SPRING MEETING OF THE NORTHEASTERN SECTION OF THE MATHEMATICAL ASSOCIATION OF AMERICA

JUNE 8 – 9, 2001

NORWICH UNIVERSITY

Founded in 1819

NORTHFIELD, VERMONT

Program Chair: Sarah Mabrouk, Framingham State College
Local Arrangements Chair: Rob Poodiack, Norwich University

NORTHEASTERN SECTION OF THE MAA
SPRING MEETING: June 8 – 9, 2001
NORWICH UNIVERSITY, NORTHFIELD, VT
THEME: Mathematics Potpourri – Something For Everyone

Friday, June 8, 2001

9:00 a.m. – Noon	Susan Forman, Bronx Community College (CUNY) **NSF Grant Writing Workshop***	Tompkins 160
12:00 – 1:00 p.m.	Lunch (not included in workshop fee)	Harmon Hall
2:30 – 6:00 p.m.	Registration	Cabot Annex
2:30 – 3:30 p.m.	Executive Committee Meeting	Tompkins 167
3:00 – 3:50 p.m.	Carolyn S. Gordon, Dartmouth College **"Isospectral Graphs And Surfaces: What Can You Hear?"**	Cabot 85
4:00 – 4:50 p.m.	Ralph D'Agostino Sr., Boston University **"Development, Validation And Transportability Of The Framingham Coronary Heart Disease Risk Prediction Functions (Case Study Of A Successful Exercise In Mathematical Statistical Methods)"**	Cabot 85
5:00 – 5:50 p.m.	Cathy M. Frey, Norwich University **"Developing Mathematical Modules For The World Wide Web"***	Cabot 284 (Computer Lab)
5:00 – 5:50 p.m.	Student Papers (See schedule on page 3)	Cabot 85
6:00 – 6:40 p.m.	Reception	Milano Ballroom
6:45 – 8:00 p.m.	Dinner	Milano Ballroom
8:00 – 8:10 p.m.	Opening Remarks	Cabot 85
8:10 – 9:00 p.m.	**Battles Lecture**: Thomas Banchoff, Brown University **"From Providence To Portugal: Surfaces Beyond The Third Dimension On The Internet"**	**Cabot 85**

*Enrollment in the NSF Grant Writing Workshop and in Cathy Frey's workshop is limited to those who have pre-registered. Please check at registration desk to determine if any seats remain.

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Saturday, June 9, 2001

8:00 a.m. – Noon	Registration	Cabot Annex
8:00 – 8:50 a.m.	Nancy Eaton, University of Rhode Island **"When Do Near Packings Exist?"**	Cabot 85
9:00 – 9:50 a.m.	V. Frederick Rickey, United State Military Academy **"Calculus Classroom Chronicles: Catenaries, Clepsydrae, And Cycloids"**	Cabot 85
10:00 – 10:30 a.m.	Break	Cabot Annex
10:30 – 11:20 a.m.	Ezra Brown, Virginia Tech **"Square Roots From 1; 24, 51, 10 To Dan Shanks"**	Cabot 85
11:30 – 12:00 p.m.	Business Meeting	Cabot 85
12:00 – 1:00 p.m.	Lunch	Outside Math/Science Building
1:00 – 1:50 p.m.	Joe McKenna, University of Connecticut **"Thought Experiments With Mechanical Systems: Fun And Games With Rubber Bands And Springs"**	Cabot 85
2:00 – 2:50 p.m.	Marilyn Durkin, Bentley College **"Observations On The Dynamics Of The Complex Cosine-Root Family"**	Cabot 85
3:00 – 3:50 p.m.	Contributed Papers (See schedule on page 4)	

Student Paper Session

Friday, June 8, 2001 5:00-6:00 P.M. Cabot 85

Dual-Eulerian Graphs
Irma Servatius, Worcester Polytechnic Institute

A graph embedded on an orientable surface is called dual-eulerian if there is an eulerian trail which is at the same time an eulerian trail of the geometric dual. We show that there is a dual-eulerian embedding of the octahedron on the two-holed torus.

Pattern Formation in Reaction-Diffusion Models
Yakov Kronrod, Worcester Polytechnic Institute

Mathematicians and biologists have presented various models to describe patterns found in biological systems. In 1952, Alan Turing proposed that diffusion as a destabilizing influence can lead to patterns in a reaction-diffusion model. This idea of diffusive instability is contrary to the typical notion of diffusion as a smoothing influence. Using linear stability analysis and numerical simulations I investigate pattern formation in a model proposed by Meinhardt and Gierer. By varying properties of the system, patterns found in nature are simulated.

The Super Integer
Chlean Saur and Matthew Jarvis, Providence College

The purpose of the super integer class is to allow programmers to surpass the capacity of primitive variables in C++. The program uses unique algorithms to rapidly perform large calculations with exact precision. All calculations are performed in base 2^62 to increase efficiency and allow for bit shifting. Base 2^62 is used because the largest primitive C++ allows for is 64 bits. One bit is used for the carry in addition and one for the carry in subtraction. The remaining 62 bits store the digit. The addition and subtraction algorithms add or subtract node by node. Carries and borrowing are computed after all the additions or subtractions are completed to increase speed. The multiplication algorithm utilizes the addition function and bit shifting to increase the speed in calculations. The division algorithm uses standard long division with a binary search tree to determine the next digit in the quotient. The exponentiation algorithm utilizes bit shifting with the exponent and the multiplication function with the base.

Conjectures on the Collatz Algorithm
Brian Bayerle, Providence College

This talk will focus primarily on odd numbers in the Collatz algorithm and equations generated from their patterns. Additional topics include step and level patterns in the algorithm.

Contributed Paper Sessions

Saturday, June 9, 2001 3:00-3:50 P.M.

Session 1 – Cabot 292

3:00-3:15 ***Activity-based Interdisciplinary Learning of College Mathematics***
Will Stout, Salve Regina University

The activity-based, guided-inquiry learning strategies can be an effective addition to the lecture approach in the college mathematics classroom. Students learn through their own experience at arriving at the "truth" about mathematics and its connection to other disciplines. We will share examples of learning activities that link mathematics with scientific and engineering concepts such as force, motion, electricity, excavation, and strength of materials.

3:20-3:35 ***Using Computers to Teach the Mathematics of Investing***
Andrew Perry, Springfield College

Many fundamental mathematical ideas are applied naturally in analyzing the stock market, and students readily appreciate the applicability of the math. In the Stock Market unit of my Business Math class, students select a portfolio of investments and follow its progress over the course of several weeks. The topics studied include percentage return on investment (including the effect of commissions), P/E ratio, dividends, stock splits, and computation of profits including use of the FIFO,LIFO and weighted average methods of valuation. The internet is used as an investment tracking tool and for company research, and a spreadsheet is used for computations and graphing.

3:40-3:55 ***Using Multivariate Calculus To Provide An Introduction To Filtering***
Sarah L. Mabrouk, Framingham State College

Analysis of maxima and minima of functions of two or more variables is a standard topic in Multivariate Calculus. While students benefit from analysis of surfaces, they can also benefit from exploring problems that introduce them to techniques of mathematical modeling and lead to methods such as regression and/or introduce them to the‰ tools‰ of other disciplines, for example, the filters of Digital Signal Processing. In this paper, I will provide an introduction to filters and filtering and discuss how Multivariate Calculus can be used to enable students to derive filters in the time domain using a least squares analysis.

Session 2 – Tompkins 275

3:00-3:15 ***Euler: Mathematician and Diligent Bureaucrat : The Great Balancing Act***
John Glaus, Euler2007.com

Euler is the quintessential mathematician, but he also proved his worth to the Russian and Prussian imperial courts as an evenhanded, competent and tightfisted official. The intention of this paper is to show the human armor Euler developed to circumvent the complications caused by outrageous administrators and belligerent autocrats. The information contained in this talk has been taken from newly translated letters written from 1748-1763 to Kiril Razumovsky and Grigory Teplov while Euler was in Berlin. The introductions to Frederick II and de Maupertuis' correspondence to Euler by Eduard Winter and Pierre Costabel, editors of the OO/SQA,Vol. VI are used as seminal references outlining Euler's career in Berlin 1741-1765.

3:20-3:35 *A Mathematics Teacher Reads the Headlines*
Barry Schiller, Rhode Island College

In starting to clean out files to begin semi-retirement, I noted various newspaper and journal headlines and stories that I had clipped over the years with some expectation of their being useful in teaching some math class. So, perhaps appropriate for a lighter touch in a summer meeting, I will share some of these headlines and suggest how they might make some useful point in the classroom.

3:40-3:55 *The new kid on the block*
Tomas Kalmar, Goddard College

Tomás Kalmar will introduce himself by anecdotally comparing his experiences in mathematics education reform at Cal State University Monterey Bay with those at Goddard College, where he is now mathematician-in-residence. Plenty of time for questions and dialogue.

Session 3 – Cabot 85

3:00-3:15 *Fibonacci Groups*
Vince Ferlini, Keene State College

The recursive property idea of Fibonacci numbers can be adapted to define a collection of cyclically presented groups called Fibonacci groups. The first question considered is whether the groups are of finite or infinite order. We then look at the abelianization (the inclusion of the commutative property) of these groups and draw a connection between them and the Lucas numbers.

3:20-3:35 *Periodicity and Boundedness Nature of Positive Solutions of a Max-type Difference Equation*
Michael Radin, Mercey College

x[n+1] = max { A[n] / x[n], 1 / x[n-1] } , n = 0,1,2,..... where A[n] is a finite periodic sequence of positive real numbers and the initial conditions x[-1], x[0] are positive real numbers.

3:40-3:55 *Some Examples of Nontrivial Homotopy Groups of Modules*
C. Joanna Su, Providence College

In 1955, Professor Peter Hilton discovered and did the first work on the analogies between the usual homotopy theory of topological spaces with base points and the homotopy theory of modules over unitary rings. Unlike homotopy theory in topology, there are two homotopy theories of modules, the injective theory, and its dual, the projective theory. In this talk, we introduce the first nontrivial examples of absolute homotopy groups of modules.

Local Arrangements Committee: Cathy Frey, Gerard LaVarnway, Ernie True, Peter Bartram, Waclaw Timoszyk, Peter Bartram, Ted Marsden, Rob Poodiack, and Steve Wiitala (Dept. Chair), all of the Norwich University Mathematics Department.

Special Thanks are due to Norwich University President MG Richard Schneider, Provost Hubert Maultsby and Math/Science Division Head Eduardo Hernandez. Also to Penny Ritzer and Melody Wilson and to Amy and Hank of Sodexho Marriott and to Bizhan in Facilities.