of the test contents to the lecture materials. Such a disconnect between the test contents and lectures can lead to an emotional turmoil, as one student described:

> *"... there are some issues with the questions in the tests...I feel like 'Oh, wait, that's totally not what was talked about in the lecture.' It's heartbreaking. It's so disconnected from the lecture. After taking it, I totally had no idea what I was supposed to do in the rest of the course."*

In my view, the pervasive opinion that "*I am not good at math*," commonly expressed by the public, may be a result of the persistent discouragement received by learners through the conventional feedback system. Mathematics education is often conducted within such damaging environment, where learners develop discouraging feelings that reinforce negative perceptions about their math abilities. It is essential to encourage learners to gain the belief that we are all capable of excelling in mathematics, because we are all thinkers at different levels. By fostering this view, we can inspire them to see the values of learning mathematical concepts as a means of further developing their thinking skills. Mathematics offers a powerful platform for honing critical thinking, problem-solving, and analytical capabilities, which extend beyond the subject itself, enriching learner's overall cognitive abilities.

By embracing EDI practices in mathematics education, we can dismantle barriers, empower learners, and foster a sense of agency and confidence in all individuals, regardless of their background or perceived mathematical abilities. Such an inclusive approach enables us to cultivate a society where individuals have a better opportunity to thrive and contribute their unique perspectives to the decision-making processes that shape our collective future.

References

CAST (2018). Universal Design for Learning Guidelines version 2.2. Retrieved from http://udlguidelines.cast.org

Vaughan, N. D., Cleveland-Innes, M., & Garrison, D. R. (2013). Teaching in blended learning environments: Creating and sustaining communities of inquiry. Athabasca University Press.

Garrison, D. R. (2016). E-learning in the 21st century: A community of inquiry framework for research and practice. Taylor & Francis.

[1] Universal Design for Learning is a comprehensive framework rooted in scientific insights into human learning, aiming to enhance and optimize teaching and learning experiences for all individuals.

[2] Central to the Community of Inquiry theory is the underlying belief that higher education embodies a blend of collaborative and individually constructivist learning (Vaughan et al., 2013, p. 10). Therefore, a nurturing community of inquiry should adeptly fuse cognitive autonomy with social engagement within the learning journey (Garrison, 2016; Vaughan et al., 2013). As stipulated by the CoI theory, the attainment of profound and substantial learning hinges upon the cultivation of three essential presences: cognitive, social, and teaching.

Call for Submissions: CMS Notes Mathematics, Outreach, Society, Accessibility and Inclusiveness Column (MOSAIC)

MOSAIC   June 2023 (Vol. 55, No. 3)

The Canadian Mathematical Society (CMS) invites you to submit articles to be featured in the MOSAIC column of the CMS Notes.

MOSAIC (Mathematics, Outreach, Society, Accessibility, and Inclusiveness Column) is directed by the CMS Equity, Diversity, and Inclusion (EDI) committee.

The column offers a space of expression for you to ask, listen, learn, share experience, and propose solutions to build a more diverse, just, and stronger mathematical community. For instance, you are welcome to submit an article sharing challenges and successes in enacting EDI initiatives within your university, with competitions, outreach activities, or other events.

Your email submission should include your article in both Word and PDF formats. Please submit your article to the EDI Committee at mosaic@cms.math.ca

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Building a Stronger Mathematical Community Through Diverse Committee Membership

Karen Meagher (University of Regina)
Chair, Women in Math Committee

The Women in Mathematics Committee is a great committee, organizing many worthwhile and engaging events. As Chair, I have enjoyed being a part of a vibrant community of women mathematicians in Canada and working closely with my fellow committee members. Unfortunately, as fun as the committee is, members come and go. When a member finishes their term, as Chair I'm left to search for a replacement.

Good news, I have a friend from graduate school who is awesome; I would love to have her on the committee with me. We took the same classes, had the same supervisor, earned the same degree, have the same number of kids, and have similar jobs now. Our skills and experiences are so very similar that we'll get along great! Of course, that means the only advantage to both of us being on the same committee is that we could pretend that we are the same person so that only one of us would have to attend the meetings!

To make the Women in Math committee even better, it needs diversity. I want young researchers who understand the challenge of searching for a job in today's market and seasoned researchers who are involved in the hiring. I want people from large research intense schools and people from intimate teaching schools. I want people with the lived experiences of racialized academics and academics who are members of gender minorities. I want people who know the realities of working in remote areas and those in urban areas. I want people who are facing the practicalities of raising children, as well as people working with disabilities.

In short, a committee works better if the people serving on it are different. The composition should be reflective of the community it is supporting. If I ask my friends to join the committee we'll enjoy each other's company, but we will not be able to fill the gaps in knowledge, experience and perspective necessary to support the achievement of the committee's objectives. Working in an atmosphere of diversity and inclusion fosters a stronger committee. I need to find a better way to fill vacancies!

Fortunately, the CMS Nominating Committee has identified this is an issue for CMS committees generally and has changed the process used to find committee members. As of September 2022, the CMS Nominating Committee uses a "Call of Interest" to fill vacancies. Every fall, the Committee announces upcoming vacancies in order to fill positions commencing the following January. This methodology aims to build a more transparent and open process aimed at encouraging diversity in CMS committee membership. It will also allow the CMS to be more proactive in anticipating and filling committee vacancies.

The Call of Interest, including a list of current and upcoming open positions, can be found in this issue. Please, check what positions are available and apply for any that are of interest to you!

Call of Interest for CMS Committee Membership

Calls for Nominations   September 2023 (Vol. 55, No. 4)

Join a CMS Committee!

Call of Interest for CMS Committee Membership

The Canadian Mathematical Society Nominating Committee invites expressions of interest in membership on the following committees. CMS committee members must hold CMS membership, however applicants need not be current members. Terms commence on January 1, 2024 and run for 3 years.

Current and upcoming committee vacancies:

- Education: 1 vacancy
- Endowment Grants: 2 vacancies (Ontario and Quebec representation preferred)
- Equity, Diversity and Inclusion Committee: 1 vacancy
- Finance: 1 vacancy
- Human Rights: 2 vacancies
- International Affairs: 2 vacancies
- International Prize: 2 vacancies
- Invested Funds: 2 vacancies
- Publications: 2 vacancies
- Reconciliation in Mathematics: 3 vacancy (Pacific, West, Atlantic)
- Research: 1 vacancy
- Women In Mathematics: 2 vacancies (Pacific, Ontario)

Terms of Reference for each committee can be found here.

How to express interest

Please send a Letter of Interest to chair-nomc@cms.math.ca with the following information:

1. Your name
2. Your career stage
3. Current university or institutional affiliation
4. Name of committee(s) you wish to join

5. Expression of interest in the particular committee(s): Why you want to be on this committee, or what you would do on this committee (this can be brief if you have a clear vision, or longer if need be.)
6. For International Affairs, Publications and Research, please also indicate your research domain

Applicants are encouraged to self-identify. The information will be used by the Nominating Committee to ensure committees are diverse in their representation. The information may also be used in aggregate to report on CMS equity, diversity and inclusion initiatives. The information provided will be kept confidential.

Please submit your letter no later than November 17, 2023.

Who should apply

We encourage everyone to consider becoming an engaged member of a CMS committee, however, we particularly welcome people who have not previously served with the CMS, or identify with, are connected to, or have experience with historically excluded groups:

- Racialized, Black, and/or People of Colour ("Visible Minorities")
- People with disabilities (including invisible and episodic disabilities)
- 2SLGBTQIA+ and/or gender and sexually diverse individuals
- "Aboriginal" and/or Indigenous Peoples (First Nation Peoples, Métis Nation, and Inuit)
- Women

If you are excited about participating in CMS activities but you aren't sure if your past experiences align perfectly with a given role/committee, the Nominating Committee encourages you to express your interest.

Determination of membership

Every committee of the CMS operates under its own Terms of Reference (TOR). The Nominating Committee will take into account the current composition of each committee and its TOR when selecting persons for nomination. Once nominated, approval is required by the CMS Executive and Board prior to appointment.

Feedback

Feedback on this new approach and suggestions on how to advance diverse representation on CMS committees are welcomed. Please send comments and suggestions to: chair-nomc@cms.math.ca.

One final push

If you have ever wanted to be more involved with the CMS or you would like to champion a particular cause or activity, please submit a Letter of Interest in being a member of a CMS Committee. Sometimes people are hesitant to put themselves forward, or just need some encouragement or support, whether they are a student, post-doc or established veteran. If you know someone who would be a good fit for a CMS committee, please encourage them to submit a Letter of Interest. **Become involved to build a stronger mathematical community!**

2024 CMS Research Prizes

Calls for Nominations   September 2023 (Vol. 55, No. 4)

The CMS Research Committee is inviting nominations for three prize lectureships. These prize lectureships are intended to recognize members of the Canadian mathematical community.

Coxeter-James Prize

The **Coxeter-James Prize** Lectureship recognizes young mathematicians who have made outstanding contributions to mathematical research. The recipient shall be a member of the Canadian mathematical community. Nominations may be made up to ten years from the candidate's Ph.D. A nomination can be updated and will remain active for a second year unless the original nomination is made in the tenth year from the candidate's Ph.D. The selected candidate will deliver the prize lecture at the 2024 Winter Meeting.

Jeffery Williams Prize

The **Jeffery-Williams Prize** Lectureship recognizes mathematicians who have made outstanding and sustained contributions to mathematical research. The recipient shall be a member of the Canadian mathematical community. A nomination can be updated and will remain active for three years. The prize lecture will be delivered at the 2024 Summer Meeting.

Krieger-Nelson Prize

The **Krieger-Nelson Prize** Lectureship recognizes outstanding research by a female mathematician. The recipient shall be a member of the Canadian mathematical community. A nomination can be updated and will remain active for two years. The selected candidate will deliver the prize lecture at the 2024 Summer Meeting.

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 for research in the mathematical sciences regardless of race, gender, ethnicity or sexual orientation. A candidate can be nominated for more than one research prize in the applicable categories; several candidates from the same institution can be nominated for the same research prize.

CMS research prizes are gender-neutral, except for the Krieger-Nelson prize, which is awarded to women only. Nominations of eligible women for the general research prizes in addition to the Krieger-Nelson Prize are strongly encouraged.

Nominations Requirements

The deadline for nominations, including at least three letters of reference, is **September 30, 2023**. Nomination letters should list the chosen referees and include a recent curriculum vitae for the nominee. Some arms-length referees are strongly encouraged. **New: the nominator most include a full citation of approximately 500 to 700 words.** Nominations and the reference letters from the chosen referees should be submitted electronically, preferably in PDF format, to the corresponding email address and **no later than September 30, 2023**:

Coxeter-James: cjprize@cms.math.ca

Jeffery-Williams: jwprize@cms.math.ca

Krieger-Nelson: knprize@cms.math.ca

2024 CMS Excellence in Teaching Award

Calls for Nominations   September 2023 (Vol. 55, No. 4)

The CMS Excellence in Teaching Award Selection Committee invites nominations for the **2024 Excellence in Teaching Award**.

The **Excellence in Teaching Award** focuses on the recipient's proven excellence as a teacher at the undergraduate level, including at universities, colleges and cégeps, as exemplified by unusual effectiveness in the classroom and/or commitment and dedication to teaching and to students. The dossier should provide evidence of the effectiveness and impact of the nominee's teaching. The prize recognizes sustained and distinguished contributions in teaching at the post-secondary undergraduate level at a Canadian institution. Only full-time teachers or professors who have been at their institution for at least five years will be considered. The nomination will remain active for three years, with a possibility to update.

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.

A nomination will consist of:

- a signed nominating statement from a present or past colleague, or collaborator (no more than three pages) having direct knowledge of the nominee's contribution;
- a curriculum vitae (maximum five pages);
- three letters of support, at least one from a former student (who has followed a course more than a year ago) and one from the chair of the nominee's unit. The letter of the Chair of the nominee's unit could include a one-page summary on information from student evaluations, or similar information;
- other supporting material (maximum 10 pages).

Nominations and reference letters should be submitted electronically, preferably in PDF format, to: **etaward@cms.math.ca** no later than the deadline of **November 15, 2023**.

2023 Endowment Grants

Calls for Proposals   September 2023 (Vol. 55, No. 4)

The Canadian Mathematical Society is pleased to announce the **2023 Endowment Grants Competition**. The CMS Endowment Grants fund projects that contribute to the broader good of the mathematical community. Projects funded by the Endowment Grants must be consistent with the interests of the CMS: to promote the advancement, discovery, learning and application of mathematics.

An applicant may be involved in only one proposal per competition as a principal applicant. Proposals must come from CMS members, or, if joint, at least one principal applicant must be a CMS member.

The deadline for applications is **September 30, 2023.** Successful applicants will be informed in January 2024 and the grants issued in February 2024.

Further details about the endowment grants and the **application process are available on the CMS website here**.

The Endowment Grants Committee (EGC) administers the distribution of the grants and adjudicates proposals for projects. The EGC welcomes questions or suggestions you may have on the program. Please contact the Committee by e-mail at chair-egc@cms.math.ca.

2024 CMS Math Competition Grants

Calls for Proposals   September 2023 (Vol. 55, No. 4)

The CMS is now accepting applications for the **2024 CMS Math Competition Grants** program. The CMS supports activities that promote the learning of mathematics among Canadian youth. In addition to the Society's math competitions, the CMS offers math competition grants for activities at the elementary and secondary school levels.

The deadline for submissions is **November 15, 2023**. Successful applicants will be informed in January 2024 and the grants issued in February 2024.

Further details and guidelines about the math competitions grants and the **application process are available on the CMS website here**.

The Committee on Grants for Provincial Competitions (CGPC) adjudicates proposals for support. Should you have further questions or comments, please contact the Committee by e-mail at **chair-grants-pc@cms.math.ca**

Applications should be submitted electronically using the online application form and additional documents preferably in PDF format, **no later than November 15, 2023** to **mathgrants@cms.math.ca**.

2023 CMS Winter Meeting | Montréal, Quebec

CALL FOR
Sessions

The Canadian Mathematical Society (CMS) welcomes and invites session proposals and mini-course proposals for the 2023 CMS Winter Meeting in Montréal from December 1-4, 2023.
In accordance with the CMS mandate to propose conferences that are accessible and welcoming to all groups, diversity amongst organizers and speakers is strongly encouraged. Diversity includes topics of interest, career stages, geographic location, and demographics.

CALL FOR SESSIONS:

Proposals should include:
(1) Names, affiliations, and contact information for all session co-organizers. Early career researchers are encouraged to propose sessions.
(2) A title and brief description of the topic and purpose of the session. This can include an overview of the subject.
(3) The total number of expected talks, with a list of possible speakers and/or papers in the theme. Sessions should strive to respect the above CMS policy of accessibility and diversity.

Open Call for Abstracts: The CMS will continue the open abstract submission process that was recently introduced to support session organizers in their important work and in their efforts towards inclusivity and diversity.

The CMS kindly asks session organizers to consider all eligible abstract submissions for their session, as up to 30 speakers per session can be accommodated.

The scientific sessions will take place from December 2-4, 2023.

Deadline: Proposals should be submitted by **Monday, July 31, 2023** to the Scientific Directors and the CMS Office should be cc'ed. There will be a second deadline of **September 30, 2023**, but earlier submissions will be considered first. Their contact information is as follows:

François Bergeron : bergeron.francois@uqam.ca
Simone Brugiapaglia: simone.brugiapaglia@concordia.ca
Alina Stancu: alina.stancu@concordia.ca

Sarah Watson: meetings@cms.math.ca

2023 CMS Winter Meeting – Call for Education Sessions

The Canadian Mathematical Society (CMS) welcomes and invites education session proposals for the 2023 CMS Winter Meeting in Montréal from December 1-4, 2023.

The education session proposals will be selected by the CMS Meeting Education Session Committee, which will also schedule the accepted sessions, in communication with their co-organizers.

Each proposal should follow the guidelines indicated in the call for Scientific Sessions. In addition, organizers are asked to specify the structure of their session (e.g., 20-minute talk followed by 5 minute Q&A and 5 minute transition; or a panel, or interactive session/workshop, etc.).

Proposals should include:

(1) Names, affiliations, and contact information for all session co-organizers. Early career researchers are welcomed to propose sessions.

(2) A title and brief description of the topic and purpose of the session. This should include a brief paragraph of the subject.

(3) Two to three sentence summary that will be posted on the CMS Meeting website if your proposal is selected.

(4) Indicate the number of time blocks needed. A block can be between 1 and 3 hours in length.

(5) A list of confirmed speakers who are approached before submitting the proposal. An inclusive and diverse set of speakers is highly encouraged.

(6) The structure of your session. Traditionally, each presenter gets 20 minutes to talk, 5 minutes of Q&A, and a 5-minute buffer for transition. We are open to different formats as well, such as a panel, interactive session/workshop, 10-minute lightning talks, etc

The CMS kindly asks session organizers to consider all eligible abstract submissions for their session, as up to 30 speakers per session can be accommodated.

The scientific sessions will take place from December 2-4, 2023.

Deadline: Proposals should be submitted by **Monday, July 31, 2023** to the Scientific Directors and the CMS Office should be cc'ed. There will be a second deadline of **September 1, 2023**, but earlier submissions will be considered first. Contact information is as follows:

Andie Burazin a.burazin@utoronto.ca

With alina.stancu@concordia.ca, bergeron.francois@uqam.ca, simone.brugiapaglia@concordia.ca, and meetings@cms.math.ca in cc.

2023 CMS Online Education Meeting – Call for Proposals

CMS Meetings   September 2023 (Vol. 55, No. 4)

The new **2023 CMS Online Education Meeting** is a new CMS-organized event. Planned to complement the in-person mathematics education sessions at the Summer and Winter CMS meetings, the 2023 CMS Online Education Meeting will feature plenary talks and presentations on various themes in mathematics education and provide ample time for comments and discussion. These meetings will take place over two days, once a year, prior to the in-person CMS Winter meetings.

The CMS will handle the organization and registration for these events. For those who register for the in-person CMS Winter meeting, registration for the preceding online meeting is free.

The inaugural CMS Online Education Meeting is scheduled for **November 25th and 26th, 2023**. Information about the meeting (schedule, themes, etc.) will be posted on the CMS website. A call for presentations will go out soon, with the submission deadline of **October 13th, 2023.**

Call for Proposals

The Canadian Mathematical Society (CMS) welcomes and invites education presentation proposals for its new event, the 2023 CMS Online Education Winter Meeting from November 25-26, 2023.

For this meeting, we will accept proposals on any theme in math education.

Education presentation proposals will be selected by the CMS Meeting Education Session Committee, which will also schedule the accepted sessions, in communication with their proposer(s).

Proposals should include:

1. Names, affiliations, and contact information of the presenter(s). Early career researchers are welcome to propose presentations.
2. A title and a brief abstract of the presentation.

All presentations will be of the standard CMS length: 20 minutes presentation + 5-10 Q&A.

The deadline for the presentation proposals is **October 13th, 2023**. There is a limited number of presentation spots. Preferences will be given to early submissions.

Please send your education session proposals (and questions) to:

- Andie Burazin a.burazin@utoronto.ca
- CMS Office, Sarah Watson, meetings@cms.math.ca in cc.

2023 CMS Winter Meeting – Call for Proposals: Mini Courses

CMS Meetings   September 2023 (Vol. 55, No. 4)

The Canadian Mathematical Society (CMS) welcomes and invites proposals for mini-courses for the CMS Winter Meeting in Montreal from December 1-4, 2023.

Since 2019, the CMS meeting program has included a limited number of three-hour mini-courses with the following objectives:

1. Initiating attendees to the subject of a novel scientific session, so as to broaden the scope of its audience and appeal; or
2. Introducing attendees to a cutting-edge area of applied mathematics, for both research and professional interests; or
3. Providing professional development opportunities and advice, particularly for graduate students and new PhDs.

The CMS Winter Meeting mini-courses will be held Friday, December 1st. Attendees will be charged a small registration fee.

Proposals should include:

1. The names, affiliations, and contact information of the main organizers;
2. A title and a brief description of the focus and purpose of the mini-course, being particularly clear on how it meets one of the three objectives outlined above;
3. A brief description of the anticipated mathematical background of the audience.

As the number of mini-courses is limited, please submit your proposal to the Scientific Directors (below) **before September 30, 2023.**

With thanks,

Scientific Directors:

François Bergeron : bergeron.francois@uqam.ca

Simone Brugiapaglia: simone.brugiapaglia@concordia.ca

Alina Stancu: alina.stancu@concordia.ca

(in cc) Sarah Watson: meetings@cms.math.ca

Call for University Hosts: Winter '25 / Summer '27

Calls   June 2023 (Vol. 55, No. 3)

The Canadian Mathematical Society (CMS) welcomes and invites host proposals from Canadian Universities for the 2025 CMS Winter Meeting, and the CMS Summer Meeting for 2027.

CMS will provide all logistical support and contract negotiation with local venues. CMS is looking for Canadian Universities that are willing and able to showcase their department and University to students and faculty from across Canada. It is asked that proposals include the following information:

1. Location

- How would people get from the airport to the venue?
- What are the reasons your city may be of interest to Canadian Mathematicians?<

2. Site

(For summer meetings) Describe the University where the meeting would be held.

- Which building would the meeting be in and how many rooms are available for meeting sessions and plenaries?
- What technological support is available in session rooms?
- Will these rooms be available during the proposed dates?

3. Lodging

Is your university able to offer any residence lodging during the conference dates? CMS will take care of contracting and negotiating with hotels.

4. Host University

Please describe your institution and department briefly.

- What funding support will the Host University have for the CMS Meeting?
- Is the University available for regular calls and updates on the meeting's progress?
- Can the Host University commit and provide at least one scientific director for the meeting?
- What level of participation do you think there might be from academics at your institution?

The CMS Meetings typically run from Friday to Monday on the first weekend in June and December but we are open to other possibilities. Summer meetings typically have 250-350 registrants and winter meetings are typically 400-600 in larger cities. Please admit your submissions to Sarah Watson (meetings@cms.math.ca).

Membership Ads

Memberships   June 2023 (Vol. 55, No. 3)