

Points & Angles

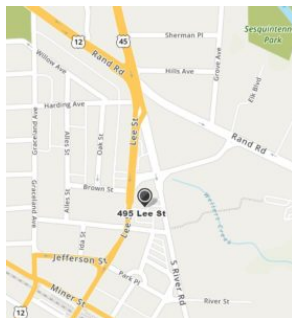
Newsletter of the Metropolitan Mathematics Club of Chicago
Volume XLVIII No. 4 Dec. 2018

The Robots are Coming for Your Teaching Job: Educational Ramifications in the Machine Learning Age

January Speaker
Matthew Moran



**New Location &
Pricing:**



Friday, Jan. 18, 2019

Doors Open/Social Hour: 5:45 PM

Dinner & Talk: 7:00 PM

Des Plaines Elks Club

495 Lee Street, Des Plaines

\$30 for Members, \$35 for Nonmembers

Reserve by noon, Monday, Jan. 14

Online at www.mmccchicago.org

or by phone at 847-486-4291

There is no shortage of media coverage on automation in the workforce, machine learning, artificial intelligence, and the inevitable robot takeover. What does this mean for education and educators? Are there already machine-learning applications at work in your daily teaching life?

This talk will explore some fundamental machine learning concepts and examples and consider implications of these concepts in education. Starting from a simple linear regression (line of best fit), the talk will develop some less familiar concepts. Come prepared to discover, if you'll be teaching next year or changing oil in your robotic replacement.

Matthew Moran is a software engineer working on data science and machine learning problems. He retired from Chicago Public Schools after fourteen years in the mathematics classroom. He is currently the Past President of MMC and a board member of Math Circles of Chicago.

Join us on January 18, at the Des Plaines Elks Club, for a family-style dinner, a great presentation by Matthew, and wonderful conversation with your friends in mathematics!

Points from the Interior

by Mary Wiltjer

Like many of us, I do some tutoring on the side. I remember one of the first kids I tutored was in Wally Dodge's algebra class at New Trier, and we would often go over his quizzes and tests. I learned so much from seeing those tests—about how many concepts you could unabashedly roll into one problem and how much you could ask of a kid. For example, you could mix sporadic topics from the whole year into a question without ever having given a problem “just like that one” before. I loved it. I have tried to do it with my assessments ever since.

Unfortunately, my experience during tutoring isn't always so enriching. I sometimes have an experience more like a few nights ago, when I was so disappointed in the problems a student was assigned that I felt the need to apologize for my profession. Now that your curiosity is peaked, it was to “simplify” radical expressions like the

following: $\frac{1}{\sqrt[4]{81}}$, $\frac{\sqrt[3]{16}}{\sqrt[5]{16}}$, and $\sqrt[3]{\frac{2}{3a}}$. I cannot believe anyone in high school math is still wasting what precious, little instructional time we have on rationalizing denominators.

We simply (no pun there) have to make better decisions about what mathematics we share with them. Never ever is it acceptable to teach a topic because it was taught when the teacher was in school. Don't misread that – I'm not saying all that is old is bad, but some of it is very bad. Rationalizing comes from a time before calculators where approximate values were found using tables of radicals, and it was easier to divide by a whole number than to divide by a decimal value. I want to emphasize that this process was used to find an approximation! Nowadays, we should essentially have just one technique to find an approximation – a calculator! Others will say that rationalizing gives answers a consistent format. However, never rationalizing the denominator could also be considered a consistent format. However, the supposed need for a consistent format is another problem. Why do they need to be consistent? As a high school math teacher, I can easily handle a few different forms of an answer. When I taught English, I didn't expect every sentence to be the same or even the structure of every argument to be identical. In my math classes, one of my mantras is “equivalent forms earn equivalent credit” (unless otherwise stated for a very good reason). I do sometimes add that they may not be “equivalently efficient.”

I often feel like some of these procedures we force on kids are used for “gotcha” point reductions. It is so common in geometry classes to make every student put every radical answer, like $\sqrt{50}$, in so-called simplified form, such as $5\sqrt{2}$. When a kid fails to do this or makes an error on it, some reduction is made. Many teachers will say it is only a small reduction. Remember that there are many radical answers in geometry, so this minor reduction becomes a significant subcategory. The child demonstrated (s)he knew the new topic well but got dinged repeatedly for this insignificant, extra step. The student feels deflated. We are laying landmines for kids to feel unsuccessful, even when they learned the topic. This act is what drives kids away from loving mathematics. If this form were expected 5% of the time or less, I probably would see it as a nice integration of equivalence and previous ideas. The student never sees that geometry is about the beautiful connection of shapes but starts to feel it is one more place where “silly arithmetic errors” keep her/him from being “good at math.” How long will we do more to push kids away than to invite them into our world of gorgeous mathematics?

I think instead of forcing whole chunks of problem types into very rigid answer forms, we should be treating equivalence as a thread. We should be giving tools for students to change expressions and equations and then expect them to use them in all units and topics. I wish we would teach kids to “complicate” as much as we teach to “simplify.” I wish we rewarded kids for the most creative and outrageous equivalent forms of an expression. We could start this young with values and then work it up through all types of variable expressions. I want kids to know that inverse operations “undo” each other and that only zero can be added and one can be multiplied to maintain equivalence of an expression. I think we now teach so much of this in little compartments when it fits a certain topic, and as a result, kids do not see they have a big toolbox from which to reach when working on any problem. Heck, I want them to know what an expression versus an equation is. How have we failed at this? Maybe it is because we spend so long on dreadful topics like rationalizing a denominator.

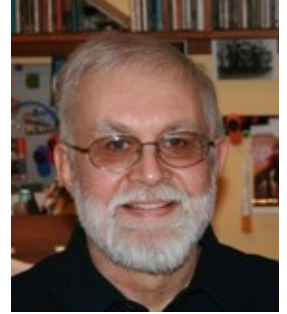
If we had infinite time, we could cover infinite topics. In reality, we have so little time, and there is so much beautiful mathematics (and even some very new mathematics) that we never expose kids to. It is time to stop

Points from the Interior (cont.)

assuming the past gave us a great curricular foundation (especially for high school mathematics) and to stop demanding uniformity of kids. I want great problem solving and mathematical thinking. I want us to free the students and ourselves from topics and procedures that should have long been put to rest. Basically, I'm rationalizing that we need to be more right and less rigid.

December Dinner Meeting Talk – John Benson

by Peter DeCraene



Our December meeting started with a great dinner and interesting conversation. After dinner, John began his talk by presenting some problems, to which he did not provide solutions:

Find the next numbers in each of these sequences and describe the patterns:

1, 2, 4, 6, 16, 12, 64, 24, 36, 48, 1024, ...

1, 10, 2, 100, 11, 1000, 3, 20, 101, 10000, 12, ...

1, 11, 21, 1211, 111221, 312211, 13112221, 1113213211, ...

From there, we were treated to a series of excellent problems, some with solutions, and all with insightful commentary.

Problems can be humorous, like simplify: $(x-a)(x-b)(x-c)\dots(x-z)$. Problems can also intrigue students. John showed us a piece of wood containing three holes (a square, an equilateral triangle, and a circle), all about the same size. He challenged us to think about one object that, when passed through each hole, would fill the hole entirely. He poses this question to students on the first day of school, without a solution, and students would come up to him days, weeks, months, or even years later to tell him they figured out the problem. Some students asked him to include their experiences with the problem in letters of recommendation for college. Intriguing problems make students wonder.

A good problem is one that first makes you think and then leads to really serious mathematics. For example: Find two unit fractions that add to $\frac{1}{2}$, or solve: $\frac{1}{a} + \frac{1}{b} = \frac{1}{2}$. [There are three solutions: $(a,b) = (4, 4), (3,6),$ or $(6,3)$.] Find solutions to the equation, $\frac{1}{a} + \frac{1}{b} = \frac{1}{n}$, or the inequality, $\frac{1}{a} + \frac{1}{b} > \frac{1}{n}$. Then, diving in a different direction, John asked us which figures tessellate and why. With a little geometry and some algebra, John led us back to the unit fraction equations and proved why only some figures tessellate and why there are only five platonic solids.

We were treated to a walk through the sets of numbers, from counting to complex (a topic we always have to teach, which can seem boring). Along the way, John showed how the arithmetic on one set leads to the need for the next set, what we gain, and what we lose as we progress. It is not boring at all!

The “locker problem” changed John’s life, when he first saw it many years ago. When he figured out why the solution made sense and discovered something about number theory, John decided he wanted to dedicate his life to creating and sharing interesting problems that would teach students something about mathematics they didn’t already know.

The trail continued... Math helps us answer the question, “Why are things the shape and size they are?” Questions like, “Why are there no giants?” to “Why are ice cream containers shaped that way?” all involve geometry concepts. (There’s an article online, “On Being the Right Size,” by J.B.S. Haldane.) Figuring out calculus and geometry problems that apparently lead to contradictions, like $0 = 1$ or “all triangles are isosceles,” help uncover important mathematical ideas. There are problems that lead to surprising solutions (If a piece of railroad track one mile in length increases by two feet, how high would the buckled track be?) or that don’t have solutions when it seems like they should (How many primes are one less than a perfect square, and how many are one more than a perfect square?). These problems keep students interested, engaged, and curious.

By the way,

... 60, 4096, 192, 144, ...

... 100000, 1001, 110, 4, ...

... 31131211131221, 13211311123113112211, ...

MMC Scholarship for High School Seniors

The Metropolitan Mathematics Club of Chicago is offering a \$2,000 scholarship for a high school senior who will pursue a career in the teaching of mathematics. In addition, up to two Filliman Scholarships may be awarded for the same amount (funded by a gift from the Filliman estate). The selected students, their parents, and their sponsoring teachers will be invited to MMC's May 10 dinner meeting, at which time the scholarship recipients will be honored.

A selection committee of MMC members, appointed by the board of directors, will determine the scholarship awards. To be eligible, an applicant must be sponsored by a member of MMC, submit the application, have an official transcript sent, request a letter of recommendation from a mathematics teacher, and respond to the prompts in point E below, such that all of the materials are received by March 8, 2019. The committee will evaluate applications and will make a recommendation to the board of directors as to the awarding of the scholarship.

The guidelines used for selection shall be:

- A. Demonstration of overall academic scholarship with an inclusion of at least eight semesters of college preparatory mathematics. (A minimum cumulative grade point average of 3.0, where A = 4.)
- B. A statement of the intention to pursue a career in mathematics teaching.
- C. Indication of participation in extra-curricular activities, especially those that may have a positive influence on a teaching career.
- D. A letter of recommendation from a math teacher who is familiar with the applicant's academic performance and his or her potential as a mathematics teacher. The teacher must be an MMC member.
- E. A short response from the candidate (1-2 paragraphs) to each of the following prompts:
 - a. What qualities do you possess that will help you in a teaching career?
 - b. Describe a teacher who has had an impact on your education.
 - c. Was there a time when you struggled with a concept in a math (or other) class? What did you do?
 - d. What was your favorite math class? Why?
 - e. Describe your favorite math problem. What makes it so great?
 - f. What excites you about mathematics?
 - g. Why do you want to teach mathematics? *This response may be longer than the others, if necessary.*

In addition to the application form, applicants must also send:

- 1. A letter of recommendation from a mathematics teacher, *preferably not sent through the applicant.**
- 2. A current transcript for seven semesters of high school.*
- 3. Responses to the prompts in point E above.

**Letters of recommendation and transcripts may be sent by separate mail.*

MMC Dinner Meeting Incentive Program

“Bring a Friend” Night

Bring someone who has never attended an MMC dinner meeting, and introduce them to MMC! Both you and your guest will receive \$5 off your dinner cost. There is a limit of 2 guests per member per meeting for the reduced cost, but you can still invite more people to come with you! This incentive is good for the following meeting:

January 18 (Matthew Moran)

Thank you to our generous members who are sponsoring this program.

Please be sure to register both yourself and your guest, using the reservations link on the website, and mention the incentive when you check in at the meeting.

USACAS 2019

MEECAS and Highland Park High School will co-host the 11th USACAS Conference. While still emphasizing CAS, this expanded **technology** conference will broaden our view of Computer Algebra Systems to include various technologies in mathematics, STEM, and science education. Our motto for the conference will be "find the right tool to solve the problem." This event will be held at Highland Park High School located in Highland Park, Illinois, on Saturday, June 15, and Sunday, June 16, 2019. There will be an opening dinner Friday, June 14, 2019, hosted by the Metropolitan Mathematics Club of Chicago (MMC).

Up to date information will be posted at usacas.org.

Registration: **\$85 for USACAS 11 (before May 9, 2019; \$100 on or after May 9, 2019)**
\$95 for USACAS 11 AND the MMC Friday night dinner
(before May 9, 2019; \$110 on or after May 9, 2019)
\$55 for MMC Friday night dinner (before May 9, 2019; \$65 on or after May 9, 2019)

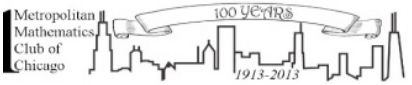
**Fee includes continental breakfast, box lunch, and snacks.*

NEW! Graduate credit will be available through Central Michigan University.

Any questions can be directed to Ilene Hamilton at ihamilton2341@gmail.com.

Follow MMC on Social Media!





Officers

- Mary Wiltjer, President
- Lisa Parker, President-Elect
- Matthew Moran, Past President
- Sheila Hardin, Board Chair
- Beth Ann Ball, Secretary
- Carol Nenne, Treasurer

Directors

- Beth Ann Ball (2018-2021)
Maine South H. S., Park Ridge
- Steve Condie (2018-2021)
Illinois Math & Science Academy
(retired), Aurora
- Serg Cvetkovic (2017-2020)
Thomas Kelly H.S., Chicago
- Peter DeCraene (2017-2020)
Evanston Township H.S. Evanston
- Carrie Fraher (2018-2021)
Glenbrook South H.S., Glenview
- Sheila Hardin (2017-2020)
Oak Park & River Forest H.S., Oak Park
- Danielle Leibowitz (2018-2021)
Mundelein H.S., Mundelein
- Karen Lopez (2016-2019)
Larkin H. S., Elgin
- Matthew Moran (2017-2020)
Chicago Public Schools (retired)
- Nicolette Norris (2016-2019)
Chicago Vocational Academy, Chicago
- Lisa Parker (2018-2021)
Lincoln-Way Central H.S., New Lenox
- Rose Sterr (2016-2019)
Benet Academy, Lisle
- Mary Wiltjer (2016-2019)
Glenbrook South H.S., Glenview

Officials

- Community Relations and Development
Serg Cvetkovic
- Conference Co-Chairs Nicolette Norris
Rose Sterr
- Conference Registrar Peter DeCraene
- Finance Committee Chair Lisa Parker
- Historian Paul Christmas
- Membership Coordinator Mary Wiltjer
- NCTM/ICTM Affiliate Representative Steve Condie
- Points & Angles Editor Sara Curran
- Publicity and Posters Paul Christmas
- Scholarship Chair Carrie Fraher
- Social Media Chair Danielle Leibowitz
- Webmaster Peter DeCraene



Metropolitan Mathematics Club of Chicago

Affiliate of ICTM & NCTM

invites you to attend the annual

MMC CONFERENCE OF WORKSHOPS

A conference in workshop format,
given *by teachers for teachers*

Saturday, January 26, 2019

8:30 am – 12:45 pm

OPTIONAL FREE AFTER-LUNCH SESSION

1:45 pm – 3:00 pm

University of Chicago Laboratory Schools
Chicago, Illinois

FOR TEACHERS OF ALL GRADES K-16

Low Cost: \$32 members; \$38 non-members; \$20 students

Professional Development Hours/CPDU Credit Available

For program booklet and registration information, see the
MMC website:

www.mmcchicago.org

MMC Board Report

by Beth Ann Ball

The MMC Board of Directors met on Tuesday, November 27, 2018, at Oak Park and River Forest High School in Oak Park, Illinois.

The board discussed the upcoming collaboration with ICTM and NCTM as Chicago prepares to host the 2020 NCTM Annual Meeting. The MMC Conference of Workshops is set for January 26, at the University of Chicago Lab Schools. The final date for registration is January 9, 2019. The Gail Burrill dinner meeting at the Elks Club in Des Plaines, followed by the Saturday workshop at Glenbrook South High School, was successful. The board looks forward to Eli Luberoff and Annie Fetter also doing the Friday dinner meeting/Saturday workshop combination.

The board accepted the resignation of President-Elect Sue Brown and appointed Lisa Parker to fulfill the remainder of Sue's term. The slate for the 2019 election is complete.

The next MMC board meeting will be held on Tuesday, February 5, 2019, at 6:30 p.m. at Maine South High School in Park Ridge. MMC members are welcome to attend any board meeting. Anyone interested in attending the next Board meeting, please contact Matthew Moran at matthew.j.moran@gmail.com.

Is your membership current? Check your mailing label to see when your membership expires. You can renew by mail with the form below or renew in person at the next dinner meeting.

| | | |
|--|---|--|
| NAME | | PREFERRED CONTACT Check one: <input type="checkbox"/> Home <input type="checkbox"/> Work |
| HOME ADDRESS | | |
| CITY | STATE | ZIP |
| HOME PHONE | HOME E-MAIL | |
| EMPLOYER | | |
| WORK ADDR | | |
| CITY | STATE | ZIP |
| WORK PHONE | WORK E-MAIL | |
| <small>ELECTRONIC-ONLY MEMBERSHIP</small> <small>Check the box below for electronic-only membership. You will receive an email with a direct link to each issue of <u>Points & Angles</u> when it is posted on the web site, often before paper copies are mailed. You will no longer receive <u>Points & Angles</u> by mail.</small> | <small>MEMBERSHIP TYPE</small> <small>Check one:</small> | |
| <input type="checkbox"/> Electronic-Only Membership | <input type="checkbox"/> 1 year (\$35) <input type="checkbox"/> student*, 1 yr (\$22) <input type="checkbox"/> 2 years (\$65) <input type="checkbox"/> 1 st yr teacher*, 1 yr (\$22) <input type="checkbox"/> 3 years (\$90) <input type="checkbox"/> retired, 1 yr (\$28) | |
| <small>FORM USE</small> <small>Check one:</small> | MEMBERSHIP COST \$ | |
| <input type="checkbox"/> New Membership <input type="checkbox"/> Renewal <input type="checkbox"/> Former Member <input type="checkbox"/> Change of Address | <small>DONATIONS</small> | |
| <small>* The student and 1st-year teacher memberships are only available as electronic-only.</small> | | |
| <small>SCHOLARSHIP FUND</small> \$ | | <small>TOTAL AMOUNT OF CHECK</small> \$ |
| <small>SPEAKER FUND</small> \$ | | |

Make check payable to **MMC**

Mail completed form and check to:
MMC
7339 W. Ibsen St.
Chicago, IL

Upcoming Events

| | | |
|----------------------------|---------------|---|
| Fri., Jan. 18 | Matthew Moran | The Robots are Coming for Your Teaching Job: Educational Ramifications in the Machine Learning Age |
| Sat., Jan. 26 | | MMC Conference of Workshops, UC Lab Schools, Chicago |
| Fri., Mar. 1 | Eli Luberoff | Technology that Thinks WITH Students, Not FOR Students |
| Sat., Mar. 2 | Eli Luberoff | Workshop |
| Fri., May 10 | Annie Fetter | Sense-Making, Ideas, Curiosity, and Learning |
| Sat., May 11 | Annie Fetter | Workshop |
| Fri., June 14 | Tom Dick | Cubics, Conics, CAS, and a Curious Connection Called “The Most Marvelous Theorem in Mathematics!” |
| Sat.-Sun., June 15-16 | | USACAS Conference, Highland Park |
| Wed.-Sat., April 1-4, 2020 | | NCTM Centennial Annual Meeting: Celebrating 100 Years— Looking Back and Moving Forward, Chicago |

Send upcoming event items to sburnett_308@yahoo.com no later than the date of the MMC dinner meeting preceding the issue in which the item should appear. All items are subject to editing.

Your membership renewal date appears in the upper right corner of the label



MMC
7339 W. Ibsen St.
Chicago, IL 60631