



# CMS NOTES de la SMC

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**Joy Morris** (University of Lethbridge)  
*Director VP - West*



As a parent in a smaller community, fairly distant from any big cities, I've had first-hand experience of how limited the reach of outreach programs can be. Despite all of my connections, I often remained unaware of the opportunities that have been created, and many of the other parents I knew were even less informed. Some parents are working long hours just to put food on the table. Some need or expect their kids to be working part-time as soon as they can. Some are much more interested in sports and recreation, or in cultural events, than in academics. Even among parents who have a strong focus on academics, have time, and are looking for programs their kids can take part in, most focus on the programs that they hear about from their friends, or the programs their other kids are in. It can be tough to reach our target audience effectively. Teachers are too often overworked and not particularly receptive to adding on new initiatives, or to sending more letters home to parents about opportunities. The result, unfortunately, is that opportunities are very far from being evenly distributed across all children. Some children (especially in big centres) have the good fortune go to schools that provide and promote abundant opportunities; many children do not have the same access to, or even awareness of, all the programs that are out there.

Most of the math outreach I've seen in our communities tries to attract the attention and interest of kids. We aim to draw them in and show them that math can be fun and exciting! When this is done well (and there are many people in our community who are very effective at outreach), it really can inspire young minds, and the impact can be life-long. But typically the interaction is very brief: the mathematician spends a handful of hours with a group of kids over a span of weeks or perhaps a single day, and this may be repeated every year or so for some span of time.

Even when I was regularly volunteering in my kid's classroom, the most time I ever spent with a child was half an hour a week for a few months, and that was in a small group setting (not individual). Typically the teachers wanted me to work with kids who were struggling rather than on enrichment. One young person in particular saddened me: in middle school, he knew that multiplication was repeated addition, but had not made the leap in understanding that (for example) you could work out  $7 \times 7$  from  $7 \times 6$  without starting over again from the beginning. With the time I had available I was not able to do much for him, and became convinced that he needed significant individual instruction that he was never going to get at school.

At the same time, I regularly attended school council meetings, and several times heard parents at these meetings asking: "The teacher doesn't have time to help my kid with math. I don't know how to help them, and can't afford a tutor. What can I do?"

These experiences inspired me to develop an outreach program aimed at parents in my local community. With the assistance of Math Education students and resources from our Faculty of Education and the Alberta curriculum, I developed an evening drop-in program for parents of middle school children. The program was intended to teach parents about what their kids learn in the middle school math curriculum, brush up their own skills, and introduce them to a variety of games and fun activities they could use at home to practice those skills with their children. I chose the middle school level because I felt it was where many parents start to lose confidence in their own math skills, yet the skills required aren't too overwhelming or scary.

My program was far from perfect. Numbers were often small, and dwindled over time; we stopped running the program when the pandemic made in-person activities more challenging. For a variety of reasons, I haven't yet revived this program. Perhaps the main challenge is still, how do we get our message out to the parents who really need such a program? Many of the parents who did come to my sessions were not what I'd thought of as my target audience; they brought their kids and were not always really wanting to participate themselves. Some school councils are effective at communicating broadly with parents, but many have only a small number of parents involved. Holding sessions on "meet-the-teacher" nights, or at least advertising on those nights, might be more effective.

Despite the problems I encountered, I still believe in the idea: parents are to a great extent an untapped audience for math outreach. These are the people who (in general) spend the most time with their kids and who know them the best. They are the ones who take to heart (if anyone does) the message that reading to their children from infancy binds the family together and builds lifelong literacy skills. The challenge is to convince them that playing games and cooking with their children also binds the family together, and builds lifelong mathematical skills.



*Joy Morris completed her PhD at Simon Fraser University in BC, in 2000. She has been working at the University of Lethbridge in Alberta ever since, where she is now a Professor, and has won the student union's teaching award. Her research revolves around group actions on graphs. She has an interest in math outreach and math education; she has written or co-written a couple of open access math text books, and developed a math outreach program aimed at parents of middle school children.*

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

*Editor, CMS Notes*



As I write this, we're about to start interviews for a tenure-track position. Not very long ago, one of our colleagues left for another university (for excellent reasons, and on good terms all around.) We were very lucky: the dean and AVP realized the importance of keeping our complement up, and of getting off to a prompt start: we were authorized to start the process almost the same day.

Due to confidentiality, of course, I can't tell you who we're interviewing. I can tell you that the search committee came back with a shortlist of extremely strong candidates, and said that they'd had to leave off others who were almost equally good. As a result, we're looking forward with considerable optimism to the upcoming visits. The next several days will be busy for the whole department, but fun. And, while I can't tell you what the candidates will be talking about, we're expecting three excellent talks to break the January blahs. The only downside, I guess, is that we'll only be able to hire one of the candidates. (If you're reading this later in February and you were one of the others, I apologize ahead of time. I'm already sure that it will not be an easy decision.)

Of course, this comes right in the middle of a busy term (aren't they all?) and will involve several extra hours of work from most of the department, and far more than that from our assiduous search committee. I'm not sure how many hours our secretary has already put in, but I can make an educated guess. And, as chairperson, I've had to send just a few memos myself. And nobody seems to mind... which is a measure of how we feel about hiring a new colleague.

The big thing we've learned: there are a lot of bright and enthusiastic young mathematicians out there. (But you knew that already, am I right?) And we're looking forward to recruiting one of them into our department.

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**Hardy Grant** (York University, posthumous)

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 editor:

**Amy Ackerberg-Hastings**, independent scholar (aackerbe@verizon.net)

*Editor's Note:* Hardy Grant (1939–2023) was a CSHPM member for more than 30 years. During most of that period, he was officially retired from York University, where he was best known for teaching a humanities course on mathematics in cultural history. However, he was an especially active member: co-editing the Society's Proceedings in 1991; resurrecting its Bulletin newsletter in 1995 after a 27-month hiatus and editing it alone and with Sharon Kunoff for the next four years; serving four terms on the Executive Council; providing the annual Kenneth O. May keynote lecture in 2010; and establishing and co-editing the CSHPM Notes column with me in 2014 after Tom Archibald and Glen Van Brummelen twisted both of our arms. His most important contributions to the history and philosophy of mathematics, though, came from his indefatigable good humor and keen interest in the scholarship of others—perhaps particularly in encouraging early-career academics. For more on Hardy's life and influence, see [the November 2023 memorial by Tom Drucker](#).

Hardy often mentioned that he should write a CSHPM Notes column himself, but he still had not gotten around to it when he died unexpectedly after a brief illness in September 2023. This installment acknowledges his indelible stamp on the 57 pieces that have appeared so far by revisiting a column series he coordinated for the Bulletin in 1999–2000. He described the concept thus in [May 1999](#):

*One night last May [1998], during the Society's annual meeting in Ottawa, the seven members whose names appear below stood on a street corner and fell to swapping personal histories of their involvement with mathematics and/or its history and philosophy—how they learned to love the subject, how it came to be part of their professional lives, and so on. Eventually someone suggested that it would be fun to share these accounts with other members, through the newsletter; hence the snippets of autobiography that follow. There must be many other such tales out there. . . .*

Read on for a reprint of the account Hardy penned. I am looking for a historian or philosopher of mathematics, preferably based in Canada, to succeed Hardy. Contact me at the email address above for more information about this collegial and delightful editorial task.



Hardy Grant and a butterfly, ca 2010.

One of [Rodney Dangerfield](#)'s best jokes—so, okay, call me a lowbrow—is about the guy who's so old that in his school days they couldn't teach history: nothing had happened yet. *I'm* so old that at university I couldn't study history of mathematics—the subject's professional and curricular status was then still marginal at best. Not that I ever *wanted* to—the idea never entered my head; which is perhaps the more surprising as I was already established in the lifelong joy and dilemma of squarely straddling [Lord Snow's notorious cultural divide](#). I always loved history; two of my four “desert island” authors ([Will Durant](#) and [Joseph Needham](#)) have that distinction just because they dared to write history on the Grand Scale. But I always loved mathematics too, and since one has to specialize in *something*, I made that my major, and I never regretted the choice.

I was duly ensconced in a university department ([York](#), in Toronto) before I was obliged to concede once and for all that I have no talent whatever for original research in mathematics. But meanwhile I found that by pure luck I had stumbled onto a scene graced by several people who were (and are) very interested—and in some cases very active—in the subject's history: [Israel Kleiner](#), [Trueman MacHenry](#), [Martin Muldoon](#), [Pinayur Rajagopal](#), [Abe Shenitzer](#). Abe and Israel in particular prodded and supported me in ways not easy to acknowledge, let alone to repay. After a while our little cabal contrived official approval for an undergraduate course (eventually third-year) in York's Humanities Division on the history and cultural influence of mathematics, and when the dust settled I wound up as principal instructor. I scrambled to organize and supplement a lot of desultory reading, realized how much I love the stuff, taught it for 17 years, joined the CSHPM, and now propose to live happily ever after. Moral? None at all that I can see, unless it's the banal observation that if you're going to insist on sitting astride disciplinary boundaries it is very agreeable to find a seat that fits your butt.

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**Kseniya Garaschuk** (University of the Fraser Valley)

*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.*

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“We must remember that intelligence is not enough. Intelligence plus character—that is the goal of true education. The complete education gives one not only power of concentration, but worthy objectives upon which to concentrate.”

**Martin Luther King**

Real-life, realistic, relevant, genuine, authentic — we use these words nearly interchangeably to describe desirable properties of application problems we would like to see in math courses. Specifically, problems we would like to utilize in first-year service courses (e.g. life sciences streams) and highly specialized ones (e.g. engineering). Yet, not only do we struggle to pick a word (I will stick with authentic), we often struggle to describe exactly what properties such applications should possess. We certainly know what we do not want: we don't want chicken coops, sliding ladders, boats pulling away from the dock, people walking away from a street lamp, lighthouses shining light on the shore. While having non-examples is useful, it would be more useful to have guidelines to help identify where the authenticity fails and where it is created.

Presented here are some key features that I find valuable in defining authentic applications, based on my teaching experience. It's important to note that this list is not exhaustive, and these features may overlap, describing similar concepts from different perspectives — essentially, these are my field notes derived from practical classroom experience.



## Real situations, information and data

The “application” in standard application problems refers to the ability to utilize learnt mathematical techniques rather than the relationship between the problem's context and the real world. As in, the problem calls for you to *apply* your skills, not that the problem itself is *applied*. The context serves only as a light dusting of makeup on top of familiar processes. These problems fit perfectly on the appropriately named “Apply” level of Bloom's taxonomy: use information in a new (but similar) situation (see endnote 1).

Authentic problems need to be rooted in real situations, real information available or obtainable by someone working on this problem and the real data that comes with it. Real scenarios tend to be complex and real data is messy, so this presents a perfect opportunity to have serious discussions about simplifying assumptions. What part of the problem will we focus on, what aspects of it will we drop, what assumptions will we declare to be able to approach this problem, how will these assumptions affect our findings?... This reflective process mirrors how professionals of various fields employ mathematical problem solving in the elusive “real world” and students deserve to see this power of math early on in their learning journey.



## Scenarios that students are aware of outside of classroom

Relevance is an important aspect of motivating learning. But “relevance” itself is a loaded concept. My students are half my age, they come from different cultural/educational/linguistic/... backgrounds than I do, they have diverse career plans, diverse values and beliefs. How can I possibly know what is relevant to them?

First of all, ask. Or, as per Gloria Steinem, “Always ask the turtle.” (see endnote 2). Students rarely get asked what excites them, what they value, what is relevant and what they *actually* want to learn about. So let's start asking. Secondly, do not assume that because you are teaching a class of biology majors that all your students will be fascinated by all things biological. There are many facets to biology itself: I doubt that every single biology major finds cell growth riveting in a same way that I know that not every single math major thinks that solving trigonometric

equations is the bee's knees. We are all complex individuals with multiple interests, so students majoring in subject X should not be put in a box labeled X and presented with nothing but applications relevant to X.

I ask my students for their input in a variety of ways, but here are three of them that I have found most effective in soliciting ideas or even full-fledged usable applications. One-pagers are a quick way for students to synthesize and present a high-level view of a concept of their choice together with an example of an application. Bi-weekly learning journal submissions often result in students suggesting what material from other courses or from their non-academic lives they would like to see me incorporate into the course – everything from lake pollution to toilet paper shortage at the beginning of the pandemic. But my current favourite assignment comes (sadly) at the very end of the term: I ask my students to design a long-answer final exam question. I give directions guiding the students in the creation of questions that are meaningful and focus on the application of knowledge, but I explicitly allow lots of room for creativity. Last year, across two sections of a course with 70 students total, this assignment resulted in the total of 172 pages of submitted problems and answers that I posted a week prior to the final exam as extra practice (with solutions!). The submissions tend to be so rich in context and content that I now regularly incorporate them into next course offerings.



## Compelling stories

There are many things that can make a story compelling. Structurally, one useful recipe is “Before and After”: a description of a situation (this can be either a feeling, a situation or a statistic), followed by an event, resulting in a change of initial situation. Another way to look at it is the popular Challenge, Action, Result model – describe a challenging situation, subsequent action taken and causal outcome. It is preferable to have a “hook”, so it certainly helps if the original situation is somewhat dire and the resolution is in the direction of a happy ending or the result is overall quite dramatic. One example from my practice is the [story of Yellowstone wolves](#): going from complete wolf extirpation – which resulted in drastic decline in the park's condition, largely due to elk overpopulation – to eventual re-introduction of the wolves and the park's ecosystem restoring itself.

The problem's appeal can come from many places. Say, you found a great research paper about modeling the rate of an enzyme-catalyzed chemical reaction based on the concentration of the substrate. This would be a great application to introduce to your calculus section full of biology and chemistry majors. The good news is that it's a lovely rational function (known as Michaelis-Menten kinetics) that you can fully analyze using calculus tools developed in a standard first-term course. The bad news is now you have to explain in your math class what enzyme, catalyst, substrate and concentration is – some students might have seen it before, but surely not all of them are familiar with the terminology. So you will need to strike a careful balance between the non-mathematical jargon and the mathematical set up. My rule of thumb is 3 minutes – I should be able to cover non-mathematical motivation or necessary terminology in under 3 minutes and sometimes I have to carefully structure my use of time here. But in this case, more importantly, how can we make this seemingly dry problem appealing?

Sometimes what makes an application fascinating is not directly its mathematical or non-mathematical content, but rather the people behind it. Even math majors don't often know much about the fascinating humans behind mathematical advances. Stories about mathematicians as people – with their quirky personalities, with their human experiences, passions and flaws – highlight the development of mathematics as a uniquely human experience. So back to Michaelis-Menten kinetics. Maud Menten grew up in BC and is now buried there, she spoke several languages including Halq'em'eylem, went on an Arctic expedition, drove a Model T Ford. She boarded the boat alone in 1912 to cross the Atlantic Ocean to study enzyme-catalysed reactions – don't you want to find out what she discovered on the other side?

Most times, you only need to get a little bit creative to find a compelling exposition. I have to admit: I enjoy thinking about different shaped containers and boxes. Of course there are many standard calculus problems about minimizing surface area while maximizing volume, but those don't even excite me, much less my students. So how can I share my love of boxes with my students in an engaging way? I tell stories, of course. I share a story of [square milk jugs](#) introduced in the US. Previously, 1-gallon US milk jugs looked like the Canadian ones (those of you who buy milk in bags will have to look up the pictures). So why change the design? Discussion ensues... Turns out the new jugs are more environmentally friendly since they are stackable and eliminate the need for milk crates, which use a lot of water and chemicals to clean, they also break often and get stolen very often (who knew the milk jugs were a popular petty theft item?). Maybe they also use less material in production – that's where calculus comes in: we discuss simplifying assumptions regarding jugs' shapes and the Canadian version, being closer to the cube, wins in the smaller surface area competition. That's not where the story ends though; it turns out the square jugs caused quite a stir – consumers hated them as they were harder to pour milk out of and it turned out they use so much plastic wrap to keep them stacked that it eliminated the environmental benefits originally envisioned by their designers.

My favourite box application is inspired by Indigenous crafts local to where I live: Coast Salish [bentwood boxes](#). These open top boxes are made out of a flat cedar plank that is steamed and bent to form a box. There are many questions you can ask right away: how do we need to bend the plank to create a rectangular shape, no cutting allowed? Where do we need to bend it to not waste any wood? Where do we need to bend it to create a box of largest volume? What if we also allow one cut to create a lid that fits? Mathematically, these are fairly standard questions though students generally struggle with 3-dimensional objects, so we always construct “bentpaper” boxes together. Contextually, students engage in this problem by exploring local traditions (what were the boxes used for?), materials (would any wood or plank do?) and crafts (how do we physically bend the wood?). The latter part emphasizes the simplifying assumptions we make to create a mathematical model: we assume that the thickness of the wood is negligible, while the craftsman needs to account for it and carve a groove at the corners.

Finally, you cannot forget the effects of genuine excitement. My love for boxes does not go unnoticed: I often get several final projects submitted inside handmade boxes, one time I got a submission on a wood plank that I was encouraged to bend into a box, another time a student gave me a book on constructing origami boxes. My fascination with Maud Menten is also apparently contagious as last term one of my students went on a quest to visit places where she lived in the Fraser Valley and even found her tombstone there. Genuine love for stories produces genuine stories and genuine connections.



## Complex, multifaceted problem domain

"Alice: Would you tell me, please, which way I ought to go from here?"

The Cheshire Cat: That depends a good deal on where you want to get to."

We often tell the students that math is everywhere, but they can rarely recognize it because they do not know what to look for: there are no polynomials hanging out in mid-air and no ladders sliding down random walls. Their math always came from books with carefully constructed examples, targeting very specific concepts, with mostly integer solutions, with applications that are never personally relevant, relatable or significant enough. So students learn to ignore the make-up of the problems or really any words surrounding the formulas and practice choosing (or guessing) the correct algorithm to apply.

There is a Chekhov principle in writing: "If in the first act you have hung a pistol on the wall, then in the following one it should be fired", meaning that notable details should play an important part in the plot. I will lightly advocate against this principle here. While you shouldn't sprinkle random redundant information around, the problem setup should be rich enough to give rise to different questions to be asked, different reasonable things to optimize or solve for, different approaches to be utilized, different ways for the plot of the solution to develop. Contextually, the most impactful stories involve activating the imagination of the listener where they place themselves in the situation described in the story. In the Yellowstone wolves' story, students act as ecologists that need to argue for the wolf re-introduction into the park: they decide on what type of predator wolves are and hence what function to use to model their behavior, they decide on simplifying assumptions we are comfortable making, they decide how we will approximate elk reproduction rate, they choose what we would like to optimize or solve for. Having an entry point and having options within a problem gives everyone an opportunity to see themselves in it. I do have to adapt to each class's choices (small price to pay for high levels of engagement), but we also discuss how our decisions will affect the model outcome.



## Sense making in context

I shot an elephant wearing my pyjamas. Was I wearing my pyjamas or was the elephant? Did I use a rifle or a camera? Imagine saying this sentence to an audience full of kids — to them an elephant in pink-striped pajamas is a completely plausible (and most definitely a more amusing) scenario. And if I am an ivory poacher bragging to my friends, then I'm surely not talking about my camera. Context matters and so do people's experiences within this context.

There are two main ways of building intelligence: giving the subject a recipe or giving them the opportunity to grow themselves. With the rise of the utility of Artificial Intelligence, I am reminded of its humble origins: the first version of IBM's Watson. The researchers found the hard way that giving anyone or anything a database of facts, no matter how large, won't get you very far — they loaded the machine with 15 terabytes of information, but without being able to "learn" from it, the first version of Watson was able to answer only about 10% of Jeopardy! questions correctly. The system builders needed to provide Watson with ways to link information together and to be able to place relevant facts in relevant context. Facts, rules and a lot of mathematical modeling did have its effect: Watson did eventually win Jeopardy! against human players and we now have many examples of practical and useful language models. But how do we teach our students that the facts alone won't do?

Authentic applications provide an easy entry point into this aspect of mathematical learning. Students often come to us with preconceived notions that any math application is based on artificial set up and hence its conclusions needn't make sense. In practice, bringing in real stories from external sources (news, reports, arts) tends to force the issue of interpretation making sense for the context at hand. Of course I still get occasional blunders where students do not perform a common sense check of their answer, but those are both rare and easy to question. In a sliding ladder problem, the answer can be almost anything without raising suspicion of its correctness; but if in a problem modeling fetus growth a student gets a negative rate of change, you can ask them if it is really feasible that a fetus body part starts shrinking.

But sense making is also a place to be humble. Students will offer entry points and interpretations of the problem that you didn't think of. They will offer answers that seem unreasonable under your assumptions, but perfectly plausible under theirs. Science in general and math in particular is not a transfer of knowledge from one person to another with a fixed set of axioms and limited options. Rather, it should be a rich and an integrated reflection of how the world functions.

I shot an elephant wearing my pyjamas.



## Problem centric

I generally believe in teaching **through** content, not **about** content. Whether the content is mathematically inspired, biologically grounded or physically established, it becomes the central motivation: start with a problem and develop tools to analyze and solve it, not the other way around. A problem-based approach can be implemented on a small scale or taken through the entire semester: the Yellowstone wolves' example above is a course-long problem, whereas the milk jug or bentwood boxes are examples of shorter problems. The goal is to make problem the central focus, not the afterthought; math arises and is developed from the questions we can ask in the context of the problem. The real power of math comes in, however, when we see that we can apply the same mathematical tools in different contexts: the construction and analysis of the rational functions performed in the Michaelis-Menten kinetics is the same one used to understand and model predator functional response.

Problems chosen can be rooted in any field, including mathematics itself (best suited for a math majors' course). For example, consider the brachistochrone problem posed by Johann Bernoulli in 1696 essentially as a challenge to Isaac Newton: "Given two points A and B in a vertical plane, find the curve traced out by a point acted on only by gravity, which starts at A and reaches B in

*the shortest time.*" This problem is easy to understand but provides a way to motivate the study of and access to various topics in calculus of variations including model construction, numerical solutions, Euler-Lagrange equation and functional integrals. How about the bicycle tracks problem here that comes from a Sherlock Holmes novel: given a set of bicycle tracks, can you tell which way the bike went? Here you really need to figure out which questions (of the tracks and bike construction in general) to even ask first.



Informed decision making, predictive ability, impactful outcome

We are constantly bombarded by data, charts, graphs and general numerical information in our daily lives. So there really is no excuse to not use real data sources in our teaching. Not only does it add authenticity to the classroom material, it also contributes to the creation of the more educated society, ensuring that our students are able to critically consider information presented to them, question assumptions and conclusions, evaluate the situation and make informed decisions about it themselves.

I find various pages on [Statistics Canada](#) and [Statista](#) useful for inspiration to build applications around. My students' learning journals also contain a ton of useful ideas and context examples from their other courses or extra curriculars. I often use local data to discuss issues of local importance and together with students investigate how math can help us in a variety of ways. We investigate [fish stocking reports](#), learn some basic facts about the various animals and their feeding habits; we examine populations of [Skeena salmon](#) and talk about salmon life cycle as well as its importance to local communities; we study fascinating hunting habits of [Northwest crows](#); we model selenium pollution of [Lake Kocanusa](#). The data we use comes from government reports, independent studies, research papers, historical records.

Interacting with these problems is not just a simple find the answer and move on process. Even when all is set and done (ie we found the answer to the question we asked of the problem in the beginning), we need to interpret the mathematical results in the context of the problem: do the results make sense given the real-world scenario? Based on our mathematical analysis, what informed decisions or recommendations would we make? How would small changes in input parameters or assumptions affect the outcomes of our analysis? What are the limitations of our solution? How will we communicate these findings? What insights could the various numbers and graphs provide? Are there ways to refine the model, improve accuracy, incorporate additional factors? ... Genuine problem solving process highlights the complexity of each situation and emphasizes that there likely is not one right answer. Our understanding of the world may be illuminated if we are willing to admit more than one truth.



Final thoughts

I am often asked where I find the context for my applications. I do browse aforementioned websites and look for something that appeals to me and that I would like to develop a story about. But also, I often stumble upon applications that I want to use. It's not just dumb luck: I stumble upon applications because the idea of developing problems to use out of something I witness is always in the back of my mind. Most recently, my daughter and I went to the dinosaur exhibit at the Canadian Museum of Nature, where we saw (among many dinosaur skeletons) the McNeill formula for relating the leg length with the walking speed of an animal; so naturally, in my calculus course, we took a closer look at the several mathematical models proposed by Richard McNeill Alexander, who studied biomechanics of dinosaurs.

We tell our students that math is all around us, so let's start noticing it ourselves.

## Endnotes

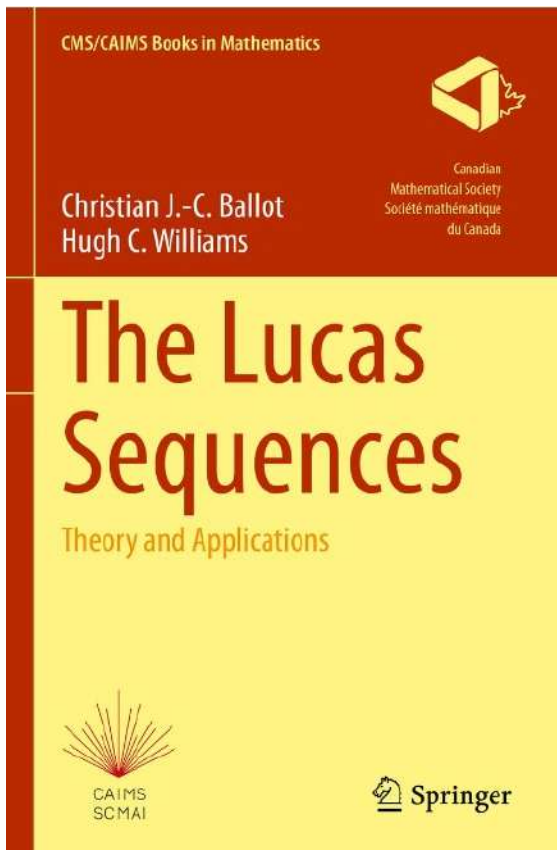
1. Viktor Blasjo on his podcast "Opinionated History of Mathematics" offers a wonderful insight into how the "pure" applications came to us from antiquity, I strongly recommend this episode: <https://intellectualmathematics.com/blog/societal-role-of-geometry-in-early-civilisations/>
2. Gloria Steinem writes the following story in her book "My Life on the Road": "I took a course in geology because I thought it was the easiest way of fulfilling a science requirement. One day the professor took us out into the Connecticut River Valley to show us the 'meander curves' of an age-old river. I was paying no attention because I had walked up a dirt path and found a big turtle, a giant mud turtle about two feet across, on the muddy embankment of an asphalt road. I was sure it was going to crawl onto the road and be crushed by a car. So with a lot of difficulty, I picked up the huge snapping turtle and slowly carried it down the road to the river. Just as I had slipped it into the water and was watching it swim away, my geology professor came up behind me. "You know," he said quietly, "that turtle has probably spent a month crawling up the dirt path to lay its eggs in the mud on the side of the road—you have just put it back in the river." I felt terrible. I couldn't believe what I had done, but it was too late. It took me many more years of organizing to realize that this parable had taught me the first rule of organizing "always ask the turtle".

Karl Dilcher (Dalhousie University)

Book Reviews Editor

Book Reviews bring interesting mathematical sciences and education publications drawn from across the entire spectrum of mathematics to the attention of the CMS readership. Comments, suggestions, and submissions are welcome.

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**The Lucas Sequences. Theory and Applications**

By Christian J.-C. Ballot and Hugh C. Williams  
 CMS/CAIMS Books in Mathematics, Springer 2023  
 Reviewed by Karl Dilcher

The fact that the celebrated numbers 0, 1, 1, 2, 3, 5, 8, 13, 21, ... are now known as Fibonacci numbers is mainly due to Édouard Lucas (1842-1891). Leonardo of Pisa (aka Fibonacci) lived in the decades around 1200, but soon he and his work were largely forgotten for centuries. Only much later, in 1844, the numbers now bearing Leonardo's name were rediscovered by Gabriel Lamé in connection with his analysis of the Euclidean algorithm, and they were first known to Lucas as the Lamé sequence. However, as is often the case with mathematical objects named after persons, the Fibonacci numbers had been discovered earlier, and were already known by Indian mathematicians long before Leonardo. These are just some of the interesting historical remarks that can be found in the introduction (and elsewhere) in the book under review.

To introduce the main topic of this book, we recall that the Fibonacci numbers  $F_n$  are usually defined recursively by  $F_0 = 0, F_1 = 1$ , and  $F_{n+1} = F_n + F_{n-1} (n \geq 1)$ . Their companion sequence, the Lucas numbers (not to be confused with the Lucas sequences) are similarly defined by  $L_0 = 2, L_1 = 1$ , and  $L_{n+1} = L_n + L_{n-1} (n \geq 1)$ . Now, given two nonzero integers  $P$  and  $Q$ , one defines the *fundamental* Lucas sequence  $U_n = U_n(P, Q)$  and the *companion* (or *associate*) Lucas sequence  $V_n = V_n(P, Q)$  by

$$U_0 = 0, U_1 = 1, \text{ and } U_{n+1} = PU_n - QU_{n-1} (n \geq 1),$$

$$V_0 = 2, V_1 = P, \text{ and } V_{n+1} = PV_n - QV_{n-1} (n \geq 1),$$

respectively. Clearly, when  $P = 1$  and  $Q = -1$ , these two sequences reduce to the Fibonacci and Lucas numbers, respectively. Nearly all known properties of these two special sequences extend to the Lucas sequences and their companion sequences. One of the main goals of the book under review is to collect the most important of these properties and identities, and to present a coherent theory. To quote from the Introduction,

"The objective of this book is to provide a much more thorough discussion of the Lucas sequences than is available in existing monographs. We will bring together a variety of results, which are currently scattered throughout the literature. Various sections will be devoted to intrinsic arithmetic properties of these sequences, primality testing, density problems, and the problem of generalizing them. Furthermore, their application, not only to primality testing but to integer factoring, solution of quadratic and cubic congruences, cryptography, and Diophantine equations, will be briefly discussed. Throughout the book, we will include a sprinkling of historical comments, where relevant.

"Much of the book is not intended to be overly detailed. Rather, our objective is to provide a good, elementary, and clear explanation of the subject matter without too much ancillary material. Most chapters [...] will address a particular theme, provide enough information for the reader to get a feel for the subject, and supply references to more comprehensive results. We have also attempted to make this book accessible to anyone with a basic knowledge of elementary number theory and abstract algebra.

"Our intended audience is number theorists, both professional and amateur, students, and enthusiasts. We emphasize that this book was never intended to be a textbook; its focus is either much too narrow or too broad for that, but it might be used as supplementary reading for students enrolled in second or more advanced courses in number theory."

In my opinion, the authors succeeded very well in their stated objectives and intentions. The book is written in a lively style and is a pleasure to read. The various chapters are, to a certain extent, self-contained, with their own abstracts and lists of references. After the Introduction, Chapter 2 contains the basic theory of the Lucas sequences. Chapter 3, entitled "Applications", begins with a discussion of the Mersenne numbers and continues with applications to primality testing, solving certain congruences, integer factorization, and other applications. Chapter 4

deals with further properties and contains connections with the circular functions, Chebyshev polynomials, and the Dickson polynomials. Chapter 5 is a detailed study of the Lucasnomial coefficients, a generalization of the usual binomial coefficients. The next three chapters, “Cubic Extensions of the Lucas Sequences”, “Linear Recurrence Sequences and Further Generalizations”, and “Divisibility Sequences and Further Generalizations” deal with various generalizations of Lucas Sequences, including Lucas’s own ideas and results. Chapter 9 is of a somewhat different nature and deals with prime densities. The final chapter contains a brief epilogue summarizing the material covered and ends with a selection of 13 unsolved problems (one of which is already solved, as the authors mention in a note added to the problem).

The final paragraph of the book’s epilogue is worth quoting here: “We have seen, then, that much has been learned about the Lucas sequences since the end of the nineteenth century. Indeed, it seems remarkable that such a large amount of activity has been devoted to such a simple pair of sequences, but still there seems to be much more to do. A glance at publications such as the *Journal of Integer Sequences*, the *Fibonacci Quarterly*, *Integers*, and the *Online Encyclopedia of Integer Sequences* (OEIS) suggests that interest in these sequences shows no sign of diminishing.”

The main content of the book is followed by an appendix with a biographical sketch of Lucas, whose life was tragically cut short as a result of a freak accident he suffered at age 49. This appendix also contains comments on his work and scientific legacy.

This excellent book by Ballot and Williams will lead the interested reader through the vast amount of relevant literature and the numerous related topics. I am sure it will prove to be as useful and important as some other classic books with similar scopes, for instance T. J. Rivlin’s *Chebyshev Polynomials* (Wiley, 1990), Richard Stanley’s *Catalan Numbers* (Cambridge, 2015), and two well-known books mainly devoted to Fibonacci and Lucas numbers, by T. Koshy (Wiley, 2018) and by S. Vajda (Dover, 2008).

Finally, it should be mentioned that this book is the latest of three related monographs authored or co-authored by H. C. Williams, the other two being *Édouard Lucas and Primality Testing* (CMS Monographs, Wiley, 1998) and *Solving the Pell Equation*, with M. J. Jacobson, Jr. (CMS Books in Mathematics, Springer, 2009).

*Book Reviews bring interesting mathematical sciences and education publications drawn from across the entire spectrum of mathematics to the attention of the CMS readership. Comments, suggestions, and submissions are welcome.*

**Karl Dilcher**, Dalhousie University ([notes-reviews@cms.math.ca](mailto:notes-reviews@cms.math.ca))

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## In Memoriam: Phil Scott (1947-2023)

Obituaries

February 2024 (Vol. 56, No. 1)

**Richard Blute** (University of Ottawa)

**Robin Cockett** (University of Calgary)

**Simon Henry** (University of Ottawa)



It is with great sadness that we convey the news of the death of our good friend and colleague Phil Scott to the Canadian Mathematics Society. He passed away after a long battle with cancer on the 18<sup>th</sup> December, 2023. His passing was a major loss to Canadian mathematics.

Phil was born on December 27<sup>th</sup>, 1947, in Leeds (UK). His mother was from Leeds although his father was Scottish from Glasgow. When he was one year old, his family moved to North Carolina where he grew up and eventually went to university at Chapel Hill to study mathematics. He moved to Canada in the 70's to study for a Ph.D., receiving his doctorate in Pure Mathematics from the University of Waterloo in 1976, under the supervision of Denis Higgs – an expert in universal algebra and category theory. In 1977 he became a postdoctoral student under Jim Lambek's supervision, which led to a lifelong collaboration between the two mathematicians. Phil then spent several years teaching and researching, including a year at Dalhousie, before joining the Mathematics Department at the University of Ottawa in 1982. He remained there until his death.

Phil made many contributions to category theory and to categorical proof theory – a subject which Phil and Jim Lambek essentially invented. He wrote a series of papers that culminated in the landmark book with Jim Lambek "Introduction To Higher-Order Categorical Logic" which was published in 1986. The book is still the standard text on the subject. But Phil's research went well beyond these initial works: he made major contributions to theoretical computer science, linear logic, inverse semigroup theory and recursion theory.

Phil was a wonderful mentor to students and young researchers at all levels. Phil would regularly receive emails wanting to know more about the fascinating field of research he helped create. He was never too busy to talk to a student or anyone interested in mathematics. The subject of categorical proof theory continues to thrive, and this is in large part due to Phil's stewardship of the area.

Those of us who knew him personally will always think of him as a dear friend and a genuinely kind soul.

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 Canadian Mathematical Society  
Société mathématique du Canada

# 2024 CMS SUMMER MEETING

## *Saskatoon*

MAY 31 - JUNE 3



### CALL FOR SESSIONS

The Canadian Mathematical Society (CMS) welcomes and invites session proposals for the 2024 CMS Summer Meeting in Saskatoon, Saskatchewan from May 31 to June 3, 2024. The deadline for submission is March 31, 2024.

The Canadian Mathematical Society (CMS) invites the mathematical community to the 2024 CMS Summer Meeting. Meeting activities are taking place at the University of Saskatchewan and an awards banquet at the Wanuskewin Heritage Park. Four days of prize lectures, plenary speakers, scientific sessions and panels, with mini-courses on May 31.

**SPEAKERS MAY APPLY TO SPEAK IN SESSIONS UP TO MARCH 29**

 **SUMMER24.CMS.MATH.CA**

Check the website for further details



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 UNIVERSITY OF SASKATCHEWAN



Canadian Mathematical Society  
Société mathématique du Canada

# RÉUNION D'ÉTÉ DE LA SMC 2024

## Saskatoon

31 MAI - 3 JUIN



### APPEL DE SESSIONS

La Société mathématique du Canada (SMC) sollicite des propositions de sessions pour la Réunion d'été 2024 de la SMC qui se tiendra à Saskatoon (Saskatchewan) du 31 mai au 3 juin 2024. La date limite de soumission est le 31 mars 2024.

La Société mathématique du Canada invite la communauté mathématique à la Réunion d'été 2024 de la SMC pour quatre jours de conférences de prix, de conférences plénières, de sessions scientifiques et de panels, en plus d'un banquet de remise de prix au Wanuskewin Heritage Park, et des mini-cours le 31 mai.

**LES ORATEURS PEUVENT POSTULER POUR PARLER LORS DES SESSIONS  
JUSQU'AU 29 MARS**



**SUMMER24.CMS.MATH.CA/FR**



Visitez le site Web pour de plus amples informations



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UNIVERSITY OF  
SASKATCHEWAN



The Canadian Mathematical Society (CMS) welcomes and invites education session proposals for the 2024 CMS Summer Meeting in Saskatoon from May 31 – June 3.

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 speakers who have confirmed or who expressed interest and 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 June 1-3, 2024.

Deadline: Proposals should be submitted by **Wednesday, January 31, 2024**. There will be a second deadline of **March 29, 2024**, but earlier submissions will be considered first. Their contact information is as follows:

Andie Burazin [a.burazine@utoronto.ca](mailto:a.burazine@utoronto.ca)

With Elana Kalashnikov: [e2kalashe@waterloo.ca](mailto:e2kalashe@waterloo.ca)

Steven Rayan: [rayan@math.usask.ca](mailto:rayan@math.usask.ca)

Jacek Szmigielski: [szmigiel@math.usask.ca](mailto:szmigiel@math.usask.ca), and [meetings@cms.math.ca](mailto:meetings@cms.math.ca) in case of

Réunion d'été 2024 de la SMC | Saskatoon, Saskatchewan

# APPEL DE *Sessions d'éducation*

La Société mathématique du Canada (SMC) sollicite des propositions de sessions en matière d'éducation pour la Réunion d'été 2024 de la SMC qui aura lieu à Saskatoon du 31 mai au 3 juin 2024.

Les propositions de sessions en matière d'éducation seront sélectionnées par le Comité des sessions en matière d'éducation de la réunion de la SMC, qui établira également le calendrier des sessions acceptées, en communication avec leurs co-organisateurs.

Chaque proposition doit suivre les directives indiquées dans l'appel pour les sessions d'éducation. En outre, les organisateur.rice.s sont invité.e.s à préciser la structure de leur session (par exemple, un discours de 20 minutes suivi de cinq minutes de questions-réponses et une autre cinq minutes de transition; ou un panel, ou une session/atelier interactif, etc.)

Les propositions doivent comprendre:

1. Les noms, affiliations et coordonnées de tous les co-organisateurs de séances de formation. Les éducateurs en début de carrière sont invités à proposer des sessions.
2. Un titre et une brève description du sujet et de l'objectif de la session de formation. Cela devrait inclure un bref paragraphe du sujet.
3. Un résumé de deux ou trois phrases qui sera publié sur le site web de la Réunion de la SMC si votre proposition est retenue.
4. Indiquez le nombre de tranches horaires nécessaires. Un bloc peut durer entre 1 et 3 heures.
5. Une liste d'orateurs/oratrices qui ont confirmé ou qui ont exprimé leur intérêt et qui sont sollicité(e)s avant de soumettre la proposition. Un ensemble d'orateurs/oratrices inclusif et diversifié est fortement encouragé.
6. La structure de votre session (par exemple, un exposé de 20 minutes suivi de 5 minutes de questions-réponses et de 5 minutes de transition, ou un panel, ou une session/un atelier interactif, etc.).

La SMC vous prie de considérer les soumissions de tout candidat.e.s admissibles. Jusqu'à 30 orateur.rice.s par session seront accommodés. Les sessions d'éducation se dérouleront du 1 au 3 juin 2024.

Conformément aux propositions de sessions scientifiques. La date limite sera le **31 janvier, 2024**. Une deuxième date limite sera fixée au **29 mars 2024**, mais les demandes antérieures seront examinées en premier lieu

Andie Burazin [a.burazin@utoronto.ca](mailto:a.burazin@utoronto.ca)

Avec Elana Kalashnikov: [e2kalash@uwaterloo.ca](mailto:e2kalash@uwaterloo.ca), Steven Rayan: [rayan@math.usask.ca](mailto:rayan@math.usask.ca)  
Jacek Szmigielski: [szmigiel@math.usask.ca](mailto:szmigiel@math.usask.ca), et [meetings@cms.math.sask.ca](mailto:meetings@cms.math.sask.ca)



*You are cordially invited to a memorable evening*

# 2024 CMS Awards Banquet

*Wanuskewin Heritage Park*

*2024 CMS Summer Meeting | Saskatoon, Saskatchewan*

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SATURDAY JUNE 1 | 6:30PM - 10:00PM

DEER AND EAGLE ROOM | TRANSPORTATION PROVIDED

TICKETS \$110 (Includes Transportation)



Canadian Mathematical Society  
Société mathématique du Canada

*See you in December*

**SAVE THE  
DATE**

**RÉSERVEZ**

**LA DATE**

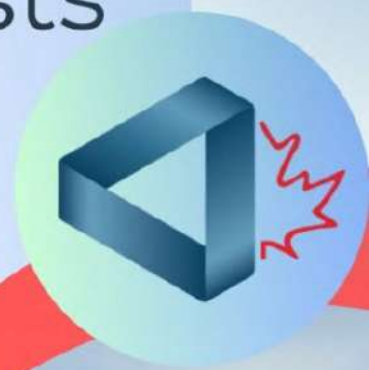
*Rendez-vous en décembre*

2024 CMS Winter Meeting  
Réunion d'hiver 2024 de la SMC

**Nov 29 to Dec 2 | Du 29 nov au 2 déc**  
**Sheraton, Vancouver Airport Hotel**  
**RICHMOND, BC**

# Call for *University* Hosts

The Canadian Mathematical Society (CMS) welcomes and invites host proposals from Canadian Universities for the 2026 CMS Summer Meeting with a priority going to Eastern Canada. All proposals will remain valid for upcoming meetings. CMS will provide all logistical support and contract negotiation with local venues. CMS is looking for Canadian Universities who 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? Is your university located downtown or would shuttles need to be provided?

✓ **2. SITE**

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. What hotel is closest to the university for lodging?

✓ **4. HOST UNIVERSITY**

Please briefly describe your institution and department. What funding support will the Host University have for the CMS Meeting? Is the University available for regular calls and updates on the meetings progress? Is the Host University able to 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 350-500 registrants.



**Please submit proposals to:**

[meetings@cms.math.ca](mailto:meetings@cms.math.ca)

# Appel pour des universités hôtes

La Société mathématique du Canada (SMC) invite les universités canadiennes à soumettre des propositions pour accueillir la Réunion d'été 2026 de la SMC, en accordant la priorité à l'Est du Canada. Toutes les propositions seront valides pour les réunions à venir. La SMC fournira tout le soutien logistique et négociera les contrats avec les sites locaux. La SMC est à la recherche d'universités canadiennes désireuses et capables de mettre en valeur leur département et leur université auprès des étudiants et des professeurs de tout le Canada. Les propositions doivent contenir les informations suivantes :



## ✓ 1. EMPLACEMENT

Comment les gens se rendraient-ils de l'aéroport au lieu de la réunion ? Quelles sont les raisons pour lesquelles votre ville pourrait intéresser les mathématiciens canadiens ? Votre université est-elle située au centre-ville ou faudrait-il prévoir des navettes ?

## ✓ 2. SITE

Décrivez l'université où se tiendra la réunion. Dans quel bâtiment se déroulera la réunion et combien de salles sont disponibles pour les sessions et les séances plénières ? Quel est le support technologique disponible dans les salles de réunion ? Ces salles seront-elles disponibles aux dates proposées ?

## ✓ 3. HÉBERGEMENT

Votre université est-elle en mesure d'offrir un hébergement en résidence pendant les dates de la conférence ? La SMC s'occupera des contrats et des négociations avec les hôtels. Quel est l'hôtel le plus proche de l'université pour l'hébergement ?

## ✓ 4. UNIVERSITÉ HÔTE

Veuillez décrire brièvement votre institution et votre département. Quel soutien financier l'université hôte aura-t-elle pour la réunion de la SMC ? L'université est-elle disponible pour des appels réguliers et des mises à jour sur les progrès de la réunion ? L'université hôte est-elle en mesure de s'engager et de fournir au moins un directeur scientifique pour la réunion ? Quel niveau de participation pensez-vous qu'il pourrait y avoir de la part des universitaires de votre institution ?

Les réunions de la SMC se déroulent généralement du vendredi au lundi, le premier week-end de juin et de décembre, mais nous sommes ouverts à d'autres possibilités. Les réunions d'été comptent généralement entre 350 et 500 participants.

**Veillez soumettre les propositions à:**

[meetings@cms.math.ca](mailto:meetings@cms.math.ca)



The Fellowship recognizes CMS members who have made excellent contributions to mathematical research, teaching, or exposition; as well as having distinguished themselves in service to Canada's mathematical community. In exceptional cases, outstanding contributions to one of these areas may be recognized by fellowship.

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, and sexual orientation.

Nominations should include a reasonably detailed rationale and be submitted by **March 31, 2024**.

All documentation should be submitted electronically, preferably in PDF format, by the appropriate deadline, to [awards-prizes@cms.math.ca](mailto:awards-prizes@cms.math.ca)

For more information on this award, please visit: <https://cms.math.ca/awards/fellows-of-the-cms/>

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Le Programme des fellows récompense les membres de la SMC qui ont fait une contribution exceptionnelle aux mathématiques en recherche, en enseignement ou en représentations, tout en se distinguant au service de la communauté mathématique canadienne. Dans des cas exceptionnels, une contribution extraordinaire à l'un des domaines ci-dessous peut être reconnue par un titre de fellow.

La SMC a pour but de promouvoir et de célébrer la diversité au sens le plus large. Nous encourageons fortement les directeurs ou les directrices de département 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.

Pour les mises en candidature prière de présenter des dossiers avec une argumentation convaincante et de les faire parvenir, le **31 mars 2024** au plus tard.

Veuillez faire parvenir tous les documents par voie électronique, de préférence en format PDF, avant la date [awards-prizes@cms.math.ca](mailto:awards-prizes@cms.math.ca)

Pour de plus amples renseignements sur ce prix, veuillez cliquer: <https://smc.math.ca/prix/fellows-de-la-smc/>

# Call for Nominations for the Graham Wright Award | Appel de mises en candidature – Prix Graham-Wright

Calls for Nominations

February 2024 (Vol. 56, No. 1)

In 1995, the Society established this award to recognize individuals who have made sustained and significant contributions to the Canadian mathematical community and, in particular, to the Canadian Mathematical Society. The award was renamed in 2008, in recognition of Graham Wright's 30 years of service to the Society as the Executive Director and Secretary.

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.

Nominations may be considered for up to three consecutive years. Unsuccessful nominations may be updated and resubmitted for consideration each year. Nominations should include a reasonably detailed rationale and be submitted by the deadline indicated above.

All documentation should be submitted electronically, preferably in PDF format, by the appropriate deadline, to [gaward@cms.math.ca](mailto:gaward@cms.math.ca).

**Deadline: March 31, 2024**

En 1995, la Société mathématique du Canada a créé un prix pour récompenser les personnes qui contribuent de façon importante et soutenue à la communauté mathématique canadienne et, notamment, à la SMC. Ce prix était renommé à compter de 2008 en hommage de Graham Wright pour ses 30 ans de service comme directeur administratif et secrétaire de la SMC.

La SMC a pour but de promouvoir et de célébrer la diversité au sens le plus large. Nous encourageons fortement les directeurs et les directrices de département 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.

La candidature restera active pendant un an seulement. Les candidatures non retenues peuvent être mises à jour et soumises à nouveau pour examen chaque année. Pour les mises en candidature prière de présenter des dossiers avec une argumentation convaincante et de les faire parvenir avant la date limite.

Veuillez faire parvenir tous les documents par voie électronique, de préférence en format PDF, **avant la date limite indiqué ci-dessus à [prixgw@smc.math.ca](mailto:prixgw@smc.math.ca)**.

**Date limite : 31 mars**

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The image shows the cover of the ICIAM Dianoia newsletter. The background is a dark blue satellite-style map of the world. At the top, in yellow-green text, it reads "ICIAM DIANOIA. VOLUME 12" and "ISSUE 1 JANUARY 2024". In the center is the ICIAM logo, which consists of the word "ICIAM" in a serif font above a blue grid containing a white world map. To the left of the logo, the text "ICIAM Dianoia: The Newsletter" is written in a light green, curved font. Below the logo, the words "NOW AVAILABLE" are written in large, bold, light green capital letters. Underneath that, the full title "ICIAM Dianoia: The Newsletter of the International Council for Industrial and Applied Mathematics" is written in white. At the bottom, there is a link: "[View this newsletter in your browser](#)".



**STUDC**  
CMS SMC

Seeking student writing for:

# NOTES FROM THE MARGIN

**Call for Submissions**

- ✓ Find us at [studc.math.ca/notes-from-the-margin](http://studc.math.ca/notes-from-the-margin)
- ✓ Submission Deadline: March 29

**SUBMIT NOW**



Recherche de textes  
étudiants pour :

# « NOTES FROM THE MARGIN »



## Appel de soumissions

- ✓ Retrouvez-nous à [studc.math.ca/revue-notes-from-the-margin](http://studc.math.ca/revue-notes-from-the-margin)
- ✓ Date limite de soumission:  
29 mars

**SOUMETTEZ  
MAINTENANT**



**Canadian Mathematical Society**  
**Société mathématique du Canada**

# Letters to the Editor Courrier des lecteurs

## LETTERS WELCOME LETTRES AUX RÉDACTEURS

The Editors of the CMS Notes welcome letters in both official languages (English or French) on any subject of mathematical interest but we reserve the right to condense them. Those accepted for publication will appear in the language of submission. | Les rédacteurs et les rédactrices des Notes de la SMC acceptent les lettres en français ou en anglais portant sur n'importe quel sujet d'intérêt mathématique, mais ils se réservent le droit de les comprimer. Les textes acceptés pour publication paraîtront dans la langue dans laquelle ils ont été soumis.

Readers may reach us at the CMS Executive Office at | Le lectorat peut nous joindre au bureau administratif de la SMC par courriel au [office@cms.math.ca](mailto:office@cms.math.ca).