Points & Angles

Newsletter of the Metropolitan Mathematics Club of Chicago
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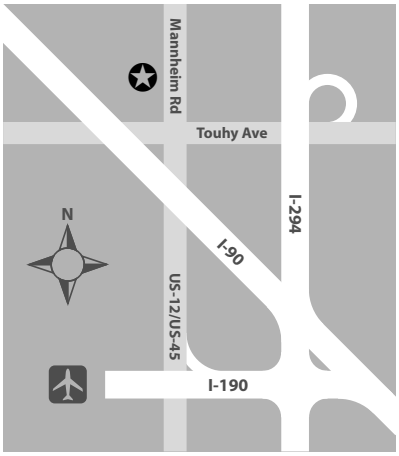
Physics and Mathematics—Two Different Subjects Sharing a Common Language

Richard Stalmack
Illinois Mathematics and Science Academy

By Don Porzio



From I-90 & Southbound I-294: Exit at I-190 West to O'Hare; Exit onto North Mannheim Rd.; Take Mannheim Rd. North 2.25 miles.

From Northbound I-294: Exit at West Touhy Ave.; Take Touhy Ave. to Mannheim Rd.; Turn right on Mannheim Rd.

Public Transit: Take the CTA Blue Line to the Rosemont Bus Terminal; Take Pace Bus #223 to Touhy Ave. & Lee Rd.; Walk East on Touhy to Mannheim Rd.

Friday, February 5, 2010
5:30 PM Doors Open, 6:00 PM Social Hour,
7:00 PM Dinner and Talk

Fountain Blue Banquets & Convention Center
2300 Mannheim Rd., Des Plaines
(847) 298-3636
$34 for Members, $39 for Nonmembers

Reserve by Noon, Monday, Feb. 1
reservations@mmcchicago.org or (630) 907-5023, day or night, leave a voicemail.

MMC's own Richard Stalmack joined the Mathematics Faculty at the Illinois Mathematics and Science Academy in 2004 after 25 years at Immaculate Heart of Mary High School in Westchester, IL. He received his B.S. in Mathematics from University of Illinois Urbana-Champaign and an M.S.T. from the University of Chicago. He has been an AP Calculus Reader for the past 7 years. Recently, he has become interested in statistics, having created a two-semester sequence that prepares students for the AP Statistics Exam. Richard's greatest talent, at least according to his students, is his *pun*-ishing sense of humor, which we will all experience first-hand this February.

His talk will explore several interesting questions in physics and look at the reasoning required to answer them, while at the same time contrasting the thought processes used in physics with those used in mathematics. Since the presenting of mathematics within the context of real world applications has taken on increased significance in our curriculum in recent years, an understanding of some of the basic principles of physics and the manner in which questions are answered is needed now more than ever in order to not only help mathematics teachers broaden their knowledge, but also to allow them to assist their students in making important connections between physics and mathematics.

Thanks to Pearson Education and our area representative, Rita McGuire, for sponsoring appetizers. Also, belated thanks to Fountain Blue for the special dessert at the January meeting.

Points from the Interior

By Paul Christmas

MMC just received a reminder of the NCTM Affiliate Rebate Program. To encourage membership in affiliates and help raise money for the organizations, MMC will earn $3.00-$5.00 for each person who renews or joins NCTM online. When joining online, you will be given the option to select an affiliate group to receive the rebate. Please encourage NCTM members at your school to register online and designate MMC as the affiliate group of choice. NCTM will send MMC $3.00 for each renewal and $5.00 for each new member (or member whose membership has lapsed for more than a year). Multi-year rebates will be provided for multi-year memberships. If every MMC member would do this, the rebates would provide the honorarium for several of our speakers.

Help MMC: select MMC as your local affiliate when you join NCTM or renew your membership online.

It is time to encourage your students interested in becoming mathematics teachers to apply for the MMC scholarship. We will again be providing up to three $1500 scholarships, two of which are provided by the Dennis and Paula Filliman family. Your encouragement could bring us the next Jenny Wexler or Phil Gartner, both former winners.

The Chicago area has been a leader in encouraging the use of CAS in classrooms. At least 3 schools (Glenbrook South, New Trier, and Walter Payton) have moved to make the TI-Nspire CAS the required calculator of use. These schools are beginning to provide evidence that the use of CAS does not hinder mathematics education but improves and enhances both teaching and learning. (When will ACT recognize this?) Come and bring a colleague to the MEECAS meeting at New Trier on February 6. CAS lessons that have been used will be the emphasis of this meeting. Also do not pass up the 6th USACAS Conference to be held at New Trier June 26-27. I am personally grateful to the leadership Natalie Jakucyn and Bob McCollum provided in the organization of the first Conference about 8 years ago. I have attended 4 of the 5 Conferences. The opportunity to hear international CAS leaders has been invaluable. This year will be no exception I am sure.

Bring a Physics teacher this month. It might help you start a dialogue with the Science department at your school. I have already invited two. Richard Stalmack will definitely entertain as well as inform!

Please let me know the names of any long time MMC members who are retiring this year. See me at the next meeting or email me at *ptc3144@aol.com*.

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1 NCTM Charter
Metropolitan Mathematics Club of Chicago
1913

Points & Angles, published nine times per school year, is the official publication of the Metropolitan Mathematics Club of Chicago. Founded in 1913, the Metropolitan Mathematics Club is the National Council of Teachers of Mathematics' first affiliate. The official club website: http://mmcchicago.org/

Mathematical Threads from Early Childhood Through College

Millie Johnson's December presentation began with a question: At what level should a teacher understand or experience their content area? She asked us to consider, but not restrict our thinking to, a first grade reading teacher, a high school orchestra teacher, a PE teacher or basketball coach, and an elementary, middle ,or high school math teacher. Does a basketball coach have to play pro basketball? What about a math teacher? With these thoughts, we were encouraged to begin with the end in mind, and we began to look at examples that led from counting to partial derivatives; from arithmetic sequences to multivariable concepts.

In early mathematical experiences, children are asked to count by 1's, then by 2's, 3's, etc. In the classes that Millie worked with, she then challenged students to count by 3's starting with 1, then count by 3's, starting with 2, etc. She asked us to create a table by writing five numbers that are multiples of 3, five numbers that are 1 less than multiples of 3, five numbers that are 2 less than multiples of 3, etc. Looking at the table created, what do we expect to be the same or to be different? Why?

From there, we looked at motivating the idea of arithmetic number sequences with 6th graders. In the sequence 1, 2, 3, 4, 5, 6, ..., n, ..., students were asked to determine the number than comes after n if the numbers continue to increase by one. This didn't go exactly as she planned, since the students overwhelmingly said "o!"

Originally, Millie had planned to go on to determining how many numbers were in a given list, such as $2, 7, 12, 17, \ldots, 107$, expecting the students to use the idea of location and value to create a chart:

Location (input)	Value (output)
1	2
2	$2+1(5)$
3	$2+2(5)$
4	$2+3(5)$
⋮	⋮
n	$2+(n-1)(5)$

The expected result was that the students would solve $2+(n-1)5=107$ to get the number of terms. However, students went back to the skip counting they had used previously. They recognized that the numbers in the sequence were just the "5n's, shifted back 3," referring to the sequence $5, 10, 15, 20, \ldots, 110$. So they used that list and just divided 110 by 5 to get the number of terms.

Some other examples of this concept: 2, 4, 6, ..., 52 are the "2n's with no shift," so there are $52 \div 2 = 26$ terms; $5, 6, 7, \ldots, 15$ are the "1n's shifted up 4," so there are $11 \div 1 = 11$ terms; and 4, 7, 10, 13, ..., 25 are the "3n's shifted up 1," so there are $24 \div 3 = 8$ terms.

This idea can be expanded to algebraic expressions to represent arithmetic sequences. As an example, we looked at an arithmetic sequence where the first 4 terms were given to find the "rule." Some examples: $2, 5, 8, 11, \ldots$ is the "3n's shifted back one" so the expression would be $3n-1$; $8, 13, 18, 23, \ldots$ is the "5n's shifted up 3" so the expression would be $5n+3$.

This same idea can then be applied to writing a linear equation. Skip counting can be applied to the idea of slope. This is what Millie referred to as a "big idea!"

To look at multiple representations of equations, we explored the idea of going for a "walk" on a line. For example, you start walking on a line from the point $(0,-1)$. The slope of the line is 3. You walk until you are above the x-coordinate 4. What is your y-value? This can be approached by using a picture, a table, or an equation. You can then use this idea starting at points other than the y-intercept, and can compare tables, graphs and equations. This idea can also be expanded to the idea of local linearity and the derivative of a function. If you start with a function (for example $y=x^2$) and use x-values that are a small distance apart (for example, 0.001), you can compare x- and y-values to see local linearity at a given point.

We then moved on to 3-space: what if you were going for a "walk" on a plane? For example, start on a plane whose z-intercept is the point $(0,0,7)$ with a slope in the x-direction of –3 and a slope in the y-direction of 2. If you are at the point $(5,3,z)$, what is the value of z? How can you get there? This can lead to vectors, particularly direction, magnitude and parallelism, as well as a method for writing the equation of a plane and a discussion of partial derivatives.

Millie summed up by referring back to her initial question and noting that if teachers can see the big picture, then this knowledge becomes a guide in selecting and relating topics and deciding emphases for courses. She compared teaching mathematics to the "hot/cold" game: a child is going through a house trying to find a hidden object, with someone giving them "hot/cold" directions. They find a diamond—which wasn't the object they were searching for, but is something valuable. This same idea can apply in teaching—whether we find what we were looking for or something else, we need to know its value.

At what level should a teacher understand or experience their content area?

Upcoming Event Details

Mathematics Educators Exploring Computer Algebra Systems (MEECAS) Meetings, New Trier High School, Northfield Campus, 9AM–12PM:

Actual CAS lessons we have used, February 6. TBA.

Workshop Challenge, April 10. Writing CAS questions for high-stakes tests.
http://meecas.org/

T³ International Conference, Atlanta, GA, March 5–7. TI combines the Georgia peach and the teacher's apple to provide a unique combination of instruction in Atlanta. Learn from experienced educators and participate in a wide variety of hands-on sessions. Receive lots of classroom activities and ideas, along with the latest news on TI technology. *http://education.ti.com/educationportal/sites/US/nonProductMulti/pd_conferences_atlanta.html*

2010 NCTM Annual Meeting and Exposition, San Diego, CA, April 21–24. Connections: Linking Concepts and Context. The meeting will address the challenges that teachers face every day, including: engaging and motivating students, addressing diverse learning styles, balancing state testing and student understanding, using technology in the classroom, and more! You'll also be able to learn from more than 700 presentations and experience the latest teaching products in the exhibit hall.
http://www.nctm.org/sandiego

USACAS6, Northfield, IL, June 26–27. Sixth U.S. conference on CAS.
http://usacas.org/6

MMC Scholarship

The Metropolitan Mathematics Club of Chicago is offering a $1,500 scholarship for a high school senior who will pursue a career in the teaching of mathematics. In addition, up to two Filliman Scholarships may also 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 the May 7th MMC dinner meeting at which time the scholarship recipients will be honored.

A selection committee of MMC members appointed by the Executive Board will determine the scholarship awards. To be eligible, an applicant must submit the application, have an official transcript sent, and request a letter of recommendation from a member of the MMC such that all of the materials are received by March 12, 2010. The committee will establish its own guidelines for evaluating applications, and will make a recommendation to the Executive Board as to the awarding of the scholarship. No member of the selection committee may nominate nor recommend a candidate.

The scholarship application form, along with the requirements, were included as an insert in the December issue of this newsletter.

Web Bytes

From the May, June 2009 and July, August 2009 NCTM News Bulletins. Reprinted with permission.

STEM Transitions (*http://www.stemtransitions.org/*) offers free integrated lessons featuring math and science in six STEM-related career clusters (health science, information technology, manufacturing, transportation, STEM, and agriculture) and includes instructor and student materials and assessment tools.

Calculus7.com (*http://calculus7.com/*) provides computer animations, graphics, and lecture notes in calculus for use in the classroom as well as an online resource

Math Open Reference (*http://www.mathopenref.com/*) provides online interactive definitions and examples of high school math topics, such as plane and coordinate geometry, which can be used with a classroom projector.

Brain Cake (*http://www.braincake.org/*) includes resources, activities, discussions, and summer programs for girls, as well as blogs and resources to help parents and teachers spark and fuel girls' interest in the science and mathematics.

Hooda Math (*http://www.hoodamath.com/*) offers free math games, tutorials, and forums for elementary-level mathematics.

Emathematics (*http://www.emathematics.net/*) has interactive exercises, lessons, and worksheets to practice math skills from elementary to high school.

Math + Science = Success (*http://www.mathsciencesuccess.org/*) offers tips for success in math and science to parents, students, and volunteers for each grade level, based on Georgia's educational system.

LearningKeys.com (*http://www.learningkeys.com/*) offers free math skill building lessons with emphasis on basic math skills and algebra readiness in a distraction-free environment.

MMC Membership and Change of Address Form

Mail completed form and check to:

MMC
329 Michael Manor
Glenview, IL 60025

NAME

PREFERRED CONTACT
Check one:
❒ Home ❒ Work

HOME ADDRESS

CITY | STATE | ZIP

HOME PHONE | HOME E-MAIL

EMPLOYER

WORK ADDRESS

CITY | STATE | ZIP

WORK PHONE | WORK E-MAIL

ELECTRONIC-ONLY MEMBERSHIP
Check the box below for electronic-only membership. You will receive an email with a direct link to each issue of Points & Angles when it is posted on the web site, often before paper copies are mailed. You will no longer receive Points & Angles by mail.

❒ Electronic-Only Membership

FORM USE
Check one:
❒ New Membership ❒ Renewal
❒ Former Member ❒ Change of Address

MEMBERSHIP TYPE
Check one:
❒ 1 year ($27) ❒ student, 1 yr ($15)
❒ 2 years ($50) ❒ 1st yr teacher, 1 yr ($15)
❒ 3 years ($70) ❒ retired, 1 yr ($20)

MEMBERSHIP COST $

DONATIONS

SCHOLARSHIP FUND $

SPEAKER FUND $

TOTAL AMOUNT OF CHECK $

Make check payable to *MMC*

Upcoming Events

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6 Upcoming Events

Sat., Jan. 30	York Community H.S.	**Conference of Workshops**
Fri., Feb. 5	Richard Stalmack	**Physics and Mathematics—Two Different Subjects Sharing a Common Language**
Sat., Feb. 6	*Northfield, IL*	***MEECAS: Actual CAS Lessons We Have Used***
Mar. 5–7	*Atlanta, GA*	***T³ International Conference***
Fri., Mar. 12	Ken Indeck	**The Most Misunderstood Concept in Geometry**
Sat., Apr. 10	*Northfield, IL*	***MEECAS: Workshop Challenge***
Apr. 21–24	*San Diego, CA*	***NCTM Annual Meeting and Exposition***
Fri., May 7	Zal Usiskin	**The Geometry of Shape and the Shape of Geometry**
Jun. 26–27	*Northfield, IL*	***USACAS6***

(See also "Upcoming Event Details" on page 4)

Send upcoming event items to *ilg@chicagomath.org* 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.

Mailing Label

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