

February 2020

Welcome to the new online issue of the CMS Notes!

We hope that you enjoy the new online issue for the Society's newsletter, *CMS Notes*. We will continue to work hard at fine tuning some of the online features as we further our skills of this WordPress site! We welcome your comments, suggestions and submissions.

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Come celebrate 75 years with us!

Matilde N. Lalín (Université de Montréal)

Vice-President, Quebec



The conversation on the impact of air travel on the environment has been very lively recently in academic settings as individuals have been reflecting on the impact of their own research related travel (see, for example, Malabika Pramanik's article in the *CMS Notes*[1]). This is a touchy subject, as many academic factors such as promotion, funding opportunities, networking, etc, naturally depend on and encourage travelling. Surely the most important issue for mathematicians has to do with collaborations. While there are many communication resources that facilitate remote collaboration, ultimately the best way to exchange ideas remains the face to face conversation, and conferences and other academic trips provide invaluable opportunities to facilitate those encounters. Of course, the optimal outcome in terms of diminishing environmental impact would be to eliminate all academic travel, but this would greatly reduce the number of such opportunities. An important question is then whether we can transform conferences and other events in order to diminish our impact on the environment.

A measure encouraging remote participation in workshops and seminars involves video streaming, which allows remote participants to ask questions during presentations. I have been aware of a number of seminars working in this way. For example, about 10 years ago I was at the University of Alberta and we used to have a shared number theory seminar involving several Western Canadian universities. An ambitious new initiative is the VaNTAGE (a virtual math seminar on open conjectures in number theory and arithmetic geometry[2]), which started last month and allows for 100 simultaneous remote connections.

In 2009, I participated in the "Workshop on Discovery and Experimentation in Number Theory"[3] that took place both at the Fields Institute in Toronto and at the IRMACS in Vancouver. While participants were welcome to go to either site, they were encouraged to attend the site closer to their location. There were around 70 participants in Toronto and about half that number in Vancouver. The core invited lectures were shared and video streamed allowing for attendance and questions from each site. There were also some individual simultaneous sessions at each site with shorter lectures which were also video streamed. I flew from Edmonton to Vancouver. While climate change was not on my radar back then, I was grateful for the short fly, as I had a young baby and was trying to diminish my travel as much as possible.

A more current example of a climate conscious scientific event is the POM (Photonics Online Meetup) conference[4] that took place on January 13th 2020. It was hosted using webcasting. Each speaker gave their presentation from their own location. Several organizations hosted POM-hubs sites, where participants were able to network and watch the presentations together. There were more than 50 hubs around the world that included Helsinki, Mumbai, Melbourne, Buenos Aires, Mankweng, Austin, Ottawa, and Montreal, to name just a few locations. The event also included poster presentations, where the posters were initially posted in Twitter a few days in advance and then presented during the conference.

An important question is whether we can transform conferences and other events in order to diminish our impact on the environment.

Both of the above examples give ideas regarding the adaptation of bigger conferences. How about small specialized workshops of, say, up to 50 participants? Personally, I find that small specialized workshops, often held in research institutes, to be among the most productive academic trips in terms of starting and maintaining collaborations. It is hard to imagine how to replace the dynamics and interactions that take place during coffee breaks and other unstructured times during these workshops. It is now common place for presentations at these workshops to be recorded and made publicly available. In collaborative workshops, I have seen remote group members who connect to work with a specific group. These measures allow for some level of remote participation, even if it is not the same as being present in the workshop.

Last July, I flew over 4,000 km from Montreal to San José to participate in a SQuaRE (a Structured Quartet Research Ensemble) at the American Institute for Mathematics (AIM)[5]. The program SQuaREs allows a small group of mathematicians to spend a week at AIM in order to collaborate. During that week, members are away from their home institutions and can dedicate most of their time to research in excellent and stimulating conditions. The group can meet three times in different years, which encourages the continuation of the collaboration. Several institutes have similar versions of these programs, such as the "Focused Research Groups" at BIRS (Canada), the "Research in Pairs" at MFO (Germany), the "Summer Research in Mathematics" at MSRI (USA), specially directed towards women and gender-expansive individuals, and the "Collaborate@ICERM" at, obviously, ICERM (USA). I find this type of initiatives to be extremely stimulating for research. That said, they also come with the environmental cost of air travel sometimes in absurd ways. For example, back in July, two people from the UK and three people from the east of USA/Canada flew to California to meet at AIM. This is almost 60,000 km in air travel for a small group of people to meet.

Now imagine that several institutes had an agreement allowing each collaborative group to be sent to a location that minimizes the total distance flown by the members of the group. For example, if our group had met at ICERM, in Providence, or at the Fields Institute, in Toronto, the total air travel would have been about 12,000 km. Of course, this estimate does not take into account eventual connections, but there is no doubt that in terms of minimizing the total amount of air travel, these institutes are geographically better situated for this particular group of individuals. Of course, the best possibility (with under 11,000 km of air travel), given that two people are from Montreal, would have been to meet at the Centre de recherches mathématiques (CRM), but this defeats the purpose of getting everybody out of their home institutions. This idea sounds very difficult to implement, as it raises questions about sharing and coordinating funding, administration capabilities, and other resources among diverse institutes in different countries. Still, it would be very interesting to start investigating the feasibility of this idea, or similar ones, to see if the possibly large impact justifies the resources and effort this coordination will require.

At the end of the day, these ideas are simply part of a larger conversation on how to reduce our impact via air travel, which is a significant contribution our community can do in the global effort to address climate change.

References

- [1] Malabika Pramanik, “Conferences and... climate?”, *CMS Notes*, May 2019, p. 1.
- [2] VaNTAGe, a virtual math seminar on open conjectures in number theory and arithmetic geometry. organised by Rachel Pries. <<https://sites.google.com/view/vantageseminar>>
- [3] Workshop on Discovery and Experimentation in Number Theory, organized by Peter Borwein, Michael Coons, Michael Filaseta, Kevin Hare, Michael Mossinghoff, and Chris Smyth. <<http://www.fields.utoronto.ca/programs/scientific/09-10/FoCM/discovery/index.html>>
- [4] Photonics Online Meetup, organized by Andrea Armani, Orad Reshef, Igor Aharonovich, Rachel Grange, Mikhail Kats, and Riccardo Sapienza. <<https://sites.usc.edu/pom>>
- [5] Structured Quartet Research Ensemble, American Institute for Mathematics. <<https://aimath.org/programs/squares>>

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Robert Dawson (Saint Mary's University)
Editor-in-Chief



In your hands you hold — or don't — the first all-electronic issue of the CMS Notes. After fifty years, during which the Notes has evolved from a typed and photocopied newsletter to the professionally-produced publication that you're familiar with, the paper version has been retired.

I've been expecting this for some time. Printing and mailing cost money, and I imagine that it's a rare CMS member who reads their copy of the Notes more than once. Archivists and librarians call such publications "ephemera", and electronic publication suits them very well indeed. Online, they are easy to read, easy to delete once read, and easy to call up again should you ever wish to.

The biggest argument against this step, brought up at many Publication Committee meetings over the years, was that the paper copy, left around the mathematics common room, would familiarize junior faculty with the fact that there was something called the Canadian Mathematical Society that did interesting things. I don't think that argument ever lost its validity — it just became weaker in comparison to the financial argument. So please, if there's an article or review in the Notes that you think a nonmember colleague would enjoy, send them a link — ideally, to the whole issue.



However, I see a truly positive side to this. Paperless publication gives us a flexibility that we didn't use to have. We can use colour more freely. We can potentially use embedded video clips or sound (we promise not to abuse this ability!) And we have more flexibility in terms of length — if somebody sends us an unsolicited article, or an unusually long review, we don't have to wonder where the pages are going to come from.

So that comes down to you — do you have a Notes article in you? Think of the sort of things that appear in [the Mathematical Intelligencer](#) (not the more research-oriented material) or [the MAA magazines](#). Canadian content is a plus, controversy not ruled out. Try to keep it short, because while bits are free, our readers' time is not unlimited.

We've had, for some time, two columns that have run mainly on submitted material — Education Notes and Research Notes. Please give special consideration to anything you could submit for these; they are, I think, popular with many of our readers, and we'd like to hear about your special research topic or teaching thought.

Finally, Crux Mathematicorum has already gone virtual, and so can also take a wider range of submissions. Crux has always taken problems and articles about problem solving; its scope will, we hope, now expand to include recreational mathematics articles in the Martin Gardner vein. Anything in that line, at a level comprehensible by a bright high school student, should be sent there.

Karl Dilcher (Dalhousie University)

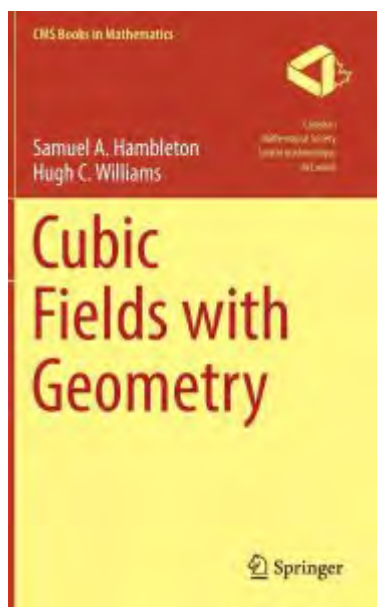
Book Review Editor

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.

Karl Dilcher, Dalhousie University (notes-reviews@cms.math.ca)

Cubic Fields with Geometry

S. A. Hambleton and H. C. Williams
 CMS Books in Mathematics, Springer, 2018
 ISBN: 978-3-030-01404-9
 Reviewed by Daniel C. Mayer, Graz, Austria



This book presents the current state of the art of working with cubic equations, polynomials and fields. It comprises a great deal of the classical knowledge and also progressive innovations by the authors.

The first two chapters exhibit foundations of algebraic number theory for the ostensive special case of cubic number fields. Irrationalities of third degree are defined as zeros of irreducible cubic polynomials, whose coefficients can be expressed as elementary symmetric polynomials, for instance trace and norm, in three conjugate zeros. The concepts of a basis of a cubic field over the rational number field and algebraic integers are introduced. With the aid of discriminants and techniques developed in the 1894 Master's Thesis of Voronoi and by Delone/Faddeev, a classical integral basis for the maximal order is constructed initially.

As a first highlight, with crucial impact on the entire further exposition, it is shown that the unique reduced binary cubic index form of a cubic field gives rise to a particularly simple canonical unitary basis of the ring of algebraic integers over the ring of rational integers. This canonical basis admits the establishment of an elegant matrix calculus for the arithmetic in the maximal order, in particular for inverse elements and norms, similar to the Brahmagupta identity for quadratic number fields. Generally, each binary cubic form, that is, each homogeneous bivariate cubic polynomial, is linked to its quadratic Hesse covariant and its cubic Jacobi covariant by means of the Cayley syzygy, which is vital in the study of Diophantine

equations. Zeros of an irreducible cubic polynomial are represented either precisely with expressions containing radicals in the formula of Cardano (inclusively goniometric formulas for the Casus Irreducibilis) or approximately by convergent sequences produced by Newton's method.

As core structures of the arithmetic in cubic fields, the authors present the unit group, fundamental systems of units, and the regulator in logarithmic space, and on the other hand ideals, Hermite normal form, discrete lattices, and the ideal class group, connected by the analytic class number formula. The unique factorization of ideals into powers of prime ideals, inessential discriminant divisors, and the issues of the decomposition laws and contributions of rational prime numbers to discriminant and conductor are addressed thoroughly and at great length, recalling older results of Hasse of 1930 and newer investigations by Llorente/Nart of 1983.

Chapter three focusses on binary cubic forms from the view point of equivalence, reduction and composition. In this context, the Davenport/Heilbronn correspondence (1971) between classes of conjugate cubic fields and equivalent cubic forms, and the Levi parametrization (1914) of cubic orders with binary cubic forms, are covered. Reduced forms are defined with the quadratic Hesse covariant for positive discriminants and with the quadratic Mathews form for negative discriminants. In both cases, there is a unique reduced representative in each equivalence class.

The fourth chapter was written by Renate Scheidler. It deals with the construction of generating polynomials with small coefficients for all non-isomorphic cubic fields of an assigned fundamental discriminant. The number of these fields, whose Galois closures are unramified over a common quadratic subfield, increases exponentially with the 3-class rank of the quadratic subfield, by class field theoretic results of Hasse (1930). According to ideas of Berwick (1925) and the cubic reflection theorem by Scholz (1932), the generating polynomials are constructed with small primitive 3-virtual units associated to the basis classes of order three in the dual quadratic resolvent field.

For negative discriminants, the infrastructure of these basis classes is used, according to an unpublished manuscript by Shanks (1987), improved by Fung (1990), and communicated here for the first time with rigorous proofs by Scheidler. For cubic fields with non-fundamental discriminants, a succinct outline of the algorithm of Belabas (1997) is given.

Chapters five and nine are devoted to several Diophantine equations viewed from Algebraic Geometry. In connection with units, the reader makes the acquaintance of the quadratic Pell equation and the group law on the associated algebraic curve over the rational integers, the cubic Pell equation of first kind with corresponding norm one torus of dimension two, in particular the norm equation for pure cubic fields, and the cubic Pell equation of second kind with associated affine variety over finite fields. Going beyond the realm of units, the cubic Pell equation of the third kind, a discriminant form equation in the sense of Györy, is discussed in connection with Pell surfaces and multiplication polynomials describing the group law.

In Chapter six, convergents of continued fraction expansions are used to express the least positive absolute values of binary quadratic and cubic forms. The greatest merit of this book is the revival of the 1896 doctoral dissertation of Voronoi, containing his generalized continued fraction algorithm for cubic orders, whose theory was interpreted geometrically by Delone and Faddeev, and is developed thoroughly in Chapters seven and eight with new proofs and original research results of the authors.

As a free module over the rational integers, an order of a cubic field can be embedded as a discrete unitary lattice into Euclidean three-space, according to the number geometric ideas of Minkowski. Voronoi defined minima of such lattices and proved that they form chains of neighboring minima on which the unit group operates and causes an orbit decomposition with finite period length, the last minimum of the first primitive period being a fundamental unit. Chapter seven exposes the properties of chains of minima, in particular the role of chains in different directions in the more intricate case of positive discriminants. Chapter eight goes into the algorithmic details and shows that it is sufficient to know how to construct the neighboring minimum of the rational unit one, which is a trivial minimum in every unitary lattice of algebraic integers. The reason is that instead of working in a fixed lattice, Voronoi switched to a similar lattice whenever a new minimum was found and started at the trivial unit one in the new unitary lattice. The authors prove a simplified new method for finding the adjacent minimum by first constructing a prepared lattice basis with distinguished properties which finally enables a selection among five possible candidates, expressed by their projections onto the two-dimensional lattice of punctures.

Two small tables of reduced index forms with covariants and an adequate collection of references complete the book. I am convinced that this book is a very valuable contribution to algebraic number theory.

Short Review

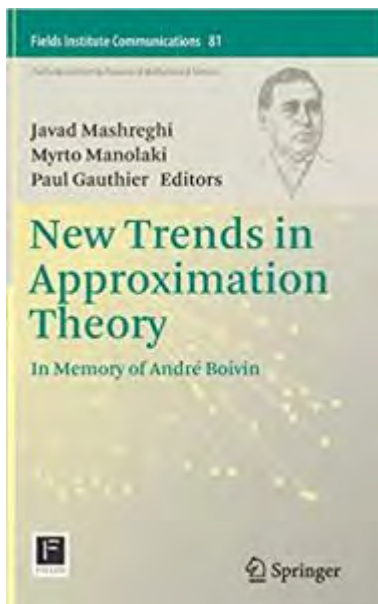
New Trends in Approximation Theory
In Memory of André Boivin

Edited by J. Mashreghi, M. Manolaki, and P. Gauthier
Fields Institute Communications, Springer, 2018
ISBN: 978-1-4939-7542-6
Reviewed by Karl Dilcher

This volume contains the proceedings of an international conference in memory of André Boivin (1955-2014), which took place at the Fields Institute in July of 2016. To quote from the Preface, "The impact of André Boivin's warm personality and his fine work on Complex Approximation Theory was reflected by the mathematical excellence and the wide research range of the 37 participants. In total there were 27 talks, delivered by well-established mathematicians and young researchers. In particular, 19 invited lectures were delivered by leading experts of the field, from 8 different countries."

The book begins with a summary, written by the Editors, of Boivin's life and work, including about 20 colour photographs. The remainder of this volume consists of 14 research papers; their titles and authors are as follows:

- "A Note on the Density of Rational Functions in $A^\infty(\Omega)$ ", by J. Falcón, V. Nestoridis, and I. Zadik;
- "Approximation by Entire Functions in the Construction of Order-Isomorphisms and Large Cross-Sections", by M. R. Burke;
- "Approximation by Solutions of Elliptic Equations and Extension of Subharmonic Functions", by P. Gauthier and P. V. Paramonov;
- "Approximation in the Closed Unit Ball", by J. Mashreghi, and T. Ransford;
- "A Thought on Approximation by Bi-Analytic Functions", by D. Khavinson;
- "Chebyshev Polynomials Associated with a System of Continua", by I. DeFrain;
- "Constrained L^2 -Approximation by Polynomials on Subsets of the Circle", by L. Baratchart, J. Leblond, and F. Seyfert;



- “Extremal Bounds of Teichmüller-Wittich-Belinskii Type for Planar Quasiregular Mappings”, by A. Golberg;
- “Families of Universal Taylor Series Depending on a Parameter, by E. Abakumov, J. Müller, and V. Nestoridis;
- “Interpolation by Bounded Analytic Functions and Related Questions”, by A. A. Danielyan;
- “On Two Interpolation Formulas for Complex Polynomials”, by R. Fournier and S. Ruscheweyh;
- “Operators with Simple Orbital Behavior”, by G. T. Prăjitură;
- “Taylor Series, Universality and Potential Theory”, by S. J. Gardiner; and
- “Subharmonic Images of a Convergent Sequence”, by P. Gauthier and M. Manolaki.

I had the privilege of knowing André Boivin throughout his 30-year career, cut short by his untimely death. This nicely edited and produced volume is a fitting tribute to his memory.

John McLoughlin (University of New Brunswick)

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.

John McLoughlin, University of New Brunswick (johnm@unb.ca)
Kseniya Garaschuk, University of Fraser Valley (kseiniya.garaschuk@ufv.ca)

This issue marks the start of my eleventh year as a co-editor of "Education Notes", including eight years with Jennifer Hyndman and continuing subsequently alongside Kseniya Garaschuk. That timeline of 2010 to the present coincides with an outreach initiative. In fact, it was in the fall of 2010 when initial funding came from the Atlantic Association for Research in the Mathematical Sciences (AARMS) to support *Enhancing our Appreciation of Mathematics through Intentional Community Outreach*. The outreach has taken many forms over the decade. Steady support from AARMS has been valuable in enabling the development on many levels. This piece will feature a discussion of aspects of the outreach along with some reflections on my part as to what has been important in the experiences.

Let me begin with three forms of acknowledgments. This reflects the fact that at the core of sustainable outreach has been the development of relationships with communities (especially schools) and individuals (particularly teachers and students). The acknowledgments respectively address the territory, the people and the institutions.

Acknowledgments

Territory:

We recognize and respectfully acknowledge that UNB in Fredericton is situated on the unsundered and uncaded traditional lands of Wolastoqiyik (Maliseet). This territory is covered by the Treaties of Peace and Friendship which the Wolastoqiyik (Maliseet), Mi'kmaq and Passamaquoddy peoples first signed with the British Crown in 1725. The treaties did not deal with surrender of lands and resources but in fact recognized Wolastoqey (Maliseet), Mi'kmaq and Passamaquoddy title and established the rules for what was to be an ongoing relationship between nations.

People:

Many people have played a significant role in supporting the outreach initiatives over the years. First and foremost, I would like to recognize the significant contributions of Ryan Jones who has been present in numerous activities as a facilitator, teacher, and colleague over the extent of the outreach. He continues to provide support and valuable feedback through his leadership role in mathematics education. Second, there are many others who have offered valuable time to voluntarily support classroom visits, community events, or other activities. Included among these people are Kelda Smith, April Wilson, Gaelan Hanlon, Julie McFawn, Farzad Saeidi, Jean MacDonald, and Saul Hernandez.

Institutions:



As mentioned, the support of AARMS has been valuable. A pilot grant of \$1000 was followed up by a top-up of \$4000 in 2011. Since that time there has been approximately \$2000 annually provided to sustain the outreach. The supports cover basic travel costs, resources and some employment costs. Usually any employment costs cover a previous volunteer who may forego a day of supply teaching to be available for an out of town full day outreach visit, or otherwise provide offset of partial costs in conjunction with a subsidized student employment program (e.g. UNB's Work Study Program). There has been tremendous support from the Faculty of Education at UNB, particularly from the late Ann Sherman as Dean for much of this period.

Building Relationships

The essence of sustainable outreach is interaction with people. Both the human and mathematical elements figure prominently into meaningful connections. Approximately 60 different schools have been visited through outreach including many that have been visited multiple times. Initial visits to a school often stem from a personal contact with a teacher or a request to visit. Frequently I reach out to a school and initiate a connection. Other times there is an element of randomness or proximity that makes outreach practical. For instance, while traveling to Nova Scotia it may be practical to reach out to a teacher in Moncton or Sackville. A recent visit to a Grade 5 classroom came about through simply dropping in

on a rural school in northwestern New Brunswick while accompanying a colleague. In addition, an effort is made most years to get to some schools in other parts of the province. For example, a spring 2018 trip took me to Bathurst and Jacquet River.

My own professional situation is helpful to the context of understanding relationships with the community. I am a professor in the Faculty of Education with a cross-appointment to the Department of Mathematics and Statistics. Many of the students in my classes are among those who are present in the various school settings. The B.Ed. Program features school placements that carry over on Mondays through the fall semester and then continue with extended five and seven week segments in regional schools. An effort is made to get out to several of these schools and conduct outreach in locations familiar to the Education students, thus, offering an unusual opportunity to observe their teacher interacting with children in classroom settings. Further, an effort is made to actively support the outreach activities of the Department of Mathematics and Statistics via participation in math camps through offering problem sessions or basketball math, and support of the provincial mathematics contest including typically hosting a reception for accompanying teachers while the students are writing the contest on campus. In fact it was at this reception that the connection was made with teachers from Bathurst and Jacquet River, thus, leading to a visit weeks later.

The essence of sustainable outreach is interaction with people. Both the human and mathematical elements figure prominently into meaningful connections.

What does outreach look like?

Images and forms of outreach vary widely. An effort is made here to offer some insight into these forms beginning with classroom visits as the most familiar of them.

Classroom Visits

One-off classroom visits most often involve one of two things – a focus on recreational mathematics through hands-on engagement with logical and spatial challenges, or a more typical class dedicated to problem solving including a mix of mental mathematics. Flexibility is critical, as a teacher may wish for a focus on a particular topic such as multiplication or fractions. Generally such flexibility comes into play more with classes that are visited multiple times. Usually class times will range from 45 to 70 minutes. It should be mentioned that the outreach is largely based in elementary classrooms (mainly grades 3-5) and middle school (grades 6-8) with much less at the secondary level.

Probably about half of school visits consist of meeting a single class, and other times more than one class is involved. Combining classes is quite common in smaller schools or with split grade levels. Another form of school outreach resembles more of an event where an area is dedicated to recreational mathematics for half a day or a full day. Library spaces or a cafeteria area may be converted into a showcase of sorts with a range of games. Such events are most effective when volunteers/paid workers are available to support the facilitation. Teachers and educational assistants in some schools help out considerably especially when an event carries through the day, thus, allowing them to become familiar with many games. These events are more common outside of Fredericton having taken place in communities such as St. Stephen, Miramichi or Burt's Corner.

Supporting Community Events

An effort is made to support existing initiatives, as suggested with the math camps or contests. An annual event in the local school district is STEAM Expo. Most years it has been practical to set up a recreational mathematical exhibit at the day long event. Well over a hundred students and community members will visit the exhibit during breaks from their own presentations. Usually some families will find the space to be a gathering place over the course of hours.

A substantial collection of games has been acquired over time. One grant was provided to purchase materials that would be shared widely with schools. That is, the value of the classroom visits involving games can now be readily extended by leaving "loaner kits" consisting of several games with the teachers. These games can remain in the school for three to six weeks typically. In addition, games have been provided on loan to events like math camps or community outreach initiatives that are not mathematically focused. For instance, games have been brought to a downtown drop-in on numerous occasions.

Community spaces have collaborated as venues for outreach. Notably the Fredericton Public Library hosted two separate Saturday afternoon recreational mathematical events, each drawing over 100 participants. Further in March 2011 we held a series entitled *The Beauty of Mathematics* featuring weekly evening presentations by UNB faculty members, namely Ben Newling, Maureen Tingley, David Wagner, and John McLoughlin. A recreational math exhibit was also held in a rural community library housed in a building with a local Grade 6-12 school.

The provincial Middle School Council Day in May 2020 will again be hosted at George Street Middle School in Fredericton. Arrangements have been made for the third time to place games and challenges throughout the school for this occasion. Mathematical challenges will appear on walls with displays in hallways along

with various games for teachers to try.

Continuity and Traditions

Relationships have developed over the years with several teachers and schools. At the core are trust and respect. The collaborative spirit allows me to drop in to borrow some materials from a school, or to request a class to try out an idea, or reciprocally to be reached out to for a visit. Perhaps a mathematician is needed for a career fair or a collection of games would be helpful for a week. There are some teachers with whom there is an unwritten expectation of at least a classroom visit each year.

Much has been said about classroom visits and various aspects of outreach. However, one annual event captures the blend of values surrounding outreach. The focus shifts here to the annual poster presentations at Devon Middle School in Fredericton.

Poster Presentations at Devon

Students in the elementary mathematics methods course at UNB present posters at Devon Middle School each year. Typically 20 to 25 posters representing the efforts of 30 to 40 students, some individual and others in pairs, adorn the hallways and balcony space overlooking the school gymnasium for a couple of periods. Students from Grades 6 through 8 math classes visit the posters to interact with the presenters, thus, learning more about mathematics.

Ryan Jones who has been involved in assisting with this activity on numerous occasions, as well as working at Devon for a stretch, offered this list of benefits.

- An education based assignment for B.Ed. students outside their practicum and (for most) at an unfamiliar school.
- Students must create a presentation that is suitable for many audiences and contexts, as they do not have pre-knowledge of the school community.
- An opportunity for B.Ed. students to speak passionately around an area of mathematics without the parameters of assessment, traditional classroom setting, classroom management.
- An opportunity for B.Ed. students to demonstrate professional and leadership qualities.
- An outreach opportunity for students that attend the host school.

Finally he notes, "A community relationship has evolved between the university/B.Ed. program and host school, providing continuity for students that attend multiple presentations, and follow-up for teachers year to year."

The initiative began over ten years ago with Sandi Braun as the primary contact person who coordinated visits amongst the math teachers. Subsequently Laura Steeves assumed that role. Laura's words speak to the value of the event.

"Having the B.Ed students come in each year to present their posters has had a huge effect on some of our students here at Devon Middle School. Our population here is very diverse, and we have some very challenging students. Quite often some children that are the most disengaged in the classroom show the most engagement in these activities. Showing students that math exists beyond the plane of grades 6 to 8 curriculum gives them the opportunity to engage on their own level. John's love of outreach and meeting learners where they are is something that I look forward to each year."

The presentations are generally multidisciplinary in nature as they connect mathematics with other interests or areas. Students are encouraged to take something they care about and look at it through a mathematical lens, or alternatively to take something mathematical and connect it to another area. Recent presentations have included mathematical connections to yoga, bungee jumping, weaving, music, and interior design. Fibonacci, the golden ratio, and historical ideas such as the concept of zero or mathematics in specific cultures (e.g. Mayan) are common subjects. This year there were two particular passions of students that brought forth novel ideas, namely, paddle boarding and scuba diving. Another memorable presentation dealt with the algorithms around photographic identification. Prospective elementary math teachers gain greater appreciation for the many facets of mathematics in addition to the curiosities of children.

Concluding Comments

Outreach takes many forms. Likewise its spinoffs are immeasurable. The development of relationships has figured prominently into who I am as an educator. Visibly seeing so many classrooms in various contexts contributes to my appreciation of the complexities of mathematics education. Professional development is a two way street, as most teachers will gain insight into both mathematical ideas and the learning of their students through observing outreach in their own classroom. Frequently the communications extend beyond the visits as our networks expand in terms of professional contacts and resources. In some cases it is the opportunity to have a conversation about mathematics before or after the class that is most valuable. Accidental encounters with math mentors or numeracy leads from the district may enrich the conversation.



Robyn and Cindy posing in front of student posters.
Photo Credit: Cindy Farrell

It is surprising how many people are reached and the manners in which one remembers things. A particular puzzle involving the matching of holes in a piece of cheese proved to be quite challenging except that one boy who struggled in math solved it so quickly. Ever since he has introduced himself as the one who solved the cheese puzzle. That is likely to be his finest mathematical moment.

We do not know the impact that simple gestures of reaching out may have. I close here with an unedited excerpt of a letter from a grade 6 student.

Dear UNB,

Thank you for playing these wonderful fun games....

I loved the time we spent to do some little games and help build our confidence to learn and share...

People were a bit noisy exspeshally me but it was still fun...

Thank you for your time and have a good day.

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Mariya Boyko (Prodigy Institution)

CSHPM Notes bring 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 either of the column's co-editors:

Amy Ackerberg-Hastings, Independent Scholar (aackerbe@verizon.net)

Hardy Grant, York University [retired] (hardygrant@yahoo.com)

My research has focused on mathematics-curriculum reforms in the USSR throughout the 1960s and 1970s and their effects on the further development of Soviet mathematics education. (On the textbooks used before the reforms, see [2].) Andrei Kolmogorov (1903–87), professor of mathematics at Moscow State University, took the lead in designing the new curriculum. The changes were part of Nikita Khrushchev's larger education reforms, which were intended to bridge the gap between school academic programs and the practical needs of the state, and to prepare students for entering the workforce upon graduation. The authors of the new curriculum were predominately professional mathematicians, university professors, and teachers of gifted students—so their perception of the academic needs of ordinary students could have been skewed. The curriculum was rather conceptual, introduced set-theoretic notions at an early stage, and emphasized deductive reasoning and the axiomatic method. In some respects, it resembled the “new math” curriculum introduced in North America in the 1960s. Overall, the Kolmogorov curriculum proved to be too conceptual and abstract for the majority of Soviet students.

A decline in grades on entrance exams to postsecondary institutions in the late 1970s was one of the first concrete signals that the new curriculum needed further modification. These exams were administered by individual institutions, following the general curriculum guidelines established by the government. Lower grades were seen not simply as an indication of students' declining level of success, but also as indicating weakness in the entire education system. Soviet culture at that time valued constant growth and continued increases in productivity. Citizens and state enterprises were in competition to produce more goods, while educational institutions aspired to produce more research papers. Students and children were encouraged to obtain better grades and to improve their academic skills. This phenomenon is also referred to as “socialist competition”—a term originally proposed by Vladimir Lenin in his essay “How to Organize Competition”, written in 1917 [5]. Soviets thus blamed the educational system's apparent decline in competitiveness on the new curriculum.

However, there was a curious pattern in students' results. They were able to solve abstract tasks and to compose outlines of complex proofs, but they were not always successful in technical tasks, such as computations or solving equations [3, p. 44]. By 1978 postsecondary educational institutions faced a challenge in designing their entrance examinations. Kolmogorov and his proponents thought that these institutions should produce questions that would test the students' mental readiness for learning complex concepts rather than the level of their technical skills. But changing the entrance examination system and the content of the examinations required an abundance of resources and a liberal timeframe, so this idea was rejected by higher-education authorities [1, pp. 89–103].

In addition to noting insufficient technical skills, the examination committees observed specific gaps in students' knowledge. One committee member, Yuriy Krivodub, stated, “Students, in general, are able to differentiate and integrate (within the limits of the school program). However, the problems that involve practical applications of derivatives caused difficulties [for the students]” [3, p. 44]. Krivodub described the students' performance as “satisfactory,” but the connotation of this term in the Russian language is not the same as in English, especially when it is used in the context of grades and assessments. Usually, the term “satisfactory” was used to indicate that a student barely met curriculum requirements. Krivodub observed that students generally struggled with geometry and, in other portions of the examinations, made many small but significant errors, such as forgetting to take the square root of an expression on both sides of an equation.

Another examination committee member, Elena Petrova, observed that many students were unable to give coherent formulations of fundamental definitions and theorems, such as defining a parallelogram and a rhombus or listing all the properties of these figures and naming the key differences between them. Compared to students who had entered postsecondary institutions in previous years, students in 1977 and 1978 were often unable to distinguish between a theorem and a definition. Between 85 and 88 percent of students throughout the country were unable to prove theorems that dealt with the general notion of a derivative. Surprisingly, most students were still able to compute simple integrals, even though the concept of an integral was considered more advanced than that of a derivative. They could not identify different types of geometric progression. Many students could not plot a graph of the inverse of a function [3].

Only a modest percentage of students received good grades on the entrance examinations. Most students needed to improve some of their technical and presentation skills and to review the fundamentals of geometry and algebra. But despite all of these shortcomings, the examination-committee members were impressed by students' ability to solve problems that required more intuitive thinking and dealt with mathematical objects that students had experience with [3].

Because students did make improvements in the areas emphasized by the new curriculum, it was not evident that mathematics reforms were the chief reason for declining test scores. Additionally, the curious pattern in students' performance on entrance examinations could have been influenced by the content of *Kvant* (Quantum), the journal for high school students and prospective university students, which after 1975 emphasized more abstract content. Kolmogorov had been one of the authors and editors of this journal since 1970. *Kvant* published miscellaneous mathematical problems, puzzles, discussion topics, and interesting facts from the history of mathematics. A separate section was dedicated to study tips and sample problems for prospective university and college students.

The issues of *Kvant* published in 1975 and later years contained a greater number of abstract problems in the section for prospective university students, which could explain why students who wrote the entrance examinations in the late 1970s were better prepared for more abstract material. For example, one of the issues contained a problem set on periodic functions, where some properties were stated and their proofs solicited [4]. Students who were exposed to this type of material at the beginning of the school year would assume that they would be tested on it at the end of the year, during the entrance-examination time period, which was often in June and July.

In theory, university and college examinations were supposed to be designed in such a way that a good student could pass them relying just on knowledge of the school curriculum. But teachers noticed that students needed a good deal of supplemental tutelage, and so extracurricular activities and organizations devoted to secondary-school mathematics became common across the country.

Soviet culture was success-driven. Increasing success metrics in all areas of industry, as well as in education, was valued by the government and by Soviet citizens. Declining performance on examinations for entrance to higher-educational institutions therefore became an important point of concern for mathematics educators throughout the USSR. Meanwhile the Soviet government emphasized the importance of competing with the capitalist states, and socialist competition was a convenient way of integrating this spirit into the daily lives of citizens of all ages and professions. Enterprises and individuals who showed increasing success and productivity in their fields were highly praised, while the ones who failed to keep up were publicly criticized. In this context, why and how mathematics scores were declining was not as important as the basic fact that they were declining. Thus, mathematics educators, the Soviet government, and Soviet citizens all understood decreasing marks on entrance examinations as an indication of a more general problem, and not just a shortcoming of mathematics education. For this reason, they united in calling for a new round of reforms.

Mariya Boyko is a recent PhD graduate of the Institute for the History and Philosophy of Science and Technology at the University of Toronto whose thesis supervisor was Craig Fraser. She also holds a teaching degree, specializing in mathematics and history. She is interested in the cultural and political factors that influenced the history of Soviet mathematics education and plans to continue expanding her research in the coming years. In her spare time she leads career-education seminars for high school students, undergraduates, and graduate students, and coaches a dance team.

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- [2] Boyko, Mariya. (2018) Theory Over Practice in Soviet Mathematics Textbooks of the 1950s. *CMS Notes* 50(4), 20–21.
- [3] Cherkasov, R., and S. Ponomarev. (1979) On Selected Results of the Entrance Examinations. *Matematika v Shkole* [Mathematics in the School], 44–48. Retrieved from *Matematicheskoe Obrazovaniye: Proshloye i Nastoyashee* [Online Archive of Mathematics Education: Past and Present], <http://old.mathedu.ru/journals-collections/>.
- [4] Dorofeev, G., and N. Rozov. (1977) Pereodichnost' i nepereodichnost' funktsij [Periodicity and Non-periodicity of Functions]. *Kvant* [Quantum] (1), 43–47. Retrieved from <http://kvant.mccme.ru/>.
- [5] Lenin, Vladimir. (1917, December) How to Organise Competition? In *Collected Works*, translated by Yuri Sdobnikov and George Hanna, 26: 404–415. Moscow: Progress Publishers, 1964. Retrieved from Digital Reprints, *From Marx to Mao*, 2011, <http://www.marx2mao.com/PDFs/Lenin/CW-Vol.26.pdf>.

2020 CMS Fellows

Calls for Nominations

February 2020 (Vol. 52, No. 1)

The CMS Fellows program recognises 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 the below areas may be recognised by fellowship.

- Making significant contributions to the profession and to the Canadian mathematical community.
- Increasing the relevance and visibility of the CMS.

For a nomination to be complete, all [nomination requirements and eligibility](#) should be included. A CMS member may nominate a maximum of two Fellows in a calendar year. Any person who is nominated and is not selected a Fellow will remain an active nominee for a further two years.

The CMS aims to promote and celebrate diversity in the broadest sense. Nominations for outstanding colleagues are encouraged regardless of race, gender, ethnicity or sexual orientation.

All documentation, including letters of support, should be submitted electronically, preferably in PDF format, to fellows@cms.math.ca **no later than March 31, 2020**.

For the full program description, please visit [here](#).



Second Inaugural Class of Fellows

2019 Winter Meeting Banquet, Toronto, ON



First Inaugural Class of Fellows

2018 Winter Meeting Banquet, Vancouver, BC

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2020 Adrien Pouliot Award

Calls for Nominations

February 2020 (Vol. 52, No. 1)

Nominations of individuals or teams of individuals who have made significant and sustained contributions to mathematics education in Canada are solicited. Such contributions are to be interpreted in the broadest possible sense and might include: community outreach programs, the development of a new program in either an academic or industrial setting, publicizing mathematics so as to make mathematics accessible to the general public, developing mathematics displays, establishing and supporting mathematics conferences and competitions for students, etc.

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 must be received by the CMS Office **no later than April 30, 2020**.

Please submit your nomination electronically, preferably in PDF format, to apaward@cms.math.ca.

Nomination requirements

- Include contact information for both nominee and nominator.
- Describe the nominated individual's or team's sustained contributions to mathematics education. This description should provide some indication of the time period over which these activities have been undertaken and some evidence of the success of these contributions. This information must not exceed four pages.
- Two letters of support from individuals other than the nominator should be included with the nomination.
- Curricula vitae should not be submitted since the information from them relevant to contributions to mathematics education should be included in the nomination form and the other documents mentioned above.
- If nomination was made in the previous year, please indicate this.
- Members of the CMS Education Committee will not be considered for the award during their tenure on the committee.

Renewals

Individuals who made a nomination last year can renew this nomination by simply indicating their wish to do so by the deadline date. In this case, only updating materials need be provided as the original has been retained.



2019 Adrien Pouliot Award Recipient



Tiina Hohn
MacEwan University

Prof. Hohn is the most recent recipient of the award. Please read the [Media Release](#) or her [citation](#). For a list of past recipients and to read their citations, please visit the official [Adrien Pouliot Award](#) page.

2020 Graham Wright Award for Distinguished Service

Calls for Nominations

February 2020 (Vol. 52, 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 should include a reasonably detailed rationale including three support letters and be submitted **by March 31, 2020**.

All documentation should be submitted electronically, preferably in PDF format, by the appropriate deadline, to gwaward@cms.math.ca.

Renewals

Individuals who made a nomination last year can renew this nomination by simply indicating their wish to do so by the deadline date. In this case, only updating materials need be provided as the original has been retained.

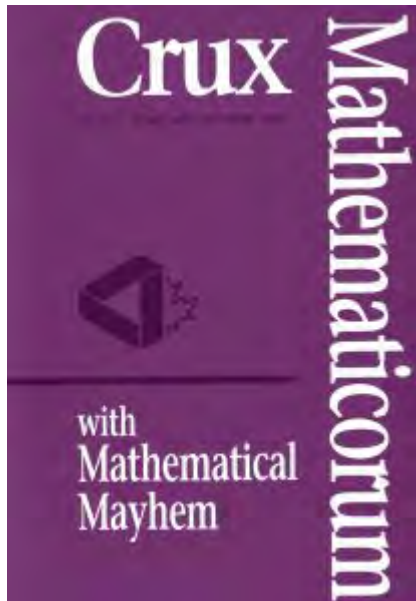


2019 Graham Wright Award for Distinguished Service Recipient



Karl Dilcher
Dalhousie University

Prof. Dilcher is the most recent recipient of the award. Please read the [Media Release](#). For a list of past recipients and to read their citations, please visit the official [Graham Wright Award](#) page.



The CMS invites expressions of interest to fill Associate Editor positions for *Crux Mathematicorum* (CRUX), the CMS international problem solving journal. CRUX is in the process of expanding the current complement of editors on its [editorial board](#) to help with the growing number of submissions.

Anyone with an interest in problem solving is invited to forward an expression of interest, including a covering letter with, curriculum vitae, and an expression of views regarding the publication. The appointment will begin on May 1, 2020 until December 31, 2024.

Please submit your expression of interest to the Editor-in-Chief at crux.eic@gmail.com **no later than March 31, 2020.**

Edna James – Creator of COMC Video Solutions

Acknowledgement

February 2020 (Vol. 52, No. 1)



Every year, the CMS posts 9 weekly problems by Nicolae Strungaru (Grant MacEwan University) leading up to the [Canadian Open Mathematics Challenge](#). We select a cross section of problems from a variety of national and regional contests that we hope will stimulate interest in problem solving and prepare students to write the Canadian Open Mathematics Challenge in November. The problem areas are not tied to particular grade levels, or to the curriculum. They cover a number of areas including, but not limited to algebra, logic, and some geometry.

In 2019, with the assistance of Dr. Edna James, Assistant Professor from Algoma University, the CMS was able to publish video solutions to go along with each problem. Edna worked tirelessly to provide detailed video solutions for each problem, which lent a new dimension to the Problem of the Week. She says:

It has been a breath of fresh air to widen my audience and get a chance to share my passion for mathematics once again. That mutual enthusiasm and excitement between student and teacher about communicating mathematics was what inspired me to be a professor in the first place.

Edna is also a member of the CMS Competitions Committee and volunteered to take on this momentous project. The CMS would like to thank Edna for her outstanding work and her contribution to the COMC.

Nicolae Strungaru's COMC 2019 Problems of the Week can be found at <https://cms.math.ca/Competitions/COMC/2019/potw.html>

Edna James' video solutions for these problems can be found at <https://www.youtube.com/channel/UCAexaEANmXC9e7O-Fzh7-Ng/videos>

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2019 CMS Winter Meeting Recap



CMS Meetings

February 2020 (Vol. 52, No. 1)

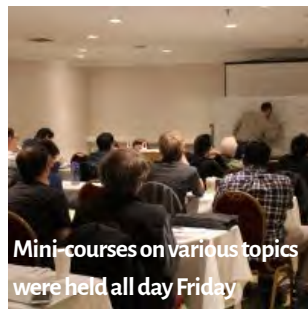
Sarah Watson (CMS)

Meeting and Events Manager

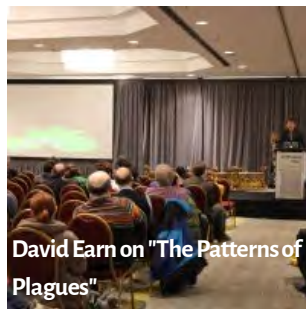
Over 650 mathematicians were welcomed to The Chelsea Hotel in Toronto for the 2019 CMS Winter Meeting from December 6-9th. Participants attended 33 scientific sessions; six plenary lectures; three prize lectures and one public lecture over the course of the meeting. The plenary lecturers were Maria Chudnovsky (Princeton); Sarah Mayes-Tang (Toronto); Antonio Montalban (California, Berkeley); Kirsten Morris (Waterloo); Malabika Pramanik (UBC), and Lauren K. Williams (Harvard).

This winter the CMS continued to offer three-hour mini courses on Friday December 6th. There were ten mini courses in diverse areas of mathematics which took place in the morning and afternoon before the plenary lecture.

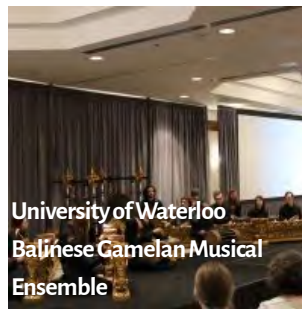
The official conference opened on Friday evening with David Earn (McMaster) giving a talk on 'The Patterns of Plagues'. Following the public lecture the University of Waterloo Balinese Gamelan Musical Ensemble performed a percussion dominated musical ensemble from the Island of Bali, Indonesia. Next, attendees got to network and catch over some food and drink at the welcome reception.



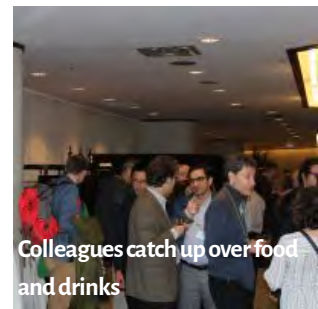
Mini-courses on various topics were held all day Friday



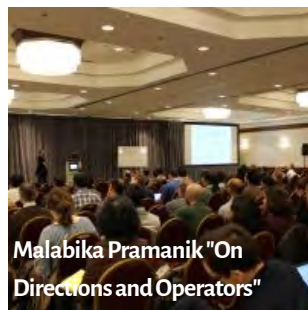
David Earn on "The Patterns of Plagues"



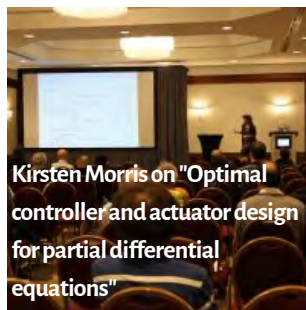
University of Waterloo Balinese Gamelan Musical Ensemble



Colleagues catch up over food and drinks



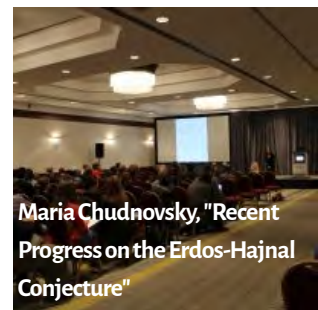
Malabika Pramanik "On Directions and Operators"



Kirsten Morris on "Optimal controller and actuator design for partial differential equations"



Special Presentation by EGMO medalist Anna Krokline



Maria Chudnovsky, "Recent Progress on the Erdos-Hajnal Conjecture"



Robin Gaudreau co-organised the first CMS LGBTQ+ event



Free CMS-sponsored daycare for participating members



Diversity and Equity Luncheon

The Student Poster Awards were also presented at the banquet: AARMS Prize: David Miyamoto (Toronto); CMS President's Prize: Kyle Bryenton (PEI); and CMS Student Committee Prize: Aaron Slobodin (Victoria).

During the 2019 Winter Meeting attendees were able to network with peers and like-minded individuals at the Equity and Diversity in Mathematics Luncheon on Saturday as well as an LGBTQ+ Lunchtime Discussion on Sunday. Attendees also had the option of childcare during the meeting which was complimentary for CMS members.



Winners of Student Poster Presentation Awards

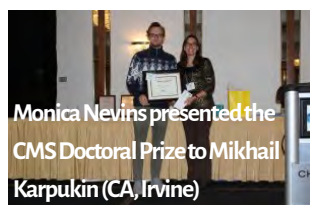


Dorothea Pronk Presents the AARMS Student Poster Award to David Miyamoto

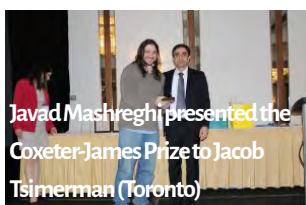


Kyle Bryenton (PEI) receives the CMS President's Prize from Javad Mashreghi

On Sunday December 8th the CMS Awards Banquet recognized the 2019 CMS Award winners: They are: Dr. Mikhail Karpukin (California, Irvine) recipient of the Doctoral prize; Dr. Jacob Tsimerman (Toronto) recipient of the Coxeter James Prize; Tina Hohn (MacEwan) recipient of the Adrien Pouliot Prize; Professor Karl Dilcher (Dalhousie) recipient of the Graham Wright Award for Distinguished Service; Dr. Lars Louder (University College London) and Dr. Henry Wilton (Cambridge) recipients of the G. de B. Robinson Award; and Dr. Catherine Sulem (Toronto) recipient of the CRM-Fields Award. The banquet was preceded by a speech by Anna Krokline, 2019 EGMO team member and medalist who discussed the future of mathematics for youth and women.



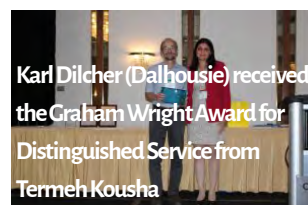
Monica Nevins presented the CMS Doctoral Prize to Mikhail Karpukin (CA, Irvine)



Javad Mashreghi presented the Coxeter-James Prize to Jacob Tsimerman (Toronto)



Tiina Hohn (MacEwan) is the recipient of 2019 Adrien Pouliot Award



Karl Dilcher (Dalhousie) received the Graham Wright Award for Distinguished Service from Terneh Kousha

Congratulations to the second Inaugural Class of Fellows who were recognized at the CMS Winter Meeting Banquet on December 8th, 2019 for their significant contributions to the profession and to the Canadian mathematical community. The following inaugural fellows were recognized:

Louigi Addario-Berry (McGill)
James G. Arthur (Toronto)
Karl H. Dilcher (Dalhousie)
George A Elliott (Toronto)
Joel S. Feldman (UBC Vancouver)
Neal Madras (York)
Javad Mashreghi (Laval)
Ján Mináč (Western)
Monica Nevins (Ottawa)
Bruce L.R. Shawyer (Memorial)
Cameron Stewart (Waterloo)



Putting on such a meeting requires much dedication and hard work and would not be possible without the efforts of the scientific directors, the session organizers, and the CMS staff. Jane Heffernan, and Patrick Ingram (York University), the Scientific Directors, put a tremendous amount of hard work into bringing an attractive and varied program and greatly deserve our thanks.

The CMS would like to acknowledge the financial support from York University, The University of Toronto, PIMS, FIELDS, CRM, AARMS, University of Waterloo, McMaster University and The University of Toronto, Scarborough, and Professor Catherine Mavriplis from the University of Ottawa in her role as NSERC Chair for Women in Science and Engineering.



Canadian Mathematical Society
Société mathématique du Canada

JUNE 5-8 JUIN, 2020

CMS 75th Anniversary Summer Meeting

Réunion d'été du 75^e anniversaire de la SMC

Ottawa, ON

Plenary speakers | Conférences plénières:

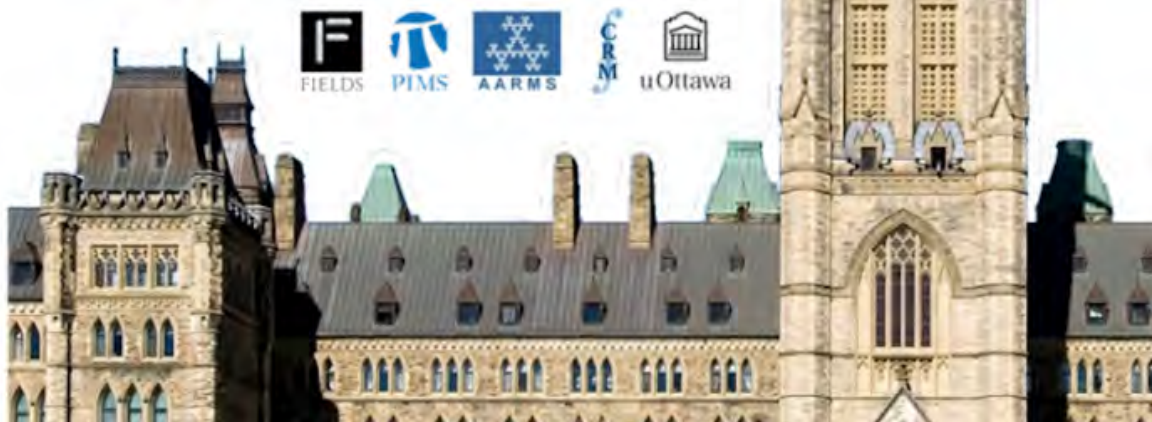
Henri Darmon (McGill)
Moon Duchin (Tufts)
Matilde Marcolli (Toronto)
Aaron Naber (Northwestern)
Ian Putnam (Victoria)

Public Lecture | Conférence publique:

Anne Broadbent (Ottawa)

Scientific Directors | Directeurs scientifiques

Allana Fraser (University of British Columbia)
Monica Nevins (University of Ottawa)
Mateja Šajna (University of Ottawa)



The Canadian Mathematical Society (CMS) welcomes and invites proposals for mini-courses for the [CMS 75th Anniversary Summer Meeting in Ottawa](#) from **June 5-8, 2020**.

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

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

The CMS 75th Anniversary Summer Meeting mini-courses will be held Friday, June 5th and Monday June 8th. Attendees will be charged a small registration fee.

Proposals should include:

- The names, affiliations, and contact information of the main organizers;
- A title and 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;
- 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 February 29, 2020**.

With thanks,

Scientific Directors:

Ailana Fraser (University of British Columbia)
afraser@math.ubc.ca

Monica Nevins (University of Ottawa)
mnevins@uottawa.ca

Moteja Šajna (University of Ottawa)
msajna@uottawa.ca

The Canadian Mathematical Society (CMS) welcomes and invites session proposals and mini course proposals for the 2020 CMS Winter Meeting in Montreal from **December 4-7**.

Call for Sessions

Proposals should include (1) names, affiliations and contact information for all session co-organizers, (2) title and brief description of the focus and purpose of session, (3) a preliminary list of potential speakers, with their affiliation and if they have agreed to participate, along with a total number of expected speakers.

Session will take place December 5, 6, and 7. The meeting schedule will accommodate 12 speakers per full day, and 5 or 7 per half day. Sessions will be advertised in the *CMS Notes*, on the web site and in the *AMS Notices*. Speakers will be requested to submit abstracts which will be published on the web site and in the meeting program. Those wishing to organise a session should send a proposal to the Scientific Directors and copy the CMS office. Those submitting proposals are encouraged to pay attention to the diversity of both the session invitees and the proposed session organisers.

Proposals should be submitted by **March 30, 2020**.

Call for Mini-Courses

The CMS is organising three-hour mini-courses to add more value to meetings and make them attractive for students and teachers to attend.

The mini-courses will be held on Friday afternoon, December 4th, before the public lecture, and include topics suitable for graduate students, postdocs and other interested parties.

Proposals should include names, affiliations, and contact information for all the mini course co-organizers and title and brief description of the focus of the mini course.

Scientific Directors

Michael Lipnowski (McGill University)
michael.lipnowski@mcgill.ca

Brent Pym (McGill University)
brent.pym@mcgill.ca

CMS Office

meetings@cms.math.ca



An invitation to celebrate



The International Mathematical Union is leading the project of having UNESCO proclaiming March 14 (Pi Day) as the International Day of Mathematics (IDM). This proclamation has been adopted by the Executive Board of UNESCO at its 205th

session in October 2018. It is now on the agenda of the 40th General Conference of UNESCO in November 2019. If adopted, the official launch will be in 2020.

Considering that March 14 2020 is a Saturday, the launch at the UNESCO Headquarters in Paris will take place on Friday March 13, 2020. We will hold a simultaneous African launch at the Next Einstein Forum in Nairobi, Kenya.

The 2020 theme is **Mathematics is everywhere**

- Mathematics is everywhere in science and tech.
- Mathematics is everywhere in the organization of civilizations.
- Mathematics is essential to meet the UN Sustainable Development Goals.
- Mathematics is everywhere in whatever you do.
- Tell me about an activity or area and I will tell you where mathematics is.

On the **website** you can

- Find open source material related to theme:
- projects, ideas, software for use in classrooms, in large events or in small activities for the children and the general public;
- Find instructions on how to organize an event;
- Post your activities on an interactive map;
- Explore the activities around the world.

How will you celebrate?

- Will you celebrate in your classroom?
- Do you wish to organize a small exhibition and/or interactive activities with your local community?
- Will your national mathematical society or mathematics teachers association organize national activities?
- Will you celebrate with a neighbouring country?

Start thinking about how you will celebrate. We are here to help. www.idm314.org



Une invitation à célébrer



L'Union mathématique internationale pilote le projet de faire proclamer par l'UNESCO le 14 mars (ou jour de Pi), la Journée internationale des

mathématiques. Cette proclamation a été adoptée par le Conseil exécutif de l'UNESCO lors de sa 205^e séance en octobre 2018. Elle est à l'ordre du jour de la 40^e conférence générale de l'UNESCO en novembre 2019. Si adoptée, le lancement officiel sera en 2020.

Au vu du fait que le 14 mars 2020 est un samedi, le lancement au quartier général de l'UNESCO à Paris aura lieu le vendredi 13 mars 2020. Nous tiendrons un lancement parallèle au prochain Next Einstein Forum à Nairobi au Kenya.

Le thème 2020 est **Les mathématiques sont partout**

- Les mathématiques sont partout en sciences et en technologie.
- Les mathématiques sont partout dans l'organisation de la civilisation.
- Les mathématiques sont essentielles à l'atteinte des objectifs de développement durable des Nations Unies.
- Les mathématiques sont partout dans tout ce que vous faites.
- Donnez-moi une activité ou un domaine et je vous dirai où sont les mathématiques.

Sur le **site web** vous pouvez

- Trouver du matériel libre de droit relié au thème: projets, idées, logiciels, à utiliser dans la classe, lors de grands événements ou de petites activités destinées aux enfants ou au grand public;
- Trouver un mode d'emploi sur comment organiser une activité;
- Afficher votre activité sur une carte interactive;

Comment célébrerez-vous?

- Célébrerez-vous dans votre classe?
- Voulez-vous organiser une petite exposition et/ou des activités interactives dans votre communauté locale?
- Votre société mathématique nationale et/ou votre association d'enseignants en mathématiques vont-elles organiser des événements d'envergure nationale?
- Allez-vous célébrer avec un pays voisin?

Commencez à penser comment vous voulez célébrer. Nous pouvons aider. www.idm314.org

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