

THE SEAWAY CURRENT

Newsletter of the Seaway Section of the Mathematical Association of America

Volume 33, Number 2

Spring , 2010

MAA Seaway Meeting:

SUNY Oswego – April 23-24, 2009

The State University of New York College at Oswego hosts this year's Spring Meeting of the Seaway Section on Friday April 23rd and Saturday April 24th.

This year's impressive lineup of principal speakers is all from within the section. The program begins with the Friday evening banquet talk.

Friday Night



Darren Narayan, Rochester Institute of Technology

Mathematical Quips, Quotes, Rumors, and Humorous Tales

Witty remarks and anecdotes make us laugh and lift our spirits. When woven into a lecture they can make learning more enjoyable and serve as a tool for remembering important concepts.

Saturday Morning

The Gehman Lecture



Professor Martin Wells, Cornell University

Title: *The Adventures of a Statistician in the Legal System*



**Dr. Harris Kwong, SUNY
Fredonia**

**Title: *Life after linear
algebra***

Abstract: Students learn many useful techniques and important concepts from a typical course in linear algebra. However, many of them only remember Gauss-Jordan elimination, and a few theorems

from matrix theory. Perhaps, one reason is that we are not showing them how these techniques can be used in other undergraduate courses. Even when they are used, we sometimes do not explicitly point out the connection. I would like to share with you examples I have gathered

from teaching and research. The talk is designed with undergraduates as the intended audience. The only prerequisites are calculus and, of course, linear algebra.



Dr. Chris Leary, SUNY Geneseo

Title : Far from the Tweeting Crowd— Good Advice from Unlikely Sources

Abstract: How do our students view mathematics? More to the point, how can we influence that perception? Certainly I have no definitive answer to

these questions, but I have stumbled upon different thoughts and techniques that I believe can help us understand and address some of the difficulties that we face in the classroom and in our offices. To

paraphrase Mark Twain, however, persons attempting to find a motive in this narrative will be prosecuted; persons attempting to find a moral in it will be banished; persons attempting to find a coherent theme in it will be shot.

Seaway NExT workshop:

There will be a Seaway Section NExT workshop on Friday afternoon, before the section meeting. Please contact the Chair of Seaway NExT, Jeff Johannes for more information.

The SEAWAY SECTION of the MATHEMATICAL ASSOCIATION OF AMERICA

2010 SPRING MEETING

April 23-24 , 2010 SUNY OSWEGO

PROGRAM

Friday Afternoon, Project NExT, Sheldon, Room 328

12-12:15 Welcome

12:15- 1:15 Lunch

1:15 - 3:15 A Few of My Favorite Things (to Use in Teaching Statistics)

3:15 - 3:30 Short break

3:30 - 4:30 Time management strategies: Advice from experts and from you

4:30-5:00 Discussion of plans and ambitions for Seaway NExT/PFF and closing remarks.

Friday Afternoon, Sheldon, Room 326

3:00 – 6:00 Meeting of the Executive Committee

Friday Evening, Sheldon Ballroom

6:00 – 7:00 Social Hour (cash bar)

7:00 – 8:30 Banquet and Presentation of Distinguished Teaching Award.

8:30 – 9:30 **Darren Narayan**, Rochester Institute of Technology

Mathematical Quips, Quotes, Rumors, and Humorous Tales

Saturday Morning, Snygg, Room 102

08:40 – 08:45 *Welcome address by Dean Rhonda Mandel*

08:45 – 09:35 **Harris Kwong**, SUNY Fredonia
Life after linear algebra

09:45 – 10:35 **Chris Leary**, SUNY Geneseo *Far from the Tweeting Crowd— Good Advice from Unlikely Sources*

10:35 – 11:00 Business Meeting

11:10 – 12:00 **Gehman Lecture: Martin Wells**, Cornell University
The Adventures of a Statistician in the Legal System

GROUP PHOTO

Lunch: 12-1:30, Food court in Campus Center Building

Saturday afternoon, Snygg, 101

1:30 – 2:25 **Patrick Halpin**, SUNY Oswego
Panel discussion: *Assessment of general education mathematics classes*
Mark Elmer, SUNY Oswego
Olympia Nicodemi, SUNY Geneseo
Jack Winn, SUNY Farmingdale

2:30-2:55 Student session organized by
Keary Howard, SUNY Fredonia
Secondary and College Mathematics Achievement
Valeri Kisiel SUNY Fredonia, *I Saw the Sign*
Steven Collins , SUNY Fredonia, *Once, Twice, Three Times a Test*

3:00-3: 25 **Paul Seeburger**, Monroe Community College
Visualizing Lagrange Multiplier Optimization using CalcPlot3D

3:30- 3:55 **Peter Mercer**, Buffalo State College
Another Application of Siebeck's Theorem

4:00-4:25 **Emilie Wiesner**, Ithaca College
Using Reader-oriented Theory to Understand Students' Textbook Use

Saturday afternoon, Snygg 106

1:30 – 1:55 **Yozo Mikata**, Bechtel
CNT Application as an Electron Emitter, and Its Associated Mathematical Problems

2:00- 2:25 Hossein Behforooz, Utica College
Some Important Notes on the Calculation of the Continued Exponents

2:30- 2:55 Laura Munteanu, SUNY Oneonta
On Some Examples of Nonlinear Control Systems and Their Associated Simulation Relations

3:00-3:25 Sam Northshield, SUNY-Plattsburgh *A Golden Graph*

3:30- 3:55 Chulmin Kim, Rochester Institute of Technology
A brief statistical analysis of speed change in long-distance race

4:00- 4:25 Shashi Kanbur, SUNY Oswego
Development and Application of New Statistical Methods in Determining the Size-Scale of The Universe.

4:30-4:55 Shashi Kanbur, SUNY Oswego
The approximation of RR Lyrae light curves using cubic polynomials

Saturday afternoon, Snygg, 102

1:30-1:55 Robert Reams, SUNY Plattsburgh
Scaling of symmetric matrices by positive diagonal congruence

2:00-2:25 Tamas Wiandt, Rochester Institute of Technology
Coexistence of stable ECM solutions in the Lang-Kobayashi system

2:30-2:55 Manuel Lopez, Rochester Institute of Technology
Co-opting Algebra to Build a Theorem-Prover

3:00 -3:25 Tony Mastroberardino, Penn State Erie, The Behrend College
Homotopy analysis method: analytical solutions for the 21st century

3:30-3:55 Min Chung, Hartwick College
Perturbations of the local Fourier bases

4:00-4:25 Ampalavanar Nanthakumar, SUNY Oswego
Copulas and their applications

Saturday afternoon, Snygg 107

1:30 -1:55 Brandt Kronholm, SUNY Albany *Generalized Ramanujan Congruence Properties of the Restricted Partition Function $p(n; m)$.*

2:00-2:25 Dandrielle Lewis, SUNY Binghamton
An Introduction to The Quaternions

2:30-2:55 Candace Schenk, SUNY Binghamton
How not to get lost when surrounded by trees. Or an introduction to Thompson's groups

3:00-3:25 Quincy Loney, SUNY Binghamton
The Octonions and the Case of the Missing Associativity

3:30- 3:55 Darryl Daugherty, SUNY Binghamton
A Guidepost to finite dimensional simple Lie Algebras

4:00-4:25 Magdalena Mosbo, SUNY Oswego
A round table problem

4:30-4:55 Gabriel Prajitura, SUNY Brockport
Things to do with a broken stick

Saturday afternoon, Snygg 200, 201, 203, 300, 301, 302
Student Talks: Organizer: Derek Habermas, SUNY Potsdam.

Abstracts from Saturday afternoon speakers

1. Hossein Behforooz, Utica College

Some Important Notes on the Calculation of the Continued Exponents

Continued radicals and continued fractions are very popular and interesting subjects to study. In this talk we will present one or two continued exponents problems. Also, I will mention a bad news about how most of our graphing calculators, math software and many new born electronic devices are not well-programmed to follow the mathematical convention rules to calculate double or higher exponents.

2. Min Chung, Hartwick College

Perturbations of the local Fourier bases

A Riesz basis is the image of an orthonormal basis under an invertible continuous linear mapping. Both orthonormal basis and Riesz basis provide us with a simple representation of an element in Hilbert space. Since perturbing an orthonormal basis in a controlled manner yields a Riesz basis, this is an important subject of study which goes back to Paley and Wiener who were interested in the question of which perturbations of the orthonormal basis $\{ \}$ are still a Riesz basis for $[-p, p]$. In this context, it is then natural to consider when the sequence is small, so that the perturbations of local Fourier bases are still a Riesz basis for $[-p, p]$. In this talk we find Riesz basis for (\mathbb{R}) of the form, with bell functions, by perturbing the local sine and cosine orthonormal bases of Coifman and Meyer.

3. Shashi Kanbur, Ampalavanar Nanthakumar, SUNY Oswego

Development and Application of New Statistical Methods in Determining the Size-Scale of The Universe.

The Cepheid Period-Luminosity (PL) relation is of fundamental importance in establishing the size-scale of the Universe. For many years this relation had been thought to be linear. Recent work at SUNY Oswego has developed a range of statistical methods to provide convincing evidence of the nonlinearity of this relation. We describe these methods, including the F test, testimator, Schwarz Information Criterion and how they have been modified and extended to studying the nonlinearity of the Cepheid PL relation. We show the near equivalence of the Testimation and Schwarz Information Criteria and discuss how the testimator can be adapted to study the heteroskedasticity of the Cepheid PL relation. We also discuss the astrophysical implications of this nonlinearity and possible future directions for this research.

4. Shashi Kanbur, Steven Reyner, SUNY Oswego

The approximation of RR Lyrae light curves using cubic polynomials

In this paper, we develop the use of cubic polynomials to approximate RR Lyrae light curves. RR Lyrae stars are some of the oldest stars in the Universe. Determining their absolute brightness leads to a stellar estimate of the age of the Universe. In order to estimate their absolute brightness, it is necessary to obtain an accurate representation of their brightness variation with time. Yet frequently available data has poor phase coverage. Here we show how cubic polynomials can be used to produce very good representations of RR Lyrae light curves and apply the method to data taken with the Hubble Space Telescope: a sample of RR Lyrae data in the halo of a nearby galaxy, M31. We compare our results to the standard method of Fourier decomposition and show that we can eliminate virtually all ringing effects with the cubic polynomial method. Further the parameters of our fits are all physical. Our study also reveals a number of additional periodicities in this data not found previously. We discuss the implication of our findings.

5. Chulmin Kim, Rochester Institute of Technology

A brief statistical analysis of speed change in long-distance race

To improve the performance in long-distance race (such as 42.195km marathon, 100km ultramarathon, 10000m speed skating, etc.), scientists have studied the characteristics of elite performers. One of those characteristics is to change speed in running (or skating). Whether the change was pre-planned as one of strategies or resulted in natural fatigue during race, it may affect on long-distance events. Pacing may be defined as the athletes' subjective strategy to achieve their performance goal. We study if the runners (skaters) who finished a race with faster times have a different pattern of pacing compared to those completed with slower times. We may model those split times as longitudinal data since the means and the covariances are naturally increased over the split number (distance). Examples from IAU (International Association of Ultra Runners) and Winter Olympics are illustrated in which the usefulness of the results.

6. Manuel Lopez, Rochester Institute of Technology

Co-opting Algebra to Build a Theorem-Prover

The Nullstellensatz and the Buchberger Algorithm for finding a Groebner basis have been used as the core around which a theorem-proving procedure is built. One still needs ingenuity to encode the mathematical statements as polynomials. However, what's important is that it can be done even if the number of situations to which any given procedure applies is limited.

After exploring our variation on the Groebner basis theme it seems quite plausible there are many other results which might lend themselves to use in this manner. This opens the possibility that different approaches might complement each other and might be organized into a mixed-strategy proof generator.

7. Tony Mastroberardino, Penn State Erie, The Behrend College

Homotopy analysis method: analytical solutions for the 21st century

Most physical phenomena are nonlinear, and so, can be modeled mathematically by nonlinear equations. In general these nonlinear equations are difficult to solve analytically. Traditional perturbation methods provide approximate analytical solutions and have played an important role in the study of nonlinear problems. However, these methods rely on the existence of small/large parameters, and solutions typically break down in the presence of strong nonlinearity. In this talk, I will present the nuts and bolts of the homotopy analysis method (HAM), a powerful analytical method for solving nonlinear differential equations which does not rely on the existence of small/large parameters. HAM has been applied to numerous problems in science and engineering such as viscous flow of non-Newtonian fluids, heat transfer, water waves, and thermal-hydraulic networks. I will apply this method to obtain a series solution for the Lane-Emden equation of astrophysics and compare this result with an exact solution. I will conclude with a comparison of a HAM solution with a numerical solution for electrohydrodynamic flow.

8. Peter Mercer, Buffalo State College

Another Application of Siebeck's Theorem

A beautiful result due to J. Siebeck (1864) is: If p is a polynomial of degree 3 with complex coefficients having 3 noncollinear zeros, then the zeros of p' are precisely the foci of the Steiner ellipse for the triangle determined by these zeros. (The Steiner ellipse is the unique ellipse inscribed in the triangle which is tangent to three sides at their midpoints.) Here we obtain an analogue of Siebeck's result for a 3×3 normal matrix having 3 noncollinear eigenvalues.

9. Yozo Mikata, Bechtel

CNT Application as an Electron Emitter, and Its Associated Mathematical Problems

This paper will discuss a 1D transient heat conduction problem, and a 1D steady-state heat conduction problem with a radiation boundary condition at one end, both of which are mathematical models for a 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. This is the focus of this paper.

10. Magdalena Mosbo, SUNY Oswego

A round table problem

This talk starts with a problem from recreational math. Fifteen people are seated at a round table. The name tags get accidentally covered by napkins, so everyone picks a seat at random. It turns out that no one is sitting in the right place. Prove that it is possible to turn the table in such a way that at least two people will be in the correct seat. This leads to the question: Is it possible that exactly one person has the right seat in the original configuration and after any rotation? And if so, how many such arrangements are there, and can they be described? I will present some partial answers and ideas for student research.

11. Laura Munteanu, SUNY Oneonta

On Some Examples of Nonlinear Control Systems and Their Associated Simulation Relations

The concepts of simulation and bisimulation relations have been introduced in the study of geometric control theory relatively recently. By using simulation relations between control systems, we can reduce a complex system to a simpler one, while still preserving some of its essential features. It turns out that one can find more than one simulation relation between two systems, and, in some cases, one can actually define a maximal one. In this presentation, we discuss a few examples of nonlinear control systems and show how to compute the associated maximal simulation relations.

12. Ampalavanar Nanthakumar, SUNY Oswego

Copulas and their applications

The Copulas are widely in use for modeling the multivariate distributions especially when each component of the multivariate vector follows a different distribution (for example, the first component could follow the normal distribution, the second component the exponential etc) when there is statistical "dependence" among the components. The talk focuses on the properties of the copulas and on the modeling aspects of the copulas for its applications.

13. Sam Northshield, SUNY Plattsburgh

A Golden Graph

We shall look at a simply constructed infinite graph which has many surprising connections with the golden ratio and the Fibonacci sequence.

14. Gabriel Prajitura, SUNY Brockport, Eugen Ionascu, Columbus State University

Things to do with a broken stick

We will discuss several geometric probability problems related to the classical broken stick problem.

15. Robert Reams, SUNY Plattsburgh

Scaling of symmetric matrices by positive diagonal congruence

Let A be an $n \times n$ matrix with real positive entries. Sinkhorn's Theorem, proved in 1964, states that there exist diagonal matrices D and E , where D and E have all diagonal entries positive, so that DAE has all row sums equal to 1 and all columns sums equal to 1. Now let A be an $n \times n$ real symmetric matrix, with A not necessarily having all positive entries. We consider the problem of for which A there is an $n \times n$ diagonal matrix D , where D has all diagonal entries positive, so that DAD has all row (and column) sums 1.

16. Paul Seeburger, Monroe Community College

Visualizing Lagrange Multiplier Optimization using CalcPlot3D

In multivariable calculus, we teach our students the method of Lagrange multipliers to solve constrained optimization problems. As we introduce this topic, most of us use some form of visual presentation to help students understand how we develop the Lagrange multiplier equation, i.e., $f(x, y) = g(x, y)$. Using a freely available online multivariable calculus applet called CalcPlot3D, instructors can give a dynamic demonstration of the visual nature of Lagrange multiplier optimization during class. After class, students can complete a guided exploration of this topic using the same applet. As part of this activity, students complete a pre-test, answer exploration questions, and then complete a post-test. The pre- and post-tests measure what improvement occurs in their conceptual understanding of the geometric nature of Lagrange multiplier optimization by completing the visual exploration. Student responses to this online activity can be sent to instructors for grading purposes. This exploration is part of a larger collection being developed for this project. CalcPlot3D is part of an NSF-funded grant project titled *Dynamic Visualization Tools for Multivariable Calculus* (DUE- CCLI #0736968). See <http://web.monroecc.edu/calcNSF/>. If time allows, other aspects of this applet will be demonstrated as well.

17. Tamas Wiandt, Rochester Institute of Technology

Coexistence of stable ECM solutions in the Lang-Kobayashi system

The Lang-Kobayashi system of delay differential equations describes the behavior of the complex electric field and inversion inside an external cavity semiconductor laser. This system has a family of special periodic solutions known as External Cavity Modes (ECMs). It is well known that these ECM solutions appear through saddle-node bifurcations, then lose stability through a Hopf bifurcation before new ECM solutions are born through a secondary saddle-node bifurcation. Employing analytical and numerical techniques, we show that for certain short external cavity lasers the loss of stability happens only after the secondary saddle-node bifurcations, which means that stable ECM solutions can coexist in these systems. We also investigate the basins of these ECM attractors. Joint work with Davis Buenger (Rice University) and Ericka Mochan (Western New England College).

18. Emilie Wiesner, Ithaca College

Using Reader-oriented Theory to Understand Students' Textbook Use

Reader-oriented theory is a form of literary criticism that begins with the premise that a text's meaning is created when a reader reads and responds to a text. This view of the reading process is in keeping with the idea that students build mathematical understanding and thus provides potentially useful perspectives on how students use (or fail to use) their textbooks to learn. I'll talk about how ideas from reader-oriented theory shed light on both the textbook and on the student in the reading process.

Registration, Meals, and Refreshments

Registration will take place in the **Sheldon Building** on Friday evening during the social hour from 6:00 to 7:00 and on Saturday morning from 8:00 until 11:00 in **Snygg lobby**, first floor. Snacks will be served in **Snygg lobby**, first floor and lunch will be served in the **food court of the Campus Center building**.

Accommodations

1. Best Western (315-342-4040) - a block of rooms is available at conference rate \$113 (single or double). You must reserve before March 23.

2. Econolodge (315-343-1600) - conference rate \$70 per room. You must reserve by April 1.

Meeting Website

http://www.oswego.edu/academics/colleges_and_departments/departments/mathematics/seaway.html

**NEXT MEETING:
OCTOBER 15-16, 2010**

SUNY PLATTSBURGH

News from the Section

1. Skidmore

Professor Alice Dean was recently announced as the "Edwin Moseley Faculty Research Lecturer" for 2010-2011. This award is the highest honor that the Skidmore College faculty can confer upon one of its own, and Prof. Dean is the Mathematics and Computer Science Department's first winner since the award's inception over 50 years ago. Congratulations, Alice!

Mark Huibregtse

2. Queen's University

Here are a few "news items" for the next Seaway Current from the Mathematics and Statistics Department at Queen's University.

Professor David Thomson, who holds a Canada Research Chair in our department, was awarded a Killam Research Fellowship.

Professor Ram Murty, who holds a Queen's Research Chair and is currently head of the department, was elected to the Indian National Science Academy.

Mr. Nithum Thain, who completed his BSc degree in mathematics at Queen's, was awarded a Rhodes Scholarship.

Greg Smith.

3. Hobart and William Smith Colleges

In January, Professors Erika King (mathematics) and Stina Bridgeman (computer science) received tenure in the Department of Mathematics and Computer Science at Hobart and William Smith Colleges.

Kevin Mitchell

4. Colgate

Colgate has hired two new members into tenure-stream positions: Within the department, Marius Ionescu, currently at the University of Connecticut; and joint with the Biology Dept in a new Systems Biology position, Ahmet Ay.

Dan Schult and Ken Valente have been promoted to full professor.

Dan Schult's work with colleagues Patrick Crotty and Ken Segall, both in the Colgate Physics Dept, has been described in a column on the website IOP, sponsored by the Institute of Physics (<http://physicsworld.com/cws/article/news/41916>)

Ken Valente's paper "Giving wings to logic: Mary Everest Boole's propagation and fulfilment of a legacy" has appeared in the Mar 2010 volume of the *British Journal for the History of Science*. He has been invited to speak on Mary Boole in Cambridge this June.

Aaron Robertson has received an NSF Conference Grant to organize the conference "From $A=B$ to $Z=60$ " in honor of Doron Zeilberger's 60th birthday (<http://www.math.rutgers.edu/events/Z60>). He will also begin research this summer with a grant from the National Security Agency.

Dave Lantz

5. Genesee Community College

Genesee Community College's Math Club is active this year. Advisors Mary Knappen and Michelle Abdella took the club to the Strasenburgh Planetarium in December. In March they've planned a trip to the University of Rochester where they will be given a tour of the Laboratory for Laser Energetics which houses the second largest OMEGA laser in the world. They will also tour the Institute of Optics. Students will be able to gain a greater perspective as to where mathematics is used.

Becky Tallo

6. SUNY Plattsburgh

Yingsheng Liu has retired (professor here since 1992). Margaret Morrow and Greg Quenell will be on sabbatical leave next year.

Sam Northshield

7. SUNY Oswego (Thanks again for hosting the meeting)

One of our math majors will participate in the Summer Math Institute at Cornell University, and another one was accepted to REU at the East Tennessee State University. Our Math Club has finally achieved official status.

Kathy Lewis, who was back last semester, officially retired in order to go back to teach in Gambia. Two of our longtime colleagues – Vivian Anderson and Curt Klemenzenz – also retired at the end of the year. Adrienne Groman, our former student who taught in the department for a year and a half, returned to the real world to work for a cancer research company.

Pat Halpin is stepping down and Chris Baltus was elected the new department chair.

Magdalena Mosbo

Some Important Links

Seaway Section Website:

<http://people.rit.edu/maacway/>

Governance:

<http://people.rit.edu/maacway/governance.html>

The Seaway Current

The Seaway Current is published twice per year by the Seaway Section of the Mathematical Association of America for the benefit of its members. Its pages are open to all members of the MAA and, by invitation to others, for the exchange of information and opinion. Contributed announcements, articles, and editorials are welcome and should be sent to the editor.

Material may be submitted on paper, by e-mail or on CD. Presently, this newsletter is produced using Microsoft Word, which can import plain text files or files produced by most standard word-processing software.

Opinions expressed in this newsletter are those of the editor or of individual contributors and do not necessarily represent the views of the MAA or of the Seaway Section.

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