

# NORTHEASTERN SECTION



**NEWSLETTER**

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**EXECUTIVE COMMITTEE****CHAIR**

Tommy Ratliff  
Department of Mathematics  
and Computer Science  
Wheaton College  
Norton, MA 02766  
(508)286-3968  
tratliff@wheatonma.edu

**GOVERNOR**

Laura Kelleher  
Science and Mathematics Dept.  
Massachusetts Maritime Academy  
101 Academy Drive  
Buzzards Bay, MA 02532  
(508) 830-5000 x2267  
lkelleher@maritime.edu

**PAST CHAIR**

Sarah L. Mabrouk  
Department of Mathematics  
Framingham State College  
100 State Street, PO Box 9101  
Framingham, MA 01701-9101  
(508)626-4785  
smabrouk@frc.mass.edu

**TWO-YEAR COLLEGE REP.**

Lois Martin  
Mathematics Department  
Massasoit Community College  
Brockton, MA 02302  
(508)588-9100, x 1621  
lmartin@massasoit.mass.edu

**SECRETARY-TREASURER**

Ann Kizanis  
Western New England College  
Mathematics/CS Department  
Springfield, MA 01119  
(413)782-1784  
akizanis@wnec.edu

**NEWSLETTER EDITOR**

Frank Ford  
Department of Mathematics/CS  
Providence College  
Providence, RI 02918  
(401)865-2635  
fpford@providence.edu



### **Message from the Chair.....Tommy Ratliff**

In my first column as Chair, I would like to thank explicitly all of the Section officers, current and past, and other contributors who put so much into the Section, especially Sarah Mabrouk, whose term as Chair just ended in November. Since taking over as Chair at the end of the Fall Meeting, I have come to realize how much work goes on behind the scenes to keep the Section programs and meetings running smoothly. The next time you see any of the people who have been involved in the Section, take the opportunity to thank them for their hard work.

We had a wonderful Fall Meeting at the University of New Hampshire in November to celebrate our 50th Anniversary as a Section. Those of you who were able to attend know what a fantastic job the program committee (Frank Battles, Donna Beers, Laura Kelleher, Lois Martin, and chaired by Jim Tattersall) did. If you were not able to make it, take a look at the program at the Section website (<http://www.maa.org/Northeastern>) and see what you missed. Special thanks also go to Eric Grinberg at UNH for handling the local arrangements.

Keep an eye on the website for announcements for Section activities this spring. In particular, there are several Dinner Meetings already planned, and be sure to circle June 2-3 on your calendar for the Spring Meeting at Boston University.

I initiated an email discussion with the Executive Committee and others last fall where I posed the question

What is the purpose of the Northeastern Section and the Section Meetings?

Obviously different people will have different opinions, and our Section may serve a different role than other Sections, but I think it is worthwhile to discuss this explicitly so that we can focus our efforts accordingly. One of the reasons why I asked this question is that I have thought that we should have much more participation at our Section meetings given the large number of MAA members we have in the Section. Certainly not every MAA member will attend every Section meeting, but I have wondered if there is something else we can offer that would be of interest to a larger group. I have suggested that we consider adding more opportunities for undergraduates at the Fall Meetings to supplement the very successful Student Papers sessions, and that we look very hard at the purpose and timing of the Spring Meeting. If you have opinions or ideas about this, please drop me ([tratliff@wheatoncollege.edu](mailto:tratliff@wheatoncollege.edu)), or any of the

other Section officers, an email, and we can include you in the email discussion. I would like for this conversation to be very open and to include as many people as possible.

I look forward to seeing many of you at BU in June!

**Message from the Governor ..... Laura Kelleher**

The Board of Governors meeting in San Antonio was opened with remarks from MAA President Carl Cowen. Included in his comments about representing the MAA at several prominent professional meetings and organizations was a mention of how much he had enjoyed helping the Northeastern Section celebrate the Section's Golden Anniversary last November at the Section Meeting at the University of New Hampshire.

Associate Secretary Jim Tattersall of Providence College announced that the 2007 Joint Mathematics Meetings are expected to be held in New Orleans as originally planned. However, to avoid the Sugar Bowl, the meetings have been moved one day, to January 5-8, 2007. More information on this as well as a listing of all currently scheduled meetings is now on the MAA web page: [www.maa.org](http://www.maa.org).

First Vice President Barbara Faires reported on the progress of the ongoing process of strategic planning. Areas of study in the first cycle are the American Mathematics Competitions, Revenue, and Professional Development. Reports from these subcommittees are due in November 2006. The second cycle includes the topics of Governance, Membership, and Students. Reports from these subcommittees are expected in November 2007.

Michael Pearson, Director of Programs and Services, discussed several opportunities of interest to MAA members. See the MAA website for information on professional development programs including the Professional Enhancement Programs (PREP), the workshops designed for Preparing Mathematicians to Educate Teachers (PMET), and Project ACCCESS: Advancing Community College Careers. While you are on the MAA website be sure to also look for pictures taken on the MAA's Mathematical Study Tours. Northeastern Section members Ed Sandifer and John Glaus are helping with the 2007 Study Tour which will honor Euler's 300th birthday.

Baseball and statistics enthusiasts will enjoy the *Math Horizon's* article *A Mathematical Model to Predict Award Winners* by Rebecca Sparks and David Abrahamson of Rhode Island College. As I write this, the MAA website is

featuring this article under the link: Cy Young and Mathematics.

I am honored to have been given the privilege of serving as NES/MAA Governor for the past three years. The experience has been both interesting and rewarding. I hope that you will join us at the NES/MAA Section Meetings at Boston University in June and at Sacred Heart University in November. You might also want to make plans to attend *Mathfest 2006* in Knoxville, Tennessee in August and, of course, the Joint Mathematics Meetings in New Orleans in January, 2007.

**Message from the Secretary-Treasurer ..... Ann Kizanis**

In the fall newsletter, I reported a balance of \$16,118.98. Since that time, we had the successful fall meeting at the University of New Hampshire. The expenses from the fall meeting haven't been reported yet, but the revenue from meeting registrations was \$4,854.00. The expenses for the printing and postage of the fall newsletter for that meeting totaled \$1,417.17. We reimbursed a total of \$201.20 for MAA gifts. The 11-month CD that I opened in the amount of \$12,000.00 last summer has earned \$200.45 since the last newsletter. Our present balance is \$19,555.06.

Our section continues to save money from the printing and postage of our newsletters, since most of our members have now adopted the new format. We spent \$1,396.70 for the printing and postage of the spring 2005 newsletter and \$1,417.17 for the fall 2005 newsletter. As a section, we should continue to think about what types of activities or projects we would like to focus on since we have available funds.

Last month, I wrote a summary of our section's 2005 financial transactions for the headquarters' finance department, and at the beginning of the summer, I shall be writing our section's annual report.

That is my update for now! We are all looking forward to the Spring MAA meeting at Boston University, where I will update you further on our finances. I wish you all a very enjoyable spring!

**Two-year College Representative's Report ..... Lois Martin**

AMATYC is sponsoring three Summer Institutes:

1. AMATYC Outer Banks Summer Institute  
 "Developmental Algebra Using a Function Approach"  
 Duck, North Carolina  
 June 18-23, 2006
2. AMATYC Teacher Preparation Summer Institute  
 Green River Community College  
 Enumclaw, WA  
 June 22-26, 2006
3. AMATYC Summer Institute: Mathematics Across the Community  
 College Curriculum (MAC<sup>3</sup>)  
 Sleeping Lady Mountain Retreat  
 Leavenworth, WA  
 August 1-4, 2006

NEMATYC is welcoming MATYCONN members to join them at NEMATYC 2006, "Building a Better Math Class" at Southern New Hampshire University, April 21-22, 2006. This will be a first effort in collaboration between the two AMATYC affiliates. The invitation to attend the conference also extends to all mathematics educators in the New England area. Conference details may be found at [www.nematyc.org](http://www.nematyc.org).

Competition in the Northeast Region of AMATYC's Student Mathematics League is intensifying. Massasoit Community College, winner of the region for the past two years, is being challenged by Southern Maine Community College and Middlesex (MA) Community College as well as several community colleges in NY. The second round of competition will take place in late February/early March.

Roberta Kieronski will become president of NHTM at its Spring meeting. Roberta is a longtime active member of AMATYC and NEMATYC.

**From the Newsletter Editor ..... Frank Ford**

Tommy Ratliff began his tenure as Chair of the Section with the question "What is the purpose of the Northeastern Section of the MAA?" The officers and many others have discussed this on email for some time now. In Tommy's message, he called for comments on the question and I hope you will join the discussion.

### **Graduate Student Papers Presented at the NES/MAA Fall 2005 Meeting**

#### **Decoherence in quantum walks on the hypercube**

**Gorjan Alagic, University of Connecticut**

Recent research in quantum computation has led to the development of natural quantum analogues of the classical random walk. This area of research has already met with significant success, in particular by producing a quantum walk algorithm for an oracle problem, which performs exponentially better than is possible classically. In this talk, we will discuss the continuous quantum walk on a graph, as well as recent results (joint work with Alexander Russell) about the effects of decoherence on the quantum walk on the hypercube. Since any real quantum system suffers from decoherence, this is a matter of significant importance for any practical implementation.

#### **Ill-posed Problems and Regularization Methods**

**Malena Espanol, Tufts University**

Discrete ill-posed problems in the form of linear systems or least squares problems occur in a variety of applications, for example in image deblurring. The difficulty in solving discrete ill-posed problems is the presence of noise on the right hand side of the linear system. The ill-posed nature of the problem ensures that the least squares solution will not approximate its true solution. In this talk we discuss properties of discrete ill-posed problems and give an introduction to numerical techniques for approximating a regularized solution of it. We present a new regularization algorithm, and show promising numerical results.

#### **Stability of Solutions to the Discrete Nonlinear Schrödinger Equation in Multiple Dimensions**

**Jacob A Gagnon, University of Massachusetts - Amherst**

The Discrete Nonlinear Schrödinger (DNLS) equation has generated much mathematical interest in recent years due to its wide variety of physical applications. Bose Einstein condensates, optical waveguides, and photonic lattices are just a few examples of its applications. In this talk, I will present solutions to the time periodic DNLS using finite differencing in one, two, and three spatial dimensions. The stability of these solutions to small perturbations

has been studied and the parameter values yielding stable solutions have been identified. Lastly, I will discuss my current work in determining the time evolution of unstable solutions.

### **Generalized Pythagorean Triples**

**Lisa Henkel, New Hampshire**

A Pythagorean Triple is a triple of integers  $(x, y, z)$  such that  $x^2 + y^2 = z^2$ . Hadwin & Teigen had a method of generating Pythagorean triples that can be generated by a matrix transformation. H. Anders Lonnemo created a matrix  $L$  that maps Pythagorean triples to other Pythagorean triples. Starting with the triples  $(1, 0, 1)$  and  $(0, 1, 1)$ , all the Pythagorean triples can be generated by the application of  $L$  and the matrices formed by negating a coordinate of  $(x, y, z)$ . In this talk we extend Lonnemo's result by looking at 4-tuples  $(w, x, y, z)$ .

### **Group Gradings Of Matrix Algebras And Incidence Algebras**

**Lance Miller, University of Connecticut**

Graded rings and algebras are a ubiquitous object in the study of projective algebraic geometry. A slight generalization of this notion is that of a group grading; group gradings of matrix algebras have recently been well-developed. In this talk we will present an accessible introduction to these objects and some highlights of the current research into group gradings of matrix algebras and subalgebras of matrix algebras (specifically incidence algebras or structured matrix algebras).

### **A Night at the Operads**

**Rachel Schwell, University of Connecticut**

Mathematical operads are tools that describe an algebraic structure that can be attached to many different sets. We will define operads and algebras over operads, and demonstrate them through accessible examples, namely real-valued functions and trees. We will then introduce a set of polyhedra whose faces are given by the different associations one can insert in an  $n$ -letter multiplication, called Stasheff polyhedra or associahedra. We will conclude with a nice theorem that links these polyhedra to based loop spaces. Further applications of operads can be found in algebraic topology, representation theory, algebraic geometry, combinatorics, knot theory, quantum physics, and string theory.

**Uniqueness For The Martingale Problem Associated With Some Partial Differential Operators**

**Huili Tang, University of Connecticut**

The motivation of the martingale problem as well as the relation between martingale problem and Stochastic Differential Equations will be introduced. Some results of uniqueness will be presented.

**Undergraduate Student Papers Presented at the NES/MAA Spring 2005 Meeting**

**Meeting**

**Paul Hughes, Isabelle Meira, Framingham State College**

**The foremost works of Sir Isaac Newton**

Abstract: My partner and I will be presenting on the foremost works of Sir Isaac Newton. Of particular interest is his major contribution to the development of Calculus, as well as some of his involved geometric proofs. We also explore major points in Newton's life and career, and the contributions to physics made by this luminary scientist. Newton's laws of motion and universal gravitation, and the impact of each, are of particular interest.

**Ruth Hibbard, Framingham State College**

**The History of 3-Space**

As students of mathematics, we find ourselves studying vectors and 3-space as part of our Calculus III or Multivariable Calculus courses. Who were some of the mathematicians who helped to explore, to develop, and to reveal connections between the mathematics and the 3-dimensional world? In this presentation, I will discuss some of the contributions of Hamilton, Cayley, and Peano as well as some contributions that go as far back as 1000 B.C.

**Pamela Soggu, Merrimack College**

**The Calculation of Rainbows**

Many students take math courses, such as calculus, and do not know how to apply the knowledge gained from their classes in the real world. My presentation will be on calculating the formation of rainbows using calculus. The presentation will concentrate around describing the path of light traveling through a single raindrop to create the illusion of a rainbow using the Law of Refraction, also known as Snell's Law, and calculating the different colors of the rainbows.

**Russell Yang Gao, Worcester Polytechnic Institute**  
**Modeling Survival of U.S. Business Firms**

This project examines various factors affecting the survival of U. S. business firms. Life tables for firm survival were constructed for three different firm-size classifications using data from the Small Business Administration and U.S. Census Bureau. The impact of firm size on survival was analyzed. Lastly the impact of various macroeconomic factors was investigated in order to build a multiple regression model for firm survival rate.

**Christine Franey, Simmons College**  
**The Mathematics of Cryptography**

The topic of this presentation is the Mathematics of Cryptography. The history will be highlighted - from the time of the Roman Empire through to some present-day applications. Cryptography evolved most quickly when the need arose, such as during times of war.

**Sarah Lupa, Simmons College**  
**Mathematics Education: The Rally for Change and the Aftermath**

In the United States, mathematical pedagogy is not only changing, but it is also of the utmost importance. The mathematics that teachers teach in primary and secondary schools today is drastically different from the mathematics that students learned for the last century. Since the 1970s, the United States has been compared to China and Japan concerning mathematics education and the quality of its graduates. Sadly, U.S graduates are unable to compete globally. This presentation, based on research gathered for an independent study, will explore mathematical pedagogy, lesson plan study, curriculum, and other factors that caused the National Council of Teachers of Mathematics in 1989 to give a report that rallied for change in mathematics curriculum. Moreover, I will answer the question: Sixteen years after the call for change how does mathematics education fare, and where do we go from here?

**Scott R. McCarthy, Worcester State College**  
**Primes, Algorithms, and Applications**

In this presentation we define second order primes and third order

primes. The goal is to study difference of primes. We give our findings bases on the study of a large number of primes. We developed algorithms based on existing algorithms for determining large primes and hence the difference of primes. We assert a conjecture about primes, difference of primes and twin primes. We will present pseudocodes, algorithms, test cases, logarithms, and graphs indicating the behavior of certain types of primes.

**Anh Le, New England College**  
**The Dihedral Group of Order 8**

The dihedral group of order 8 can be used to encode the social structure of the kin system of family relationships among the Warlpiri – an Australian tribe. The kin relationships discussed in this paper includes the tribe's marriage and child birth rules used to determine the inheritance rights and responsibilities for land and religious rituals. Illustrated by a Cayley table, the Warlpiri relationships is an example of a group, satisfying all properties of the dihedral group of order 8.

**Kevin Hamer, University of New Hampshire**  
**Wikis**

Wikis, a popular format for websites, offer new means of developing mathematics. The ease of interconnecting pages and typesetting allows for material to be expressed quickly in detail. Relevant connections are easily traced, while the simplicity of editing allows memberships to ensure the accuracy of articles and proofs. Large wikis provide comprehensive references, while involving a class in the development of their own wiki provides the class with notes and a means to identify one another's strengths outside of class.

**Kirsten Hutchinson and Derek Pouliot, University of New Hampshire**

**A Counterexample to Kaplansky's Conjecture**

Kaplansky's conjecture has been a highly anticipated tool in the study of based rings. Many algebraists have spent much time trying to validate the conjecture in order to simplify their study. Thirty-two years have passed and no progress had been made. Noticing that a direct proof of the conjecture would be very difficult, we set out to explore the possibility of a counter example. We were hoping to find an existing based ring that would contradict the conjecture; what we ended up doing was

discovering a new based ring, which has dimension fifteen, that can be used to disprove the conjecture for based rings. This based ring is unique in that it can not be created by any transformation on a group.

**New Colleagues Papers Presented at the NES/MAA Spring 2005 Meeting**

Dr. Esha Chatterjee, Bryant University

**On the Boundedness Character of Rational Difference Equations**

We will explore the role of bounded solutions in various difference equation applications. We will then characterize rational difference equations in terms of its boundedness.

Victoria Sapko, Framingham State College

Numerical semigroups and ring theory

Numerical semigroups (subsemigroups of the natural numbers) are very simple to understand yet have a rich theory of their own as well as connections to rings.

**Stephanie Costa, Rhode Island College**

**Ordered Whist Tournaments - Existence Results**

An Ordered Whist Tournament is a relatively new specialization of whist tournament design. It will be shown that Ordered Whist tournaments exist for  $4n+1$  players.

**Dr. Kathleen Rondinone, Southern Connecticut State University**

**2 Approaches to Teaching College-Level Math: Group Work-focus versus Direct Instruction-focus**

This talk examines two teaching styles (group- and direct instruction-based) for introductory math courses. I conclude that a more balanced approach yields more favorable results.

**Contributed Paper Presentations at the NES/MAA Spring 2005 Meeting**

**Improper Use of Linear Reasoning: Not Just a Careless Mistake.**

**Gertrud Kraut, University of New Hampshire**

Recent studies reveal a deep rooted and almost irresistible tendency among 12 – 16-year old students to improperly apply the linear model to word problems involving lengths, areas, and volumes. In this paper we address four important issues related to the improper use of the concept of linearity: (1) students consider their misunderstanding and incorrect application of the linear model as careless mistakes (2) students have not addressed and corrected these misconceptions by the time they arrive at college, (3) the incorrect use of linear reasoning extends to

several topics in algebra, algebraic equations, and functions, and, (4) the incorrect application of linear reasoning causes difficulty in precalculus and calculus courses. Our studies show that these misconceptions are difficult to overcome when students have been permitted to maintain the incorrect understanding and habits until they arrive at college, and these difficulties are often the reason they leave an engineering or physical science major.

### **Numerical Analysis of Spectral Properties of Operators Generated by an Aircraft Wing Model**

**Steve Wineberg, University of New Hampshire**

This talk concerns numerical approximation of the eigenvalues of a non-selfadjoint fourth-order matrix differential operator arising from a much-studied model of aircraft wings subject to subsonic air flow.

We discretize the fourth-order matrix differential operator, defined on a domain with nine boundary conditions, using Chebyshev polynomials.

Depending on how the boundary conditions are imposed and how the fourth derivatives are handled, this leads to several different, but mathematically equivalent, matrix systems.

Despite their mathematical equivalence, calculating the eigenvalues of these systems gives dramatically different results, even using 17 digits of accuracy for the numerical computations. This discrepancy is explained by the fact that all but one of the systems is extremely ill-conditioned.

The one sufficiently well-conditioned system is generated by a method of imposing the boundary conditions as the kernel of a well-conditioned matrix. This yields a matrix whose distribution of eigenvalues agrees very closely with the qualitative distribution of eigenvalues for the continuous problem, which has been derived by A. V. Balakrishnan and Marianna A. Shubov, using theoretical considerations.

### **Gilbert Strang of MIT wins the NES/MAA Distinguished Teacher Award**

The Northeastern Section is proud to announce that Gilbert Strang of the Massachusetts Institute of Technology is the winner of this year's NES/MAA Award for Distinguished College or University Teaching of Mathematics.

The committee was extremely impressed with both Professor Strang's

accomplishments as a teacher in the classroom and with the far-reaching impact he has on the way mathematics is taught at MIT and other institutions. Of particular influence are his textbooks *Linear Algebra and its Applications* and *Introduction to Applied Mathematics*, his lectures which are available on the web through MIT's OpenCourseWare project (<http://ocw.mit.edu/>), and the twenty Ph.D. and five Master's students he has supervised.

Two comments, one from a student and one from his nominator, best describe the deep respect and enthusiasm that Professor Strang inspires and explain why he is this year's teaching award winner:

"Professor Strang is an amazing teacher. His apparent enthusiasm for the subject material as well as for life in general is infectious in a pleasant way. He is inspirational, making the subject matter relevant to today's students while simultaneously infusing the lectures and text with humor. What an amazing teacher and what true rarity!"

"Gil combines a warm and empathetic personality, a deep love for mathematics, and a profound understanding of how math is actually used in science and engineering. He has used these qualities to reshape the content of linear algebra for undergraduates and engineering methods for graduate students, making sure that the new material can appear as beautiful to his students as it is to him."

#### **NES/MAA 2000-2005 ..... Ockle Johnson**

(With this installment, the Northeastern Section has a complete written history. Earlier installments included Jim Tattersall's history of the era before the 1990's which is available on the Section website and Frank Battles' history of the 1990's which was in the last issue of the newsletter. —Editor)

In 2005 the Northeastern Section celebrated its 50<sup>th</sup> anniversary. Having begun with a meeting on October 14, 1955 at the University of New Hampshire, the Section returned to UNH for a semi-centennial anniversary celebration at its fall, 2005 meeting. As the Section began its next 50 years, it was appropriate that the incoming chair, Tommy Ratliff, asked the Executive Committee to consider what the purpose of the Section is.

As the Section moved into the 2000's there was a mixture of continuity and change. Section meetings in the fall and spring continue to be our central activity. These are supplemented by dinner meetings in the spring. Despite excellent programs and locations, the summer short courses suffered from low

attendance and morphed into a one day mini-course before the 2004 spring meeting. What to do next was a topic of discussion through 2005. At the fall 2002 meeting Section NExT activities for new faculty were inaugurated under the leadership of Lisa Humphreys and have continued prior to each of the fall and spring meetings. This complements the New Faculty paper session at the fall meetings. Sarah Mabrouk brought a renewed focus on activities and outreach for graduate students at the meetings.

The early 2000's continued the tradition of excellent Section meetings. Fall meetings were typically held close to the Boston area and Spring meetings moved further out into the section. Through 2005 six meetings were held in Massachusetts, two in Rhode Island, two in New Hampshire, one in Vermont and one in Maine. Connecticut will host its first meeting of the decade in fall 2006. Meetings planned for the rest of the decade will move us around the Section. Excellent speakers giving excellent talks were the norm for our two named lectures, the Christie Lecture in the fall and the Battles Lecture in the spring. The Christie Lectures were given by Ed Burger, Richard Guy, Carl Pomerance, Lisa Humphreys, Bud Brown and Dusa McDuff. The Battles Lectures were given by Joe Gallian, Tom Banchoff, Thomas Hales, Mike Rosen, Frank Farris, and Frank Morgan. Some of the other speakers of note at Section meetings were Fred Rickey, Greg Fredrickson, Richard Guy, Underwood Dudley, Sean McLaughlin, Gil Strang, Steve Dunbar, Dawn Lott, Ary Goldberger, Stephen Brams, Robert Bradley, David Bressoud, Arthur Benjamin, Jack Graver, Brian Winkel, Carl Cowen, and Ron Graham. A few of the other highlights were the recreational math focus and games from Binary Arts at the Bridgewater meeting, visitors from the Seaway Section and lots of students at the Williams meeting, and presents for almost everyone in attendance at the Framingham meeting.

In addition to our Section meetings, our region was again an attractive location for the national MAA. We hosted MathFest 2002 in Burlington, VT and MathFest 2004 in Providence Rhode Island. Section members served vital roles in the planning and execution of those meetings.

Dinner meetings in the spring provided another opportunity for Section Members to gather. Sites varied, but one could always count on a meeting at Holy Cross in conjunction with their Sulski lecture and a Providence area meeting. Framingham State added an annual dinner meeting in honor of Ken Preskenis.

The Section is blessed with excellent teachers. The Distinguished Teaching Award winners for the Section were Ed Burger, Paul Blanchard, Laura Kelleher,

Emma Previato, Joe McKenna and Dave Abrahamson. Ed and Tom Garrity were also nation Haimo Award winners.

The Section also recognized the outstanding service of three of its members. Dennis Luciano received the National MAA Certificate for Meritorious Service in 2002 and Jim Ward and Karen Schroeder received the Howard Eves Award in 2000 and 2005 respectively.

Although the financial health of the Section remained strong, the Executive Committee discussed ways to deal with a downward trend. Registration fees for Section meetings were increased by \$5 across the board, with the fee being \$25 for members. The largest expense was the printing and mailing of the Newsletter. To cut costs the Newsletter was published on the Section website and individual members were given the option of receiving an e-mail notification that the Newsletter was available on-line, a one page Newsletter Lite, or the full print version. Frank Ford, the Newsletter Editor, and Ross Gingrich, the webmaster, were key players in this move.

The Section continued to be served by a committed group of officers. Ed Sandifer of Western Connecticut State University began the decade as chair, followed by Ockle Johnson of Keene State College (2001-2003), Sarah Mabrouk of Framingham State College (2003-2005) and Tommy Ratliff of Wheaton College (2005-2007). Former chairs served admirably as our Section's Governor, Donna Beers of Simmons College (2000-2003) and Laura Kelleher of Massachusetts Maritime Academy (2000-2006). Betsey Whitman of Framingham State College concluded several years of fine service as our Secretary/Treasurer in 2000 and was succeeded by Ann Kizanis of Western New England College. Kathleen Bavelas of Manchester Community Technical College provided excellent service as our Two-Year College Representative until 2004 when she was succeeded by Lois Martin of Massasoit Community College. After sharing the Editorship of the Newsletter with Barry Schiller of Rhode Island College, Frank Ford of Providence College has done yoeman's work as the sole editor since 2000. Lucy Kimball of Bentley College has been the coordinator for our dinner meetings. The section has also been well served by a cadre of organizers for the various paper sessions at our meetings: Ed Sandifer, Tommy Ratliff, Rob Podiak, Ockle Johnson, Mike Cullinane, Lisa Humphreys, Karen Stanish, Ray Kovac, Phil Hotchkiss, Chris Aubuchon and Sarah Mabrouk.

The Section has also provided national MAA leadership. Tom Banchoff began the decade as the President of the MAA. Jim Tattersal continues to serve as Associate Secretary of the MAA.

As we continue, we look forward to continued strong leadership, good meetings and new directions.

### **From the Colleges**

(Will return in the Fall newsletter. Send items to Frank Ford at [fpford@providence.edu](mailto:fpford@providence.edu).)

### **Northeastern Section NExT at Spring Meeting.....Lisa Humphreys**

The Northeastern Section is continuing a Section NExT program for new and relatively new colleagues at this year's fall Section meeting. By providing talks and workshops on issues of interest, opportunities to meet and share ideas with other new colleagues, and an introduction into Section activities, we hope to assist new faculty in their transition from graduate school to professional academic life. We welcome all untenured full time faculty, both those who have and have not been National NExT fellows.

### **Friday, June 2, 2006**

12:00 – 1:00 p.m.

**Lunch and Group Discussion**

1:00 – 2:00 p.m.

**Using Graphs for Scheduling**

Laura Kelleher, Massachusetts Maritime Academy

If you are interested, please contact Lisa Humphreys of Rhode Island College at [LHumphreys@ric.edu](mailto:LHumphreys@ric.edu). You should also register for the Section meeting by completing the registration form in the Section Newsletter and check off that you will be participating in the Section NExT program. (If you did not receive a Newsletter, indicate that to Lisa.)

### **NES/MAA Award for Distinguished College/University Teaching of Mathematics Nominations**

(Elsewhere in this newsletter, Tommy Ratliff announced that Gilbert Strang won the 2006 Northeastern Section of the Mathematical Association of America (NES/MAA) Award for Distinguished College or University Teaching of Mathematics. It is not too early to plan nominations for the 2007 award. If you have any questions, send email to Sarah Mabrouk at [smabrouk@frc.mass.edu](mailto:smabrouk@frc.mass.edu).

-Editor)

There is no packet of forms to fill out in order to make nominations for the 2006 Northeastern Section of the Mathematical Association of America (NES/MAA) Award for Distinguished College or University Teaching of Mathematics: you create the nomination packet with various letters written by those familiar with

the candidate's teaching/research/publications. The eligibility and nomination requirements as well as some hyperlinks to help you in creating the nomination packet are listed below.

The eligibility requirements are

- college or university teachers who currently teach a mathematical science at least half-time during the academic year in a public or private college or university in the United States or Canada (those on approved leave (sabbatical or other) during the academic year in which they are nominated qualify if they fulfilled the requirements in the previous year),
- at least five years experience in teaching a mathematical science, and
- has membership in the Mathematical Association of America and is teaching in the Northeastern Section, and the nomination requirements,
- widely recognized as extraordinarily successful in his/her teaching,
- has teaching effectiveness that can be documented,
- has influence in teaching beyond his/her own institution, and
- fosters curiosity and generates excitement about mathematics in students.

### **Call for Undergraduate Student Papers**

Students (and recent graduates) from the Northeastern Section are invited to present talks at the Spring meeting on topics in mathematics, statistics, or computer science. The presentations should be 10-15 minutes in length, on expository work, research projects, employment experiences, or problems from mathematical periodicals. The registration fee and cost of meals will be waived for one student presenter per paper. Send an abstract by email to Raimundo Kovac, RKovac@ric.edu, or Karen Stanish. kstanish@keene.edu. The deadline for submission is May 15, 2006.

### **Call for Contributed Papers**

Participants at the Northeastern section meetings are invited to submit contributed papers. We are particularly interested in papers which will appeal to a variety of participants. If you are planning to speak about results of your research, keep in mind that the audience most likely will not be familiar with your specialty, so you will want to give some motivation and context for your work. Your presentation should be approximately 15 minutes in length.

Please send an abstract and your mailing address together with a list of

any special equipment you may need to Rob Poodiack at  
rpoodiac@norwich.edu. E-mail submissions are preferred, but you may  
also send a typed submission to

Rob Poodiack

Department of Mathematics

Norwich University

158 Harmon Drive

Northfield, VT 05663

The deadlines for submission of abstracts is: May 15, 2006

### **Call for Graduate Student Papers**

**Graduate Students**, full-time and part-time, are invited to present papers on topics in mathematics, statistics, or computer science. Graduate students at any stage of their graduate work are welcome to give a presentation during the session. The presentations, approximately fifteen (15) minutes in length, can be given on expository work, research projects, variations on intriguing proofs, interesting problems in mathematics, work derived from periodicals, employment experiences, summer/independent research experiences, or parts of or work related to Master's or Doctoral research projects. The registration fee and the cost for Saturday lunch will be waived for one graduate student presenter per paper. Interested graduate students should submit the title of the presentation with an abstract of no more than 100 words together with full name, college/university affiliation, contact information (phone number, fax number, and email address), audio-visual/technology needs for the presentation, the name of a faculty sponsor, and full contact information and affiliation for the faculty sponsor to Sarah Mabrouk, smabrouk@frc.mass.edu; please use "NES/MAA Graduate Student Paper **Session - Submission**" for the subject line. **The deadline for submission is Friday, May 12, 2006.**

## Northeastern Section of the MAA

Spring Meeting: June 2-3, 2006

Boston University  
Boston, Massachusetts

Web: [math.bu.edu/MAA\\_meeting](http://math.bu.edu/MAA_meeting)  
Email: [maa\\_meeting@math.bu.edu](mailto:maa_meeting@math.bu.edu)

### Program Committee

Bob Devaney, Chair, Boston University  
Lois Martin, Massasoit Community College  
C. Eugene Wayne, Boston University  
Paul Blanchard, Boston University

### Local Arrangements

Paul Blanchard, Chair, Boston University  
C. Eugene Wayne, Boston University  
Emma Previato, Boston University

### NES/MAA Project NExT Program

(all full-time untenured faculty are welcome)

#### Friday, June 2, 2006:

12:00 – 1:00 p.m.

1:00 – 2:00 p.m.

**Lunch and Group Discussion**  
**Using Graphs for Scheduling**  
Laura Kelleher, Massachusetts Maritime Academy

#### NES/MAA Spring Meeting

#### Friday, June 2, 2006:

2:00 – 6:00 p.m.

1:00 – 2:30 p.m.

3:00 – 3:50 p.m.

4:00 – 4:30 p.m.

4:30 – 5:20 p.m.

5:30 – 6:00 p.m.

6:00 – 6:30 p.m.

6:30 – 7:50 p.m.

8:00 – 8:50 p.m.

**Registration**  
**Executive Committee Meeting**  
**Blogging by Numb3rs**  
Mark Bridger, Northeastern University  
**Break**  
**Serendipity and Partitions with Initial Repetitions**  
George Andrews, Penn State University  
**Undergraduate Student Papers**  
**Reception**  
**Buffet Dinner and Opening Remarks**  
**Battles Lecture: An equation runs through it: River**  
**running on the Colorado River in the Grand Canyon**  
**-history, current practice, and role of a mathematician**  
Catherine A. Roberts, College of the Holy Cross

**Saturday, June 3, 2006**

8:00 – 11:30 a.m.	<b>Registration</b>
8:00 – 9:00 a. m.	<b>Graduate Student Paper Session</b>
9:00 – 9:50 a. m.	<b>Standards in the Teaching of Mathematics in the First Two Years</b> Philip Mahler, Middlesex Community College
10:00 – 10:30 a.m.	<b>Break</b>
10:30 – 11:20 a.m.	<b>Teaching Statistics by Example</b> Lisa M Sullivan, Boston University
11:30 – Noon	<b>Business Meeting</b>
12:00 – 1:00 p.m.	<b>Barbecue</b>
1:15 – 2:05 p.m.	<b>When Numerical Methods Fail but Undergraduates Succeed</b> Gareth Roberts, College of the Holy Cross
2:15 – 2:30 p.m.	<b>Break</b>
2:30 – 3:20 p.m.	<b>Canonical forms: A mathematician's view of musical canons</b> Noam D. Elkies, Harvard University
3:30 – 4:30 p.m.	<b>Contributed Paper Session</b>

**Abstracts/Biographies****Title: Blogging by Numb3rs****Speaker: Mark Bridger, Northeastern University**

**Abstract:** The CBS TV show Numb3rs features a mathematician who uses his skills to help his FBI brother solve crimes. It's network TV fare, but it's all we've got, so Mark Bridger decided to write a web-log or "blog" to explain in relatively non-technical terms the mathematics referred to in each episode. In writing nearly 100 installments, Mark has learned a lot of math, gotten some interesting e-mail, and become an unpaid -- the story of his life -- consultant to the show. His wife Maxine, also a mathematician, works with him, and she doesn't get paid either, though they both got nice hats and tee-shirts.

**Biography:** Mark Bridger has had an eclectic math career. He received his Ph.D. under Maurice Auslander (Brandeis, 1967) in homological algebra and published a bit in that field. Around 1980 he got involved in computing and its applications to math education. He wrote some of the first math-plotting software for the then new IBM PC, and he and his wife Maxine peddled it through their small company, Bridge Software. He also did a bit of consulting in image and data analysis.

Gabe Stolzenberg, his colleague at Northeastern University, got him interested in constructive analysis. They wrote a Monthly paper, and Mark is about to publish a text in that field. Blogging the Numb3rs show has allowed him to look

into a lot of math he never had gotten around to learning -- He's just making a dent, but having a lot of fun.

Mark likes biking, gardening, crosswords and carpentry, and he played in a bluegrass band for 12 years until he hung up his mandolin by popular demand. Maxine, an expert, has not been able to convince him to do more than 1 sudoku.

**Title: Serendipity and Partitions with Initial Repetitions**

**Speaker: George Andrews, Penn State University**

**Abstract:** An inquiry by an engineer led by a circuitous route to the topic of this talk. A variety of interesting connections with modular forms, mock theta functions and Rogers-Ramanujan type identities arise in consideration of partitions in which the smaller integers are repeated as summands more often than the larger summands. In particular, this concept leads to new interpretations of the Rogers-Selberg identities and Bailey's modulus 9 identities. This latter interpretation suggests some thoughts on the Borwein Conjecture.

**Biography:** George Andrews is Evan Pugh Professor of Mathematics at Penn State University and an expert on the theory of partitions. He has a long-term interest in the work of S. Ramanujan, whose last notebook he unearthed in 1976. He is now collaborating with Bruce Berndt on a series of volumes explicating the brilliant and sometimes enigmatic ideas in this notebook. Andrews was elected to the National Academy of Sciences in 2003.

**Title: An equation runs through it: River running on the Colorado River in the Grand Canyon---history, current practice, and the role of a mathematician**

**Speaker: Catherine A. Roberts, College of the Holy Cross**

**Abstract:** This talk will discuss the development of a model for white water rafting on the Colorado River in the Grand Canyon National Park. The speaker will discuss the challenges faced by the National Park Service as it seeks to manage, both responsively and responsibly, this important natural resource. How a mathematician came to play a part in these efforts will round out the presentation.

**Biography:** Catherine Roberts majored in math and art history at Bowdoin College. She then earned her doctorate in applied mathematics from Northwestern University in 1992 and is now an associate professor at the College of the Holy Cross in Worcester, MA. Prior to her move back to New England (she grew up in Chatham on Cape Cod), she taught at Northern Arizona

University near the Grand Canyon. Her research took a dramatic turn away from nonlinear integral equations towards mathematical modeling when she got involved in the project that is the subject of her talk. She is the editor in chief of an interdisciplinary journal called Natural Resource Modeling. Catherine has been very involved with the Association for Women in Mathematics, helping organize their workshops and recently serving on their board. She is an associate editor of the UMAP journal, and serves on the board of the Resource Modeling Association and the Regional Environmental Council. Catherine's husband is a chemist at W.P.I. and they have two sons.

**Title: Standards in the Teaching of Mathematics in the First Two Years**

**Speaker: Philip Mahler, Middlesex Community College**

**Abstract:** The National Council of Teachers of Mathematics (NCTM) has “standards” for teaching K-12 mathematics, the American Mathematical Association of Two-Year Colleges (AMATYC) has the same for teaching mathematics in the two-year college, and the MAA has them for its math intensive, and now service, courses. This will present what AMATYC has to say, and compare these to the MAA’s CUPM recommendations, as well as discuss what is driving “standards-based” efforts.

**Biography:** Philip Mahler has a BA in Modern Languages from Assumption College and an MAT in Mathematics from the University of Florida. He was a co-Chair of the Michigan MAA section, and for the Northeast Section has served as newsletter editor and program chair. He is a past president of the New England Mathematical Association of Two-Year Colleges, and of AMATYC. He has participated in activities at the national level on quantitative literacy and college algebra reform, and is co-PI on grants related to the recent updating of the AMATYC standards.

**Title: Teaching Statistics by Example**

**Speaker: Lisa M Sullivan, Boston University**

**Abstract:** Many undergraduates across a range of major fields of study are required to take statistics. While statistics can be difficult for students with little mathematical background, introductory statistics courses that include real and relevant applied examples make the material more accessible and interesting to the students. Increasing students’ interest can positively affect their efforts to grasp the material. This talk will present examples, projects and exercises that might be useful for teachers of introductory statistics courses.

**Biography:** Lisa M. Sullivan Ph.D. is Associate Professor and Associate Chair of Biostatistics at the Boston University School of Public Health, Associate Professor of Mathematics and Statistics at the Boston University College of Arts and Sciences and Assistant Dean for Undergraduate Education at the Boston University School of Public Health. She has received numerous awards for excellence in teaching for courses in Introductory Biostatistics and Statistics I and II at Boston University. She is the Principal Investigator of the Boston University Summer Institute in Biostatistics, funded by the National Heart, Lung, and Blood Institute, designed to introduce undergraduate students to the field of biostatistics. She co-authored a popular textbook entitled *Introductory Applied Biostatistics*, she has published extensively in the medical arena and serves as a statistical consultant to the American Heart Association's journal *Circulation*. Her research interests focus primarily on the Framingham Heart Study where she is involved in developing and evaluating health risk appraisal functions. These functions are used by practicing clinicians to assess, for example, a patient's risk of developing coronary heart disease over the next ten years. She worked recently with other Framingham investigators on new risk functions for coronary heart disease which feature prominently in the National Cholesterol Education Program's Adult Treatment Panel III. She is also actively involved in a number of projects centered on infant and child health including a clinical trial evaluating the effectiveness of pharmacologic treatments for children with autism and an epidemiological study to assess the association between alcohol exposure during pregnancy and the incidence of sudden infant death syndrome.

**Title: When Numerical Methods Fail but Undergraduates Succeed**

**Speaker: Gareth Roberts, College of the Holy Cross**

**Abstract:** Numerical methods don't always work. For example, Newton's method applied to a quadratic polynomial with complex roots  $\alpha$  and  $\beta$  will fail to find a root starting from any initial seed on the perpendicular bisector of the line segment joining  $\alpha$  and  $\beta$ . This is usually dealt with by making a small perturbation of the initial guess, but what if the method fails to work on an *open set* of initial seeds?

This question is explored from a dynamical systems perspective. Taking a given numerical method and applying it to a particular family of complex polynomials leads to some fascinating dynamical systems. Such an investigation is quite accessible to a motivated undergraduate researcher. Some specific examples using Newton's and Halley's method will be discussed including the impressive contributions of some recent undergraduates.

**Biography:** Gareth Roberts received his B.A. in 1992 from Oberlin College where he studied mathematics, music and ultimate frisbee. After receiving his Ph.D. from Boston University in 1999 under the guidance of Dick Hall, he spent two beautiful years in Boulder at the University of Colorado as an NSF Vigre postdoc. He is now an assistant professor at the College of the Holy Cross in the even more beautiful city of Worcester (pronounced Woostaah) and is happy to have found some outstanding undergraduate researchers to collaborate with.

**Title: Canonical forms: A mathematician's view of musical canons**

**Speaker: Noam D. Elkies, Harvard University**

**Abstract:** Musical canons, from simple rounds like “Three Blind Mice” to the compendium of canons Bach compiled in his Musical Offering, have a history almost as long as that of Western music itself, and continue to fascinate musical composers, performers and listeners. In a canon the same melody is played or sung in two or more parts at once; this melody must therefore make musical sense both as a tune and in harmony with a delayed or otherwise modified copy of itself. How does one go about constructing such a melody? This challenge has a mathematical flavor. It turns out that some kinds of canons are so easy to create that they can be improvised in real time, while other kinds are more demanding, and in some cases only a handful of examples are known. The talk will be illustrated with both abstract diagrams and specific musical examples, and may also digress into generalizations of canons (the forms known collectively as “invertible counterpoint”) and the reasons--besides showing off - that so many composers incorporate canons into their music.

### **Housing**

Hotels in Boston are expensive. We have made arrangements with two hotels relatively close to BU with special conference rates, but we strongly recommend that you consider the on-campus accommodations at the new John Hancock Student Village. This air-conditioned, apartment-style residence has been the premier dormitory on campus since its opening in fall 2000. Each apartment has four single-occupancy bedrooms, two bathrooms, a small kitchen and a living room. Many of the rooms have spectacular views of downtown Boston or of Cambridge across the Charles River. Beds are made prior to arrival, and guests are supplied with bath linens and basic amenities such as soap and shampoo.

There is an alarm clock in each bedroom, but televisions and telephones are not provided. The Student Village is .5 miles from the meeting lecture halls. **If you would like to stay at the Student Village, you must pre-register for the meeting and pay all charges by May 19.** The room rate is \$60 total per night.

The Hotel Commonwealth is a new luxury (with a capital L) hotel in Kenmore Square. It is located .6 miles from the lecture halls. The special room rate for the meeting is \$209 per night plus 12.45% tax. The usual rate is \$369 per night plus tax. **To obtain the lower rate, you must book your room by May 5** and mention the MAA conference or math conference at BU when you call. If you need parking, you should ask about it when you book your room. Visit the hotel's web site [www.hotelcommonwealth.com](http://www.hotelcommonwealth.com) for more details. The hotel's address is 650 Beacon St, Boston, MA, 02215, and its phone number is 617-927-4445.

The Radisson Hotel on Memorial Drive in Cambridge is .9 miles from the lecture halls. The special room rate for the meeting is \$139 per night plus 12.45% tax. Upon request, they offer a shuttle to BU and surrounding areas within a three-mile radius, but there is no shuttle service between 2:30-5:00 pm. To obtain the special room rate, mention that you are visiting the BU Math Department. If you need parking, you should ask about it when you book as well. Visit the hotel's web site [www.radisson.com/cambridgema](http://www.radisson.com/cambridgema) for more details. The hotel's address is 777 Memorial Drive, Cambridge, MA 02139, and its phone number is 617-492-7777.

There are other hotels located in the Kenmore Square area but none that we recommend with much enthusiasm.

### Meals

There will be two meals that will be part of the regular meeting, a buffet-style dinner banquet on Friday evening and a barbecue lunch on Saturday to held on the "BU beach" (weather permitting). You must pre-register (see below) to be guaranteed reservations for these meals. **Your pre-registration, including meal reservations, must be received by Friday, May 19.** Spouses and guests

are welcome at meals but must be included in the pre-registration count. Both meals will include some vegetarian and vegan options. On the registration form, we ask for any special meal needs, e.g., vegetarian, vegan, just to be sure that we have adequate quantities. The cost of the banquet on Friday is \$29 per person, and the cost for the barbecue lunch on Saturday is \$10 per person.

The Section NExT lunch on Friday is open only to Section NExT participants.

### **Parking**

Boston University has strict parking regulations. Do not park in university parking lots unless you have a parking pass. The Red Sox are playing in Detroit on June 2 and 3, so there should be plenty of on-street parking at parking meters. However, on-street parking is only a convenient option for one or two hours. We expect to have more information about parking closer to the meeting. Check the conference web site, [math.bu.edu/MAA\\_meeting](http://math.bu.edu/MAA_meeting), for more information.

### **Directions to Boston University**

There are detailed directions to Boston University (including maps) available at [www.bu.edu/visit](http://www.bu.edu/visit). The meeting web site, [math.bu.edu/MAA\\_meeting](http://math.bu.edu/MAA_meeting), will also provide directions to the specific buildings, lecture halls, and classrooms that will be used for the meeting as well as additional parking information.

### **About Boston University**

Boston University is an international leader in undergraduate education, advanced research, and professional studies. With a faculty of more than 3,000 scholars, teachers, and researchers, and more than 30,000 students - from all 50 states and 140 nations - the University is the fourth-largest independent university in the United States. The University's 17 schools and colleges offer more than 250 degree programs in the arts and sciences, communications, engineering, law, management, performing arts, medicine, and other professions. Situated along a mile of Boston's picturesque Charles River, the

University is committed to building community within its campus and to serving the city, neighborhoods, and communities of which it is a part.

### **Pre-Registration**

**Please pre-register!** On-line registration is NOT available. Please send the registration form on the next page so that it **arrives by Friday, May 19**. Checks should be made to: *NES/MAA*. If you have questions about registration, send email to [maa\\_meeting@math.bu.edu](mailto:maa_meeting@math.bu.edu). For more information about the conference, visit the conference web site [math.bu.edu/MAA\\_meeting](http://math.bu.edu/MAA_meeting). You should mail this pre-registration form to:

MAA Meeting  
Department of Mathematics & Statistics  
111 Cummington St  
Boston University  
Boston, MA 02215

**NES/MAA SPRING MEETING 2006 REGISTRATION FORM**

Last Name \_\_\_\_\_

First Name \_\_\_\_\_ MI \_\_\_\_\_

If you prefer another name on badge, please indicate here: \_\_\_\_\_

Institutional Affiliation \_\_\_\_\_

Mailing Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

ZIP \_\_\_\_\_ Country \_\_\_\_\_ Daytime Phone Number \_\_\_\_\_

Email Address \_\_\_\_\_ FAX Number \_\_\_\_\_

Please check box that applies to you:	
Four-year college faculty <input type="checkbox"/>	Two-year college faculty <input type="checkbox"/>
University faculty <input type="checkbox"/>	High School teacher <input type="checkbox"/>
Business/industry/government <input type="checkbox"/>	Retired <input type="checkbox"/>
	Undergraduate <input type="checkbox"/>
Pre-registration fee:	
MAA Member <input type="checkbox"/> \$25	\$
Non-Member <input type="checkbox"/> \$30	
Student or unemployed <input type="checkbox"/> \$10	
Friday Banquet: \$29 per person (Be sure to include any guests.) Number: _____	\$
Please indicate special meal needs/allergies: _____	
Saturday Barbecue: \$10 per person (Be sure to include any guests.) Number: _____	\$
Please indicate special meal needs/allergies: _____	
On campus accommodations: \$60 pp/night. Number: _____	\$
TOTAL PAYMENT (Make checks payable to: NES/MAA.)	\$
Section NExT (all full-time untenured faculty are welcome): There is no fee for Section NExT activities for Spring 2006. Are you attending Section NExT on Friday? <input type="checkbox"/> yes <input type="checkbox"/> no Are you attending Section NExT lunch on Friday? <input type="checkbox"/> yes <input type="checkbox"/> no	

Frank Ford  
Newsletter Editor  
Dept of Math/CS  
Providence College  
Providence, RI 02918