

The BIG SIGMAA News

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**Business, Industry, and Government Special Interest Group
of the Mathematical Association of America**

BIG Events at JMM San Diego

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In January mathematicians of the world will be converging on San Diego for the annual Joint Mathematics Meetings, the joint annual meeting of the American Mathematical Society (AMS) and the Mathematical Association of America (MAA), with additional sessions sponsored by the Society for Industrial and Applied Mathematicians (SIAM), the Association for Women in Mathematics (AWM), the National Association of Mathematicians (NAM), and the Association for Symbolic Logic (ASL). JMM claims to be the largest mathematical meeting in the world; nearly 6,100 mathematicians attended the meetings last January in Atlanta. The 2018 meetings will be held January 10-13. There is an exciting lineup of invited speakers and, of course, lots of interesting sessions of shorter talks. Several of the invited talks might be of par-

ticular interest to BIG SIGMAA members; see the inset. You can find the details on the JMM website (http://jointmathematicsmetings.org/meetings/national/jmm2018/2197_intro).

The BIG SIGMAA will have a BIG presence at the meetings, as always. The BIG contributed paper session will be held on Friday morning. Ten speakers, from both industry and academia, will talk about their experiences in applying mathematics to BIG problems. On Friday evening, Dr. Stephen Hobbs, a mathematician at the Space and Naval Warfare Systems Center in San Diego, will present the BIG SIGMAA guest lecture. The title of his talk will be *Using Navy carriers for disaster relief, and the remarkable Hilbert space*. There will be a reception

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Selected Invited Talks

Topological Modeling of Complex Data
Gunnar Carlsson

Privacy in the Land of Plenty
Cynthia Dwork
Gibbs Lecture

Information, Computation, Optimization: Connecting the Dots in the Traveling Salesman Problem
William Cook

Nonsmooth Boundary Value Problems
Jill Pipher
Noether Lecture

Tensor Decomposition: A Mathematical Tool for Data Analysis
Tamara G. Kolda
SIAM Invited Address

Political Geometry: Voting Districts, "Compactness," and Ideas About Fairness
Moon Duchin
Gerald and Judith Porter Public Lecture



The Puzzle Corner

Find all pairs of positive integers x and y such that $x^2 + 3y$ and $y^2 + 3x$ are both perfect squares.

(from Nick's Mathematical Puzzles)

Solution on page 4

Careers in Mathematics Conference

On Saturday, October 21, Millersville University hosted a Careers in Mathematics Conference, held in conjunction with a Pre-Service Teacher Day and cosponsored by the Eastern Pennsylvania and Delaware (EPaDel) section of the MAA, the Pennsylvania Council of Teachers of Mathematics (PCTM), and the Pennsylvania Association of Mathematics Teacher Educators (PAMTE). Dr. Ximena Catepillan and Dr. Cynthia Taylor from Millersville co-chaired the organizing committee. The conference was attended by over 120 undergraduate students from colleges and universities in eastern Pennsylvania and Delaware and by over 110 pre-service teachers from ten universities in eastern Pennsylvania. The purpose of the EPaDel portion of the conference was to acquaint mathematics majors with the possibilities for non-academic mathematical careers.

After brief introductory remarks by Dr. Jeffrey Adams, the associate provost for Academic Affairs of Millersville University, Dr. Eugene Boman, the EPaDel chair, and Dr. Lynn Columba, the PCTM president, a pan-

el of fifteen mathematicians, statisticians, economists, software engineers, and others with BIG STEM careers spoke briefly about their experiences and then fielded quite a number of questions from the attendees. Following the panel discussion, the group broke for the first of three break-out sessions. At the sessions for the students, individual panel members gave short presentations about their work.

The day concluded with some closing remarks and the distribution of some mathematically-oriented door prizes.

At lunch and after the break-out sessions, the organizers of the conference talked with some of the students. Dr. Catepillan reported that the students “were clearly very impressed with all that they had learned. Certainly this was the first time many of these students had the chance to see real-world mathematicians in action.” The comments and presentations of the panelists “stimulated a great deal of thinking about their mathematical educations and future plans.”

Overall, a great conference and a great experience for the students.

Colleges and Universities in attendance:

Berks County Intermediate Unit
 Bucknell University
 Cabrini College
 Dickinson College
 Franklin & Marshall College
 Harrisburg Area Community College
 King's College
 Kutztown University
 Lycoming College
 Millersville University
 Moravian College
 Muhlenberg College
 Penn State Abington
 Penn State Harrisburg
 Saint Joseph's University
 Shippensburg University
 Slippery Rock University
 Temple University
 Wesley College
 West Chester University

PIC Math

You may recall that the Spring 2016 Newsletter contained a piece about an MAA initiative called Preparation for Industrial Careers in Mathematical Sciences (PIC Math), written by one of the initiative's leaders, Suzanne Weekes. In the latest issue of MAA FOCUS, Suzanne and three of the other PIC Math leaders (Michael Dorff, Darren Narayan, and Mikayla Sweet) have written another piece about PIC Math. Be sure to check it out.

Pi

The secret relationship of line and circle, progress and return, is always known, transcendental and yet a commonplace. And though the connection is written it cannot be written out in full, never perfect, but

is exact and constant, is eternal and everyday as orbits of electrons, chemical rings, noted here in one brief sign as gateway to completed turns and the distance inside circles, both compact and infinite.

by Robert Morgan

BIG Events at JMM San Diego (continued)

(Continued from page 1)

after the talk, followed by the BIG SIGMAA business meeting. All BIG SIGMAA members are encouraged to attend the business meeting.

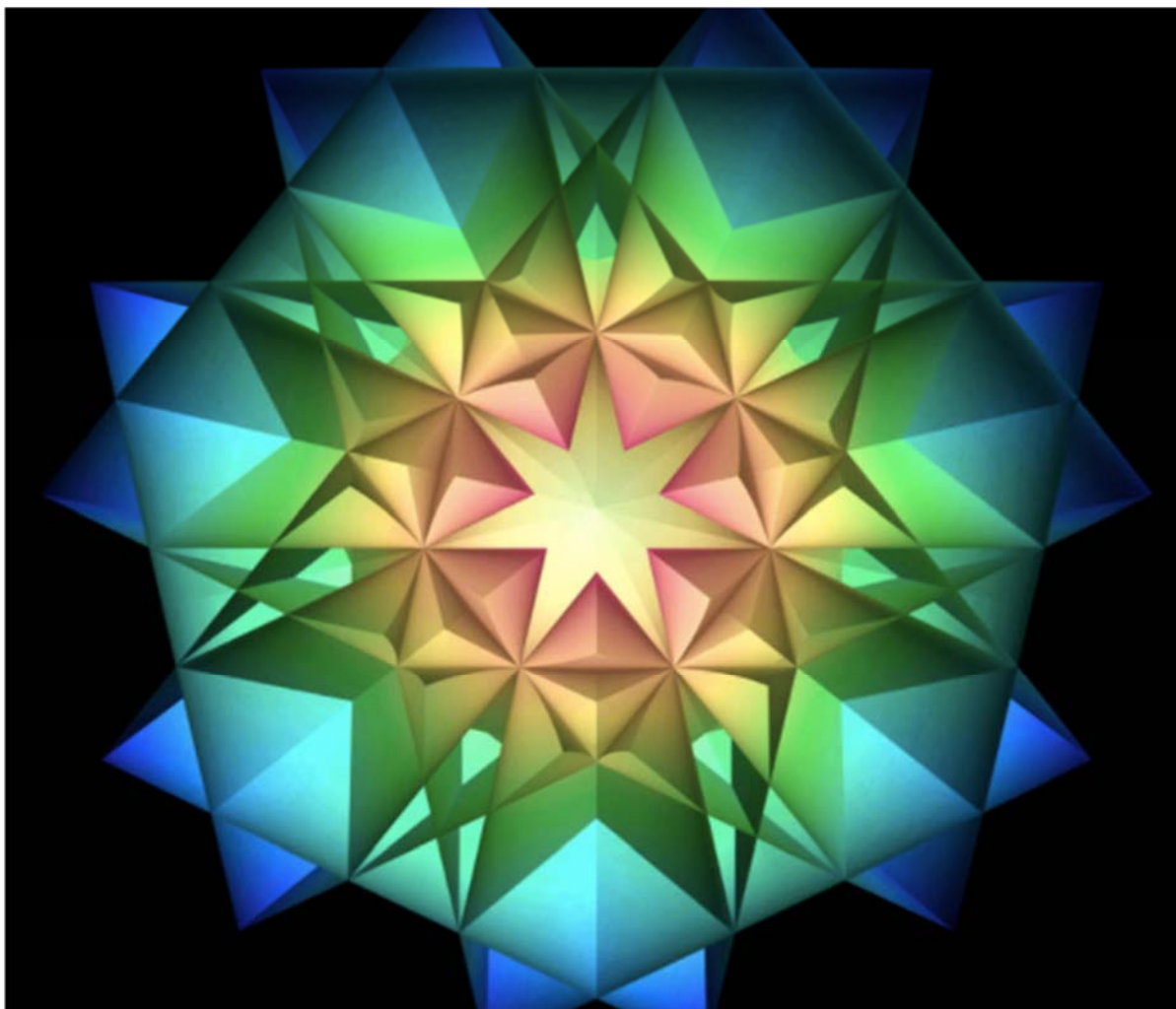
BIG SIGMAA members may also be interested in two panel discussions taking place on Thursday afternoon. The first, sponsored by the AMS, is titled *Preparing mathematics students for non-academic careers* and the second,

cosponsored by the AMS, the MAA, and SIAM, is titled *Multiple Paths to Mathematics Careers in Business, Industry and Government*. Dr. Allen Butler, the chair of BIG SIGMAA, is one of the organizers for this panel discussion.

There will also be a BIG Career Booth again this year in the exhibits area. The booth is designed to provide BIG mathematicians with a centrally-located venue to network, provide information, and recruit other BIG

mathematicians. Time slots in the booth are available for reservation during the conference for representatives of companies and government laboratories and agencies. If you have questions or wish to reserve a time slot, contact Dr. Thomas Barr at thb@ams.org.

I hope to see many BIG SIGMAA members at the meetings, especially members who live in the Southern California area.



The Italian astrophysicist and mathematical artist Aldo Spizzichino died earlier this year. He pioneered mathematical art with his gorgeous, algorithmically-based vector graphic creations.

Business, Industry, and Government Special Interest Group of the Mathematical Association of America

Allen Butler, Chair
William Fox, Vice Chair for Programs
Gregory Coxson, Vice Chair for Membership
James H. Fife, Vice Chair for Services
http://sigmaa.maa.org/big/BIG_SIGMAA_Home.html

BIG SIGMAA serves as a unifying link between business, industry, and government mathematicians, academic mathematicians, and mathematics students. The SIGMAA provides resources and a forum for MAA members who share an interest in mathematics used in business, industry, and government, aids in professional development, helps build partnerships between industry and academics, and increases awareness of opportunities for mathematicians in business, industry, and government.

John Napier

The year 2017 is the 400th anniversary of the death of John Napier (February 1, 1550 – April 4, 1617). Napier was a Scottish landowner who was a physicist and an astronomer as well as a mathematician. He was the 8th Laird of Merchiston.

John Napier is best known as the discoverer of logarithms. Napier's definition of logarithm, however, was not quite the same as ours today. For Napier, the logarithm of a number N was the number L for which $N = 10^7(1 - 10^{-7})^L$. Napier first called L an "artificial number", but later introduced the word "logarithm", from the Greek words *logos*, meaning proportion, and *arithmos*, meaning number. Napier calculated his logarithm for any whole number up to 10 million. The calculation took him 20 years.

Quotation from John Napier

Seeing there is nothing, (right well beloved students of mathematics,) that is so troublesome to mathematical practice, nor that doth more molest and hinder calculations, that the multiplications, divisions, square and cubical extractions of great numbers, which besides the tedious expense of time, are for the most part subject to many slippery errors, I began, therefore, to consider in my mind, by what certain and ready art I might remove these hindrances. And having thought upon many things to this purpose, I found at length some excellent brief rules to be treated of perhaps hereafter: But amongst all, none more profitable than this, which together with the hard and tedious multiplications, divisions, and extractions of roots, doth also cast away even the very numbers themselves that are to be multiplied, divided, and resolved into roots, and putteth other numbers in their place which perform as much as they can do, only by addition and subtraction, division by two, or division by three. Which secret invention being, (as all other good things are,) so much the better as it shall be the more common, I thought good heretofore, to set forth in Latin for the public use of mathematicians.

From *Mirifici Logarithmorum Canonis Descriptio* (1614); translated into English in 1616 by Edward Wright as *A Description of the Admirable Table of Logarithms*.

Puzzle Corner Solution

Let x and y be positive integers such that both $x^2 + 3y$ and $y^2 + 3x$ are perfect squares.

Then there exist positive integers a and b such that $x^2 + 3y = (x + a)^2$ and $y^2 + 3x = (y + b)^2$. Expanding the right-hand side of these equations and simplifying, we get the system of equations

$$\begin{aligned}2ax - 3y &= -a^2 \\ 3x - 2by &= b^2\end{aligned}$$

Solving for x and y , we have $x = (2a^2b + 3b^2)/(9 - 4ab)$ and $y = (2ab^2 + 3a^2)/(9 - 4ab)$.

Since x , y , a , and b are all positive, it follows that $9 - 4ab > 0$, and hence $ab < 2.25$. Since a and b are integers, it follows that $ab = 1$ or 2 , and hence $(a, b) = (1, 1)$ or $(1, 2)$ or $(2, 1)$. If $(a, b) = (1, 1)$, then $(x, y) = (1, 1)$; if $(a, b) = (1, 2)$, then

$(x, y) = (16, 11)$; and if $(a, b) = (2, 1)$, then $(x, y) = (11, 16)$.

Thus the only pairs of positive integers x and y for which $x^2 + 3y$ and $y^2 + 3x$ are $x = 1$ and $y = 1$, $x = 16$ and $y = 11$, and $x = 11$ and $y = 16$.