The Electric Current

NEWSLETTER OF THE SEAWAY SECTION
MATHEMATICAL ASSOCIATION OF AMERICA

Volume 26, Number 1 **Fall 2002**

SUNY POTSDAM, POTSDAM, NY, NOVEMBER 1 – 2

Section Heads North for Fall Meeting

SUNY Potsdam will host this fall's meeting on Friday, November 1 and Saturday, November 2. This is the first time that the Section has met at SUNY Potsdam, although we have met at Clarkson University twice, in 1962 and 1972, and in nearby Canton, New York, at St. Lawrence University, in 1971 and 1982.

A Victorian and sandstone setting is the backdrop for the Village of Potsdam, the educational, cultural, and scientific center of St. Lawrence County. Rich in heritage, the community is also on the cutting-edge of technology, and offers modern medical and shopping facilities, a wide variety of restaurants, and one of the state's finest public school systems. Founded in 1806, the village is situated north of the Adirondack foothills on an abundant and wide band of the renowned, reddish-orange Potsdam sandstone.

SUNY Potsdam traces its origins to 1816 and the founding of the St. Lawrence Academy. It became the Potsdam Normal School in 1868 and the State Teachers College at Potsdam in 1942. Potsdam joined the State University of New York at its founding in 1948.

Potsdam has over 3500 undergraduates, close to 500 graduate students, and 271 faculty, 199 of whom are full-time. Thirty-one buildings occupy its 240-acre campus, highlighted by Crumb Memorial Library, the Crane Music Center, and the $8 million Maxcy Athletic Complex.

David Henderson, Randolph Lecturer

This fall, both the Friday evening and Saturday programs will take place on campus. Friday evening's activities will be held in Thatcher Hall, beginning at 6:00 p.m. with the social hour and dinner. The after-dinner talk, *Misadventures of a Maverick*, will be given by **Reuben Hersh**.

Professor Hersh received his Ph.D. from New York University, and taught at several colleges during his career, retiring from the University of New Mexico in 1994. He is currently teaching 12th grade mathematics at a preparatory school in Santa Fe, New Mexico.

Professor Hersh is perhaps best known to the mathematical community as the author or co-author of several extremely popular books, including *The Mathematical Experience* (1981), *Descartes' Dream* (1986), and *What is Mathematics, Really?* (1997). The Mathematical Experience won a National Book Award in 1983. Dr. Hersh also received the Chauvenet Prize in 1975 with Martin Davis and the Ford Prize in 1994 with Edgar Lorch.

The meeting returns to SUNY Potsdam on Saturday, with the morning session in Kellas Hall and most of the afternoon sessions taking place in Flagg Hall.

The program on Saturday morning features the annual John F. Randolph Lecture in Mathematics Education, to be given this year by **David Henderson** of Cornell University. The title of his address is, *Educational Mathematics*.

Dr. Henderson received his Ph.D. in 1964 from the University of Wisconsin. His research areas are geometry and mathematics education – or, as he prefers to call it, "educational mathematics." He says that his main theme is to enliven our conception of "proof." He defines proof as "a convincing communication that answers – *Why?"* and believes that proofs should be a central part of mathematics teaching at all levels.

Professor Henderson is the author of *Differential Geometry: A Geometric Introduction* (1998) and *Experiencing Geometry in Euclidean, Spherical, and Hyperbolic Spaces* (2000); the latter is an extensive revision and expansion of his popular 1995 text, *Experiencing Geometry on Plane and Sphere*.

See **Meeting Highlights** *Page 14*

SEAWAY SECTION MATHEMATICAL ASSOCIATION OF AMERICA

2002 FALL MEETING

November 1 – 2
SUNY Potsdam
Potsdam, New York

PROGRAM

Friday Afternoon, 117 Satterlee Hall

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

Friday Evening, Thatcher Hall

6:00 – 7:00 Social Hour (cash bar)
7:00 – 8:30 Dinner

8:30 – 9:30 *Misadventures of a Maverick*
Reuben Hersh,
University of New Mexico

Saturday Morning, McNamara's Diner, Potsdam

7:15 – 8:15 Department Chairs' Breakfast

Saturday Morning, Kellas Hall

08:00 – 11:00 Registration

Saturday Morning, 105 Kellas Hall

08:40 – 08:45 *Welcome*
Dr. Margaret Madden, Provost,
SUNY Potsdam

08:45 – 09:35 *Computer Graphics in Curved Spaces*
Jeff Weeks

09:45 – 10:35 *Abnormal Cardiac Rhythms: Insights from Mathematical Models*
Colleen Clancy,
Columbia University

10:35 – 11:00 Business Meeting

11:10 – 12:00 **John F. Randolph Lecture**
Educational Mathematics
David Henderson,
Cornell University

Saturday Afternoon, Thatcher Hall

12:00 – 1:30 Lunch

Saturday Afternoon, 105 Kellas Hall

1:30 – 2:25 Panel Discussion:
Review and Accreditation of Programs in Mathematics and Mathematics Education
Moderator: Joseph Straight,
SUNY Fredonia

Panelists: Cheri Boyd,
Nazareth College
Leo Alex,
SUNY Oneonta

Saturday Afternoon, 210 Flagg Hall

2:30 – 2:55 *Teaching Calculus in a Learning Community*
R. Bruce Mattingly,
SUNY Cortland

3:00 – 3:25 *Developmental Courses: Should We Be Tough or Soft?*
Marlo Brown,
SUNY Binghamton

3:30 – 3:55 *A Piece of the Pi*
Joseph Petrillo,
SUNY Binghamton

Saturday Afternoon, 211 Flagg Hall

2:30 – 2:55 *Beyond Euclid*
James Parks,
SUNY Potsdam

3:00 – 3:25 *Angel: Online Instruction Management*
Dawn Jones,
SUNY Brockport

3:30 – 3:55 *Calculus Through Technology*
Harold Ellingsen,
SUNY Potsdam

Saturday Afternoon, 238 Flagg Hall

2:30 – 2:55 *A New Method for Solving Bessel's Equation Using the L2-transform*
Osman Yurekli, Ithaca College

3:00 – 3:25 *Some Absolute and Hyperbolic Constructions with an Unmarked Right Angle*
Charlie Jacobson, Elmira College

3:30 – 3:55 *Patterns in Coin Tossing*
James Marengo, RIT

See **Program and Abstracts,** *Next Page*

Program and Abstracts

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Saturday Afternoon, 239 Flagg Hall

2:30 – 2:55 *Generating Undergraduate Research Projects Using Geometry*
David Brown, Ithaca College

3:00 – 3:25 *A Liberal Arts Course on Mathematics and Music*
Julia Wilson, SUNY Fredonia

3:30 – 3:55 *Handshaking to Sums of Powers of Integers*
Thomas Pfaff, Ithaca College

Saturday Afternoon, 240 Flagg Hall

2:30 – 2:55 *TBA*

3:00 – 3:25 *Two Interpretations of Discrete Diffusion and Their Consequences on Turing Instabilities*
Bernard Brooks, RIT

3:30 – 3:55 *Partition of Integers as a Hidden K-12 Curriculum*
Sergei Abramovich and Peter Brouwer, SUNY Potsdam

Saturday Afternoon: Student Program

12:00 – 1:20 **Dexter's Café, Thatcher Hall**
Lunch and Discussion: Students who participated in REUs this past summer will share their experiences.

1:30 – 2:25 **205 Kellas Hall**
Student Workshop: *Fun with Graphs*
Patti Fraser Lock,
St. Lawrence University

2:30 – 4:00 **205 and 206 Kellas Hall**
Parallel Sessions of Student Talks

ABSTRACTS

Reuben Hersh

It is not hard to "catch hell" if you question the unquestionable. "Math is all about eternal truths," for example, or, "The only thing we have to do to make college math teaching successful is update the curriculum and use more technology." However, after you catch hell for questioning a few sacred dogmas, you are still here! So, you can go on telling it like it is.

Jeff Weeks

The mathematics of real-time 3D graphics in curved spaces is elegant, beautiful and simple. Best of all, it's so similar to the mathematics of standard flat-space graphics that the graphics card in your PC or Mac will render curved-space animations in hardware just as quickly and accurately as it renders flat-space scenes.

The talk will begin with an elementary introduction to curved space, using physical models and interactive 3D graphics to build intuition and demonstrate some surprising visual effects. Next, we'll take a look at how your computer renders scenes in flat space, and find that the same algorithm works in curved space, as well. Along the way, just for fun, we'll see connections with space-time and special relativity.

Colleen Clancy

Isolated cardiac conduction disease, idiopathic ventricular fibrillation and Long-QT syndrome, are examples of clinical syndromes, observed as abnormal cardiac rhythms, which may predispose patients to premature death. Each may arise from genetic mutations in membrane spanning proteins (ion channels) that allow for the passage of ions in a time and voltage dependent manner. It is, however, difficult to make the connection between gene defects and clinical syndromes due to the overwhelming complexity of physiological interactions, even at the level of a single cell. As such, structural and functional information is often obtained experimentally from artificial expression systems that are removed from the physiological environment.

Mathematical models provide a unique tool that allows for construction of virtual transgenic cells in order to investigate integrated electrical behavior of cells. Models are constructed based on stochastic gating properties of individual ion channels that can be described as Markovian processes. Parameters are optimized based on experimental data for populations of channels, the behavior of which is well represented by probability distributions. Groups of ion channels are then integrated and investigated as a complex dynamical system by applying numerical methods to solve coupled non-linear ODEs.

David Henderson

What do ideas and results (theorems) in mathematics mean? And how can we understand (and experience) them on the basis of what they mean? How does this relate to what and how we teach?

Saturday Afternoon Panel

We are living in the age of assessment, and no doubt your department is required to undergo periodic review of its programs. In addition to such "local" assessments are the extensive program and institutional reviews that many of us have recently undergone or are now experiencing as part of the process of achieving accreditation by the National Council for Accreditation of Teacher Education (NCATE). The panelists will share their experiences with local and/or NCATE program reviews, with the aim of imparting some wisdom that may make the process easier and of more value.

See **More Abstracts** *Next Page*

More Abstracts

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R. Bruce Mattingly

SUNY Cortland has established a number of programs for first-year students called learning communities. Cohorts of students enroll in a block of classes that are grouped around a common theme. One such community offered in Fall 2002 is entitled "Earth and Sky," and is centered on two courses: physical geology and astronomy. The focus of this presentation will be upon the precalculus course that I am currently teaching as part of the program. The talk will include a discussion on how the course was designed to meet the interdisciplinary goals of the program, a report from the trenches on how the course is actually going, and possible implications for teaching other introductory mathematics courses using this approach.

Marlo Brown

Within the last ten years, there have been several major changes to the developmental math classes offered at SUNY Binghamton. About ten years ago, we offered three very low-level, half-semester courses. Gradually, we have increased the level of these courses and now we offer two full-semester, more advanced courses. What caused these changes, and how have the students responded to the increased demands on them? This talk will discuss the history of the developmental mathematics courses at Binghamton.

Joseph Petrillo

Platonism, the philosophical theory that the existence of mathematical objects is independent of our knowledge of them, forms the foundation of conventional mathematics. The "law of the excluded middle" and the "trichotomy law" of the real numbers are two of the most important examples of principles that are both required and accepted by the Platonist. Some mathematicians, called constructivists, hold a drastically different point of view, however. They assert that mathematical objects do not exist independent of our construction of them. In particular, constructivists believe that a given proposition is neither true nor false until such a time as one determines which. In other words, the law of the excluded middle is invalid. For example, the constructivists would argue that the statement, "In the decimal expansion of pi there occurs a string of 1000 consecutive zeros," is neither true nor false, since at present it is unknown whether or not such a string occurs. This talk will elaborate on the above and present L. Brouwer's construction of a real number for which the trichotomy law fails.

James Parks

Teaching geometry with Sketchpad allows you to give guided investigations, open-ended explorations, and demonstrations of results. It also gives you the power of "dynamic geometry." which makes many problems much easier to comprehend. Several examples of such problems will be given.

Dawn Jones

Over the past few years I have used many online instruction management systems. Currently, I am using the Angel system, which has been adopted across the SUNY Brockport Campus. In this talk, I will give a brief overview of why you would want to use such a system and show you some specific examples from my classes.

Harold Ellingsen

I will discuss a project involving students and instructors of Calculus I and II at Elizabeth City State University. The purpose of the project was to enhance the learning of the students and the teaching of the instructors through technology, to create courseware that would develop students' mathematical and critical thinking skills and improve teaching effectiveness, and to provide exceptional students with the opportunity to serve as lab assistants. I will describe how the students learn the basics of Mathematica, how they work in groups on the lab assignments, and how the instructors benefit, as well, as the creation of the labs produces new problems and new ways to look at familiar concepts.

Osman Yurekli

There are various methods of solving Bessel's equation. We will present a new method to solve Bessel's equation using the L2-transform.

Charlie Jacobson

A Euclidean construction is one that depends upon Euclid's parallel postulate (EPP), while a hyperbolic construction depends upon the hyperbolic parallel postulate (HPP). An absolute construction depends upon neither. It is well known that in Euclidean geometry, an unmarked right angle (URA) is equivalent as a construction tool to a compass and straightedge. The author illustrates basic absolute and hyperbolic constructions done using a URA, including the bisection of an acute angle in hyperbolic geometry. That construction, together with the standard URA bisection construction in Euclidean geometry and the ability to use a URA to decide whether EPP or HPP holds, constitutes a finite procedure for the bisection of an acute angle in absolute geometry. The author concludes with some suggestions for further study.

James Marengo

On the average, how many tosses of a fair coin are required to obtain a specified pattern, such as HTH? Also, what can be said about the probability distribution of the number of tosses required to get such a pattern? Questions such as these will be examined with the help of some basic concepts involving Markov chains.

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Additional Abstracts

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David Brown

When choosing undergraduate research projects, care must be given to finding interesting projects requiring minimal background knowledge and an assurance of some progress. In this talk, I will present a general area that has produced many project ideas for a junior-level research course taught at Ithaca College. The way that distances are measured in the plane has an effect on the resulting geometry and isometry structure of the plane. I will describe how metrics such as the taxi-cab metric can lead to an array of questions to investigate. In particular, I will talk about a subway metric and what I call the octagonal metric.

Julia Wilson

Cross-disciplinary courses on math and music are increasingly popular at the undergraduate level, as there is a wide range of topics for such a course and they can be treated at a variety of levels. I will describe the development of a course geared to non-math major, liberal arts students. This course satisfies a general education requirement for an upper-level course that provides a capstone experience. It places mathematical topics in a historical and cultural context, and aims to give students an appreciation of the power of math as an analytical and descriptive tool.

Thomas Pfaff

Formulas for sums of powers of integers are well known and, in fact, Mathematica will produce them when asked. Most of the proofs of these results use induction or recursion. This talk will use a combinatorial approach to derive these formulas.

Bernard Brooks

Two different interpretations of discrete diffusion are discussed. The discrete interpretations are compared to results in continuous reaction diffusion equations. It will be shown that the order in which the reaction diffusion components are applied makes a difference in the components' qualitative behaviors. It will also be shown that the "react, then diffuse" interpretation mirrors continuous reaction diffusion better, and so that interpretation should be used in simulation of continuous systems. Moreover, the "diffuse, then react" interpretation will always result in the undesirable qualitative effect of a Turing Instability with strong enough equal diffusion rates.

Sergei Abramovich and Peter Brouwer

Motivated by work done with pre-teachers of mathematics in a problem-solving course, this presentation will show how computing technologies, including a spreadsheet, *Maple*, and graphing software, facilitate an informal journey into a hidden aspect of the formal content of the pre-college curriculum dealing with the arithmetic of partitions. This simply formulated yet remarkably profound concept is implicitly present at all levels of the curriculum and may be viewed as a hidden thread. By using three problems from different grade levels within the New York state school curriculum as an example, it will be suggested that a deeper perspective on seemingly disconnected problem-solving contexts may serve as a powerful didactical tool in helping teachers to appreciate mathematics and its pedagogy as an integrated whole. It will be argued that the method of generating functions enhanced by technology makes it possible to revisit the algebra-oriented curriculum through a combinatorial lens.

2003 Spring Meeting
April 4 – 5
Alfred University

The Spring 2003 meeting of the Seaway Section will be hosted by Alfred University and will take place on Friday and Saturday, April 4 and 5. The banquet speaker will be Mike Breen from the Public Relations Office of the American Mathematical Society, who has taught at Alfred.

Anyone wishing to contribute a talk should send the title and abstract to Gary Towsley, Program Chair, at

towsleyg@geneseo.edu

The deadline for submissions is Monday, February 3, 2003. Questions concerning local arrangements should be directed to Debra Waugh (waugh@alfred.edu) at Alfred University.

Meeting Highlights

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Jeff Weeks, a freelance mathematician living in Canton, NY, will lead off the Saturday morning program with a talk entitled *Computer Graphics in Curved Spaces*.

Jeff has an AB from Dartmouth and earned his Ph.D. at Princeton. His main interests are geometry, topology, cosmology, and education. Currently a MacArthur Fellow, his present research centers on a collaborative effort with cosmologists to test the topology of the universe using satellite data. His educational activities have led to a multimedia unit for middle school students, *Exploring the Shape of Space* (Key Curriculum Press, 2001). The unit uses classroom activities, computer games, and video to let students explore universes that are finite but have no boundaries.

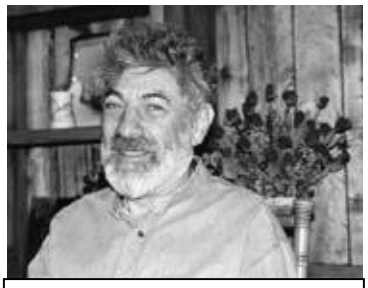
Jeff is also the author of the book *The Shape of Space*, which has just come out in a new edition from Marcel Dekker, and numerous research and expository articles.

Completing the Saturday morning program is **Colleen Clancy**, who earned a BS from Union College in 1995 with a double major in mathematics and biology. Dr. Clancy will speak on *Abnormal Cardiac Rhythms: Insights from Mathematical Models*.

After leaving Union, Colleen went on to earn her Ph.D. from the Department of Physiology and Biophysics at Case Western Reserve University. Her dissertation was entitled, *Computational Models of Congenital Abnormalities in Ion Channels: Linking Defects to Abnormal Cellular Functions*. She came to the section's attention when she was featured in the September 7, 2001 edition of the *Chronicle of Higher Education* in the article, "4 New Ph.D.'s to Watch." Dr. Clancy is now a Postdoctoral Research Scientist in the Department of Pharmacology at Columbia University.

The program on Saturday afternoon features a panel discussion on program review and accreditation, as well as several interesting parallel sessions.

The student program will formally begin during lunch with a discussion of REU experiences. Following lunch there will be a workshop, *Fun With Graphs*, led by Patti Lock of Saint Lawrence University. The program concludes with talks by students. Anyone wishing to contribute a talk should contact **Victoria Klawitter**, Student Program Chair, at klawitv@potdam.edu.



Reuben Hersh
Banquet Speaker

Important Meeting Update

Unfortunately, Colleen Clancy has had to cancel. Filling in will be **Mark McKinzie** of Monroe Community College. Stand by for more details.

SUNY Potsdam to Host Fall Meeting

The Department of Mathematics at SUNY Potsdam will host the Fall 2002 Meeting of the Seaway Section. Chairing the local arrangements committee is **Cheryl Miller**, Associate Professor of Mathematics.

Located in McVicar Hall, the Department of Mathematics offers a traditional mathematics major, an honors mathematics major, a Masters of Arts degree, and a double degree program (the BA/MA program) that allows highly qualified students to earn both bachelors and masters degrees in four years.

The traditional major requires 33 semester hours consisting of ten mathematics courses: Calculus I and II, Multivariate Calculus, Set Theory and Logic, Linear Algebra I, Modern Algebra I, Advanced Calculus I, Problem Seminar, and two electives from a variety of upper-division pure and applied mathematics courses that are offered on a regular basis.

The program is based on the premise that the study of pure mathematics can be undertaken successfully by a large number of students if they are provided with a supportive environment. This includes careful and considerate teaching by a well-trained and dedicated faculty, continual encouragement, successful role models, enough success to develop self-esteem, enough time to develop intellectually, recognition of achievement, and a belief that the study of mathematics is a worthwhile endeavor.

The department is currently home to about 125 majors and ten full-time faculty members. Its alumni have gone on to careers in banking, insurance, research and development, the state and federal governments, and, of course, to teaching at all levels. About 20% of the mathematics graduates go on to graduate school. More information is contained in the booklet, *SUNY Potsdam Mathematics Alumni and Their Careers*.

Registration, Lunch, and Refreshments

Registration will take place in Thatcher Hall on Friday evening during the social hour, and also on Saturday morning from 8:00 until 11:00 in Kellas Hall. Refreshments will be available in the registration area on Saturday morning, and following the sessions on Saturday afternoon. The Saturday Lunch will be served from noon to 1:30 in Thatcher Hall. The lunch will be buffet-style.

Directions to SUNY Potsdam

SUNY Potsdam is located about ½ mile south of the center of the village off Pierrepont Avenue, which is Route 56. If you are entering the village on Route 11, or on Route 56 from the north, look for signs for the college. Enter the campus at Barrington Drive on Friday and on Lake Placid Drive on Saturday.

Pre-registration Form

Name: _____

Institution: _____

MAA Member: Yes _____ No _____

Registration Fee: _____ @ $15 $ _____

Friday Dinner: _____ @ $25 $ _____

Entrée Choices: _____ California chicken
_____ prime rib
_____ shrimp scampi
_____ vegetable Provencal

Saturday Lunch: _____ @ $10 $ _____

Total: $ _____

Please pay in U.S. funds and make checks payable to **Seaway Section, MAA. Lunch and dinner reservations, with payment, should be received by Friday, October 25.** Note that there is no registration fee or lunch charge for students, but students should still pre-register.

Mail to: Cheryl Miller
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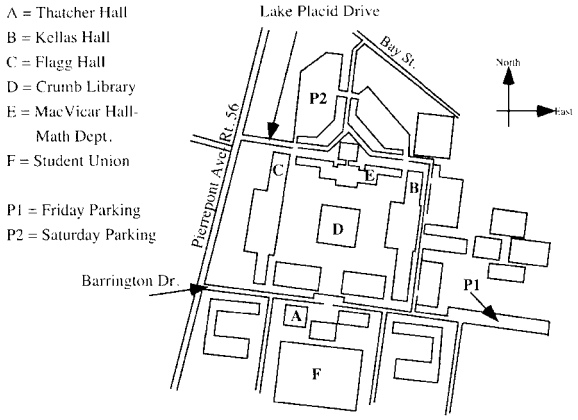
SUNY Potsdam Campus



Accommodations

Blocks of rooms have been reserved at the following hotels: *The Clarkson Inn*, One Main Street, Potsdam, 315-265-3050, $109 for a double; *Comfort Suites*, 6000 US Route 11, Canton, 315-386-1161, $90 for a double. To secure the above rates, mention the MAA meeting at SUNY Potsdam and reserve by October 1.

Directions to the Hotels

The Clarkson Inn is located on Main Street in downtown Potsdam, on the east side of the Raquette River, near where Main St. (US Route 11) intersects NY Route 56.

The Comfort Suites is located just east of Canton, on US Route 11, near the intersection with NYS Routes 68 and 310.

Meeting Website

Additional hotels, driving directions, maps, an online registration form, and the latest program information may be found at meeting website:

www.potsdam.edu/MAA_meeting