

**Abstracts for MAA Seaway Meeting  
Buffalo State College  
Banquet Speaker**

**Kelly Delp, Ithaca College**

*Playing with Surfaces: Spheres, Monkey Pants and Zippergons*

I will describe a process, inspired by clothing design, of smoothing an octahedron into a round sphere. This process was adapted to build many surfaces out of paper and craft foam. The pattern pieces for the surfaces were designed using a dynamic Mathematica notebook, and cut using a digital cutter. This project was joint with Bill Thurston.

**Saturday Morning Invited Speakers**

**Keary Howard, SUNY Fredonia**

*I see Me in you: Regarding the self-evident truths of teaching and learning mathematics*

An interactive discussion of what we believe to be a baker's dozen of axioms that constitute the art of teaching and learning mathematics. Plan to reflect on why we thoroughly enjoy the opportunity to teach and learn this beautiful discipline...

**Steve Dunbar, University of Nebraska at Lincoln, Director of American Mathematics competition.**

*Olympiad problems for Fun, Learning and Research with Dynamic software.*

The Mathematical Association of America has continuously sponsored nationwide high-school level math contests since 1952. The sequence of contests now has 5 different contests at increasing levels of mathematical sophistication. Students who succeed at the top level on these contests become the team representing the U.S. at the annual International Mathematical Olympiad. Problems from Mathematical Olympiads are rich starting places for mathematical investigations. I'll give a brief overview of the history and role of the American Mathematics Competitions. Then I'll present some interesting problems from recent Olympiads focusing on combinatorial geometry, illustrating and investigating them with dynamical software.

## **Gehman Lecture: Maria Chudnovsky, Columbia University**

### *Perfection and Beyond*

About ten years ago the Strong Perfect Graph Conjecture, a well-known problem in both graph theory and combinatorial optimization, was proved (this result is due to the speaker, in joint work with Roberston, Seymour and Thomas). The proof used methods from structural graph theory. The original version of the proof spanned about 150 journal pages, but it has since been somewhat shortened. In this talk we will describe the problem, explain its importance, outline some of the ideas underlying the proof, and also discuss related problems that have been the subject of recent research.

## **Saturday afternoon Contributed talks**

### **1. Ephraim Agyingi, David Ross and Sophia Maggelakis, RIT**

#### *Rethinking Wound Healing: A mathematical Model*

Oxygen supply is a critical element for the healing of wounds. Clinical investigations have shown that oxygen therapy improves the healing rate of wounds. The underlying reason behind oxygen therapy improving the healing rate of a wound remains unclear and hence current protocols are empirical. In this paper we present a mathematical model that simulates an aspect of oxygen therapy in the treatment of cutaneous wounds. We use the model to propose an alternative treatment that may accelerate the healing rate of cutaneous wounds. At the core of our model is an account of the initiation of angiogenesis by macrophage-derived growth factors. The model is expressed as a system of reaction-diffusion equations, and we present results of simulations for a version of the model with one spatial dimension.

### **2. Michael Barg, Niagara University**

#### *An Advertising Model for a First ODE Class and Beyond*

The Vidale-Wolfe advertising model is a first-order linear ODE that relates market share to rate of advertising expenditure for a product. This model could be a welcome addition to the standard ones often considered in a first ODE class. The equation and subsequent analysis should appeal to students of business in addition to students of mathematics. In this talk, we will show how associated optimal control problems for the advertising expenditure are accessible with a little more work. We present one such optimal control problem and a solution using Green's theorem. Using an advertising pulse, an optimal feedback policy is given in the absence of an upper limit on the rate of advertising expenditure. We conclude with remarks about how the model is being applied to political campaign advertising in a project that an undergraduate is currently pursuing in an honors thesis.

### **3. Hossein Behforooz, Utica College**

#### *Celebrating Martin Gardner Centennial with Magic Squares*

As you know, every year, April is Mathematics Awareness Month. This year, mathematics communities have decided to arrange a very especial Mathematics Awareness Month to celebrate Martin Gardner Centennial (MGC). Yes it is his 100th birth year (1914--2014). This year, the theme of math awareness month is "Mathematics, Magic, & Mystery". Recently, I have found some new interesting stuff in magic squares that I have contributed to the MGC event and here I want to share some of them with you in this seminar. Remember, besides all kinds of studies in mathematics, recreational mathematics has own place in the world of math. MATH is FUN. Please join us and enjoy. For more information about MGC go to [www.mathaware.org](http://www.mathaware.org) to find 30 days of videos and articles on mathematical magic tricks, mysteries, puzzles, illusions and more....Also there are few more gatherings in year 2014 for MGC. See, [www.gathering4gardner.org](http://www.gathering4gardner.org) , [www.usasciencefestival.org](http://www.usasciencefestival.org) and [www.celebrationofmind.org](http://www.celebrationofmind.org).

### **4. Christina Carter and Dave Wilson: Buffalo State College**

#### *Flipped Calculus classroom*

During fall and spring semester 2013 we flipped the classroom in a first and second semester calculus class. Course content was viewed on video at home and class time became problem solving sessions. The results were very encouraging. Calculus 2 data from previous semesters, taught by the same instructor, showed a 21% increase in mean final exam score. The third quartile score rose from 68% to 92%. Student engagement during class time went from hesitant to fully participatory.

We will describe the model we used outside and inside the classroom. The logistics of making lecture videos or choosing existing ones from Khan Academy will be shared. Students will join us to discuss their experiences in the flipped classroom.

### **5. Ryan Gantner (Saint John Fisher College), Yousuf George (Nazareth College), Patrick Rault (SUNY Geneseo), and Jane Cushman (Buffalo State College)**

#### *IBL in the Seaway Section (and Beyond)*

Inquiry-based learning (IBL) in the mathematics classroom can come in many shapes and forms. We'll present a short history and introduction to IBL and illustrate its diversity and practicality by sharing experiences from our own classrooms. We'll describe the Greater Upstate New York IBL Consortium, which can offer support and mentoring for those new to inquiry-based learning and a supportive network for exchange of ideas for both novice and experienced practitioners.

## **6. Nicole Juersivich, Nazareth College**

### *Trial by Fire: Undergraduate Research in Mathematics Education*

Undergraduate research (UR) provides many opportunities for students and faculty members; however, not much information exists on how to design and implement an UR course in mathematics education. For a number of years, Nazareth College has had a UR course in mathematics, but not one in mathematics education. In this session, I will present how I designed and implemented the course for the first time, and then re-designed, and re-implemented the course the second time based on feedback and reflection. Some topics addressed will be the form and intensity of the experience, assessments used, and lessons learned.

## **7. Martha Kilpack, SUNY Oneonta**

### *Lattice, You Have Seen One and Don't Even Know It.*

What is a lattice? Did you know you first saw a lattice in elementary school? We will have a look at some lattices you have seen before, and some you have not. We will discover what properties define a lattice, and where lattices come in useful.

## **8. David Lantz, Colgate University**

### *Star CZD graphs of commutative rings*

In the summer of 2013, Dang Minh Nguyen (Colgate '15) and I began investigating which numbers were vertex counts in the CZD graphs of commutative rings (vertices the annihilators of elements, adjacent if they annihilated each other) which were stars (one vertex adjacent to all others, the rest degree 1). This talk is a report on the research experience as well as on the results we have.

## **9. James Marengo, RIT**

### *An Application of Sufficiency to a Problem Involving a "Die"*

The concept of sufficiency is the cornerstone of the theory of uniformly minimum variance unbiased estimation in statistical inference. In essence, a statistic is sufficient for an unknown population parameter  $\theta$  if it exhausts all the information about  $\theta$  that is contained in a random sample of data taken from this population. Thus, if one is presented with the value of this sufficient statistic, one cannot obtain any additional information about  $\theta$  by seeing the raw data. In this talk, I will attempt to convey the essence of this fundamental concept with the following simple example: Suppose we toss a  $\theta$ -sided object  $n$  times where  $\theta$  is unknown and  $n$  is known. The sides of the object are numbered consecutively from one to  $\theta$ , and the sample data consists of the side numbers that come up on each toss of the object. The problem is to find the uniformly minimum variance unbiased estimator of  $\theta$ .

## **10. Yozo Mikata, Bechtel**

### *Iterative Scheme for A Nonlinear Integro-Differential Equation for Field Emission with Conduction and Radiation*

This paper will treat Murphy-Good field emission law combined with 1D heat transfer with both conduction and radiation, which is a mathematical model for a carbon nanotube (CNT) used as a field electron emitter. CNT has attracted an increasing attention as a potentially excellent material for an electron emitter since around mid-90's. Predicting the current density, and the temperature profile of CNT caused by the Joule heating associated with the current density, is the key to understanding the physics of CNT as a field electron emitter. The particular focus of this paper is the coupling between the Joule heating caused by the field emission and the potential thermionic emission resulting from the Joule heating. Exact treatment of this problem is extremely complicated, but the present paper will address this problem iteratively.

## **11. Joseph Petrillo, Alfred University**

### *The Alfred University Calculus Initiative – Flipping the Calculus Classroom*

The Alfred University Calculus Initiative (AUCI) is a flipped calculus course that combines a new curriculum with an active-learning classroom, video lessons, and online quizzes and homework. The goal of the AUCI is to improve understanding of and success in first-semester calculus while maintaining the level of rigor and breadth required for more advanced courses. In this talk, we will provide compelling results that demonstrate the effectiveness of the AUCI. In particular, we will give a progress report on the third iteration of the project as well as on feedback from high school teachers who piloted the project last fall. This project is supported by the National Science Foundation Grant No. DUE-1140437.

## **12. Hossein Shahmohamad, RIT**

### *Burnside, Redfield & Polya – The Art of Coloring and Enumeration*

William Burnside, John Redfield and George Polya are the bright engineers of a mathematical theory named Polya Theory of Enumeration that has proven to be very efficient. Polya Theory is an elegant marriage of group theory and generating functions. We will briefly go over some examples and introduce this theory that counts certain non-equivalent colorings of special objects like vertices of a cube.

### **13. Elizabeth Wilcox, SUNY Oswego**

#### *Al-Jabar: A Colorful Intro to Abstract Algebra*

Abstract Algebra is ... abstract. For computationally-minded math majors, Abstract Algebra is one of the toughest courses around. Al-Jabar (Al-Jabar Games, <http://al-jabargames.com/>) is a way to start the semester with a concrete example, while slipping in a review of induction and key group theory ideas all under the radar. This game was created by Cyrus Hettle and Robert Schneider, who seem to have struck gold with the game. My (student) externs and I made an Al-Jabar lesson plan and accompanying homework assignment that I implemented in Introduction to Abstract Algebra this semester. Come learn about the game and check out the materials we've developed.

### **14. Julie Wilson, SUNY Fredonia**

#### *A Discovery Learning Approach to Axiomatic Geometry*

I will present some teaching materials I have developed for guiding students in small, self-led groups through an axiomatic approach to neutral, Euclidean, and hyperbolic geometry. These materials consist of a sequence of axioms and theorems that differs in some important philosophical and practical respects from other axiomatic approaches, as well as a collection of "lab assignments" that students work on in class and write up for homework. The labs serve as a path through a portion of the axiom-theorem sequence.

**Teachers' Masters Capstone Projects in Secondary and College Mathematics**  
Session Organizer, Keary Howard, SUNY Fredonia

**Abstract:**

These sessions are highlighted by the presentation of research results from secondary school mathematics teachers completing their capstone Masters projects. Topics and presenters include:

**Session 1 (55 minutes)**  
**Student Misconceptions Regarding Units, Rates, and Fractions**

*Understanding and Misconceptions of Rates of Change and Unit Conversions, Liz Schake, SUNY Fredonia*

*College Students' Accuracy in Measurement Estimation: The U.S. Customary Units vs. the Metric System, Ashley Melinski, SUNY Fredonia*

*Procedural and Conceptual Understanding of Fraction Concepts in College Students, Shannon Tydings, SUNY Fredonia*

**Session 2 (55 minutes)**  
**Student Misconceptions Regarding Order of Operations, Spatial Reasoning, and Derivatives**

*Pardon My Expression: A Study of College Students' Misconceptions of the Order of Operations and its Applications, Kristen Joseph, SUNY Fredonia*

*Spatial Ability in Adolescence and How it Varies by Age, Gender, and College Major, Sara Maiorana, SUNY Fredonia*

*Derivatives as a Rate of Change: A Study of College Students' Understanding of the Concept of a Derivative, Suzanne Constantinou, SUNY Fredonia*

# Workshops:

## History of Mathematics in the Classroom

There is currently great interest in the history of mathematics among mathematicians. Many mathematicians are interested in and do research on the topic, and many in turn incorporate their knowledge of the history of mathematics in their teaching. This session is dedicated to exploring history of mathematics in the classroom.

To celebrate the 900th birth anniversary of the Indian mathematician Bhāskara II, the session will commence with a talk on him, his times, and his contributions to mathematics and astronomy. In particular, the cakravāla method for solving quadratic indeterminate equations will be described in detail.

The remainder of the session will be dedicated to speakers that will address the history of mathematics in the classroom. Among the topics that will be discussed are history of mathematics courses; the use of history in other mathematics courses; who takes a history of mathematics course; the influence of the Arithmos seminars on teaching mathematics and the history of mathematics; the use of collections of American mathematics textbooks in teaching the history of mathematics; the design and construction of instruments; the use of textbooks vs. original sources; survey classes vs. class focused on a specific topic; and Western vs. non-Western mathematics.

The program for the session is:

**1:30-1:55 Bhāskara II: A Remarkable Mathematician**

Keith Jones and Toke Knudsen, SUNY Oneonta

1:55-2:00 Break

**2:00-3:55 History of Mathematics in the Classroom**

Introduction (Gary Towsley)

Mark McKinzie, St. John Fisher College

Angeliki Kazas-Pontisakos, SUNY Oneonta

Toke Knudsen, SUNY Oneonta

Bob Rogers, SUNY Fredonia

Chuck Rocca, Western Connecticut State University

Jeff Johannes, SUNY Geneseo

Gary Towsley, SUNY Geneseo

## **Workshop on Leadership in Departments of Mathematical Sciences**

Organizer: Dr. Mihail Barbosu, RIT

This workshop will provide opportunities to establish connections between department chairs, but it is open to all those interested in academic leadership, departmental challenges and strategies.

This year the format of the workshop will be a round table focused on:

- Departments and programs
- Student recruitment
- Student Retention

## **How should we serve the underserved?**

Organizer: Olympia Nicodemi

I propose that we gather to swap ideas as to what we do and what we should do in our mathematics programs to foster STEM studies in the traditionally under-served populations. I am sure we can start the conversation at the meeting, but simply establishing a list of us who would like to exchange thoughts in the future would be a great start.

## **Workshop on Graduate School:**

**Who? What? When? Why? You?**

**Moderator: Elizabeth Wilcox: SUNY Oswego**

Ever wonder if you should be thinking about going to graduate school in math? Or, how financial aid works for graduate school? Want to know how people choose a graduate school? Come listen to current graduate students answer common questions undergraduate students have about graduate school. You'll have the opportunity to ask your own questions, too.