

**Northeastern Section of the MAA
Spring Meeting: June 4-5, 2004
ROGER WILLIAMS UNIVERSITY
BRISTOL, RHODE ISLAND**

Friday, June 3, 2004

- 2:00 – 6:00 p.m. Registration
2:00 – 3:00 p.m. Executive Committee Meeting
3:00 – 3:50 p.m.
 Taking the Erlangen Program Seriously: A Modern Approach to Undergraduate Geometry
 William Barker, Bowdoin College, Brunswick, ME
4:00 – 4:50 p.m.
 **Guidelines, Timelines, and Tools for Self-Assessment:
 Students Get Set for a Mathematics Conference**
 Donna Beers, Simmons College, Boston, MA
5:00 – 5:50 p.m. **Student Papers**
6:00 – 8:00 p.m. **Dinner and Opening**
8:10 – 9:00 p.m. **Battles Lecture**
 Forbidden Symmetry--Relaxing the Crystallographic Restriction
 Frank Farris, Santa Clara University, Santa Clara, CA

Saturday, June 5, 2004

- 8:00 – Noon Registration
9:00 – 9:50 a.m.
 An Overview of Benford's Law with Applications to Auditing
 Rick Cleary, Bentley College, Waltham, MA
10:00 – 10:20 a.m. Break
10:30 – 11:20 a.m.
 The Curious Case of the Bird's Beak
 Robert Bradley, Adelphi University, Adelphi, NY
11:30 – 12:00 p.m. Business Meeting
12:15 – 1:15 p.m. Lunch
1:30 – 2:20 p.m.
 **A Linear Programming Approach to Predicting Award Winners
 (or, Who needs baseball writers when we know how they'll vote?)**
 David Abrahamson and Rebecca Sparks, Rhode Island College
2:30 – 3:20 p.m.
 The Uniform Boundedness Conjecture for Dynamics over Number Fields
 Robert Benedetto, Amherst College, Amherst, MA
3:30 – 4:20 p.m. **Contributed Papers**
3:30 – 4:20 p.m.
 The CUPM Curriculum Guide 2004 and the Curriculum Foundations Project
 William Barker, Bowdoin College, Bowdoin, ME

Program Committee

Julie Levandosky, co-chair, Framingham State College
Jason Molierno, co-chair, Sacred Heart University
Hema Gopalakrishnan, Sacred Heart University
Ed Sandifer, Western Connecticut State University

Local Arrangements

Joel Silverberg, Roger Williams College
Bruce Burdick, Roger Williams College
Frank Ford, Providence College

Abstracts / Speakers

Taking the Erlangen Program Seriously: A Modern Approach to Undergraduate Geometry

William Barker, Bowdoin College

An exciting and beautiful approach to undergraduate geometry can be built on Felix Klein's philosophy that geometry is the study of invariants under a group of transformations. Change the group of transformations -- the "symmetries" --- and one produces a new geometry. Much of the development can be done without coordinates, leading to an elegant blending of classical geometry and group theory. This lecture will present an outline of such a course, ending with applications to relativistic space-time and connections to the theory of Lie groups and Lie algebras.

The CUPM Curriculum Guide 2004 and the Curriculum Foundations Project

William Barker, Bowdoin College

For four years the MAA Committee on the Undergraduate Program in Mathematics (CUPM) has labored to produce its Curriculum Guide 2004, a set of recommendations designed to guide Mathematics Departments in designing and revising their programs for undergraduates. One difference from past Guides has been the reliance on information collected from the partner disciplines. This was done via a series of eleven workshops held across the country with representatives of the other disciplines. Organized by the CUPM subcommittee on Curriculum Renewal Across the First Two Years (CRAFTY) under the title the Curriculum Foundations Project, mathematicians learned what other disciplines need from the mathematics instruction given to their students. This lecture will present the major themes and findings of both the CUPM Curriculum Guide 2004 and the companion Curriculum Foundations Project and indicate how they can be used by departments to improve their programs. The lecturer was heavily involved with both efforts: he was a member of the seven person writing team for the Curriculum Guide and was the Chair of the Steering Committee for the Curriculum Foundations Project.

A Linear Programming Approach to Predicting Award Winners (or, Who needs baseball writers when we know how they'll vote?)

When a voter casts an award ballot, he often uses numerical criteria in his decision. While no one voter may consciously assign specific weights to such criteria, the results of the balloting may coincide with scoring based on a weighted average of those criteria. We illustrate the process of finding the appropriate weights by studying baseball's Cy Young Award voting over the last decade.

Dave Abrahamson received his Ph.D. in Applied Mathematics in 1981 from Brown University, specializing in differential equations under the direction of E. F. Infante. He taught at Brown University and The Lincoln School before coming to Rhode Island College in 1986.

Rebecca Sparks received her Ph.D. in 2001 from the University of Rhode Island, specializing in optimization and control systems under the direction of Orlando Merino. She is currently in her third year at Rhode Island College. Dave and Rebecca have combined their research interests and pursue topics in optimization, mathematics in sports, and pedagogy.

Donna Beers, Simmons College,

"Guidelines, Timelines, and Tools for Self-Assessment: Students Get Set for a Mathematics Conference"

Abstract: At many colleges and universities, undergraduates who major in mathematics must fulfill an independent study or capstone project requirement. In this talk we will describe our work this past semester in guiding team-based projects. Topics covered will include: setting goals and expectations, identifying project stages from planning through implementation, introducing students to research tools and information resources in mathematics, enhancing writing and presentation skills, and developing tools for self-assessment and peer assessment. We will report on lessons learned and consider ways of refining this

work for the future.

Bio: Donna Beers is Professor of Mathematics at Simmons College. She did her undergraduate and graduate work at the University of Connecticut where she earned her Ph.D. in commutative algebras. At Simmons she has served as chair of the Mathematics and Computer Science Department, director of the Honors Program, and director of the Information Technology program. Her teaching interests include the preparation of prospective teachers and an interdisciplinary Honors seminar on patterns. Donna has served as chair and governor of the NES/MAA. She has also served on the editorial boards of *The American Mathematical Monthly* and *Mathematics Magazine*. She presently serves on the Dolciani Mathematical Expositions editorial board and on the steering committee of the MAA PREP Workshop: Leading the Academic Department: A Workshop for Chairs of Mathematical Sciences Departments.

Robert Benedetto, Amherst College

"The Uniform Boundedness Conjecture for Dynamics over Number Fields"

Abstract: A polynomial f with rational coefficients maps rational numbers to rational numbers. If we repeatedly compose f with itself, we see that some rational numbers are preperiodic under f . That is, some numbers are eventually mapped to a periodic cycle of points under repeated application of the function. In 1950, Northcott proved that for any fixed f of degree at least two, there are only finitely many rational preperiodic points. In 1994, Morton and Silverman formulated a broad conjecture stating that in the above context, the number of such rational preperiodic points is bounded by a constant depending only on the degree of f . In this talk, we'll discuss their uniform boundedness conjecture, including the evidence and various results surrounding it.

Robert Bradley, Adelphi University

"The Curious Case of the Bird's Beak"

Abstract: The Marquis de l'Hôpital (1661-1704) wrote the first calculus book in 1696, where l'Hôpital's Rule was first published. Among the many other topics covered, l'Hôpital studied cusps, where continuous curves fail to have a derivative. He classified these points as being of two types: the more ordinary type, such as you would find in the "semi-cubic" equation, and a more exotic type, which resembles the shape of a bird's beak. L'Hôpital gave a mechanical argument to show that curves with cuspidal points of this second kind must exist, but did not produce the equation of any such curve. Almost half a century later, Gua de Malves (1712-1785) gave a proof that no algebraic curve could make the shape of a bird's beak. His argument involving infinitesimals was persuasive, and even Leonhard Euler (1707-1783) initially accepted it as valid. However, in the late 1740's, both Euler and Jean d'Alembert (1717-1783) fashioned counterexamples to Gua de Malves' claim. In this talk, I will trace the development of this curious episode in the history of the theory of equations, which is of interest in its own right, as well as for the light it sheds on the developing concept of function in the 18th century.

Rick Cleary, Bentley College

"An Overview of Benford's Law with Applications to Auditing"

Abstract: Benford's law proposes a distribution of digits, most notably first digits, in measurements that span many orders of magnitude. Auditors have begun using Benford's law as part of fraud detection schemes in a variety of settings. It is well known, however, that Benford's law does not apply in certain conditions, such as when the data is all of the same order of magnitude. In this presentation we give an overview of Benford's law and some ways to use it as a teaching tool. We discuss how the related output from popular auditing software raises interesting statistical questions for the accounting community. (This work is being done jointly with Prof. Jay Thibodeau, Bentley College Department of Accountancy.)

Bio: Rick Cleary is Associate Professor and Chair of the Department of Mathematical Sciences at Bentley, a business university in Waltham, MA. He specializes in applied statistical analyses. He enjoys finding ways to use his knowledge of statistics and the research process to work with people in a variety of fields. In the past few years he has worked on problems in sports, biomechanics, market research, and plant pathology, among others. At Bentley since 2001, he is now learning the ways in which statistical tools are applied in accounting, economics and finance. He previously taught at Saint Michael's College in Vermont (1980-1997) and Cornell University (1997-2001). Prof. Cleary's interests outside the classroom tend to athletics, especially running, golf, baseball and basketball. He was an undergraduate at Oneonta State College in New York, and earned his Ph. D. in Statistics at Cornell.

Frank Farris, Santa Clara University

The Battles Lecture

"Forbidden Symmetry--Relaxing the Crystallographic Restriction"

Abstract: If you look at enough swatches of wallpaper, you will see centers of 2-fold, 3-fold, 4-fold, and 6-fold rotation. Why not 5-fold centers? They cannot occur, according to the Crystallographic Restriction, a fundamental result about wallpaper patterns, which are defined to be invariant under two linearly independent translations. Even so, we offer convincing pictures that appear to show wallpapers with 5-fold symmetry. The talk is intended to be accessible to students who know something about level curves in the plane and linear algebra.

Bio: Frank Farris is an Associate Professor in the Department of Mathematics and Computer Science at Santa Clara University, and he is the current editor of *Mathematics Magazine*.

About Roger Williams University

Roger Williams University is an independent, co-educational institution, accredited by the New England Association of Schools and Colleges. The 140-acre waterfront campus in the historic seacoast town of Bristol, Rhode Island provides an ideal setting for learning and teaching. The University's undergraduate curriculum, a fusion of sound liberal arts studies and selective professional programs, is delivered by the faculty of a college of arts and sciences and five professional schools. The Ralph R. Papitto School of Law, which opened in the fall of 1993 and is accredited by the American Bar Association, offers the university's first graduate program.

The University's namesake, Roger Williams, founder of Rhode Island, is remembered as a leading champion of freedom in the American colonies. The government he established 360 years ago was based on religious toleration and separation of church and state.

The Department of Mathematics comprises six wonderful, dynamic individuals with diverse mathematical specialties and outside interests. The department offers a traditional undergraduate major in mathematics as well as a modified major for students seeking a double major with education.

Roger Williams University will host Euler 2004, the third annual meeting of the Euler Society, at our Portsmouth campus August 8-11. This meeting immediately precedes the MAA's MathFest in Providence. See www.eulersociety.org for more information as it becomes available.

Hotel Information

Hotel Possibilities are listed at

<http://www.rwu.edu/About+RWU/Campus+Visits/Local+Accommodations.htm>

Directions

Bristol Campus - *Main Campus*

(Meeting Rooms)

From Boston, Massachusetts:

- Take Route 93 South to Route 24 South to Fall River. From Route 24 bear right onto Route 195 West to Exit 8A (Tiverton/Newport RI) where you will continue on Route 24 South for approximately seven miles. Take Mt. Hope Bridge/Bristol exit. Bear right up hill and across Mt. Hope Bridge. The University is just after the bridge on the right.

From Massachusetts and points north:

- Take Route 128 South (also called 95) toward Rhode Island. Travel south on Route 95 to Route 195 East toward Cape Cod. Take Route 195 East to Massachusetts Exit 2 (Warren/Newport RI, Route 136 South). Follow 136 South for approximately nine miles. Campus is on your left; make a U-turn, just before Mt. Hope Bridge, to main entrance.

From Albany, New York and points west:

- Take Route 87 to Route 90 East (Mass Turnpike). Take Route 146 South to Route 95 South to Providence, Rhode Island. Take Route 195 East to Massachusetts Exit 2 (Warren/Newport RI, Route 136 South). Follow 136 South for approximately nine miles. Campus is on your left; make a U-turn, just before Mt. Hope Bridge, to main entrance.

From New York City and points south:

- Take Route 95 North to Providence, Rhode Island. Take Route 195 East to Massachusetts Exit 2 (Warren/Newport RI, Route 136 South). Follow 136 South for approximately nine miles. Campus is on your left; make a U-turn, just before Mt. Hope Bridge, to main entrance.

Portsmouth Campus - Residence & Conference Center

(For Hotel-style Accommodations)

From Boston, Massachusetts and points north:

- Take Route 93 South to Route 24 South to Fall River. From 24 bear right onto Route 195 West to Exit 8A (Tiverton/Newport) where you will continue on Route 24 South for approximately seven miles. Take Mt. Hope Bridge/Bristol exit. Bear right off the exit and take first right onto Anthony Road. RWU Residence and Conference Center will be your first driveway on the right.

From Albany, New York and points west:

- Take Route 87 to Route 90 East (Mass Turnpike). Take Route 146 South to Route 95 South to Providence, Rhode Island. Take Route 195 East towards Fall River/Cape Cod. Continue on 195 East to Fall River, Massachusetts. Take Route 24 South (Tiverton/Newport) for approximately seven miles. Take Mt. Hope Bridge/Bristol exit. Bear right off the exit and take first right onto Anthony Road. RWU Residence and Conference Center will be your first driveway on the right.

From New York City and points south:

Do you teach in HS? _____ in 2-yr College? _____