81^{th} Annual Meeting
MAA – Wisconsin Section
April 5-6, 2013

University of Wisconsin—Marshfield

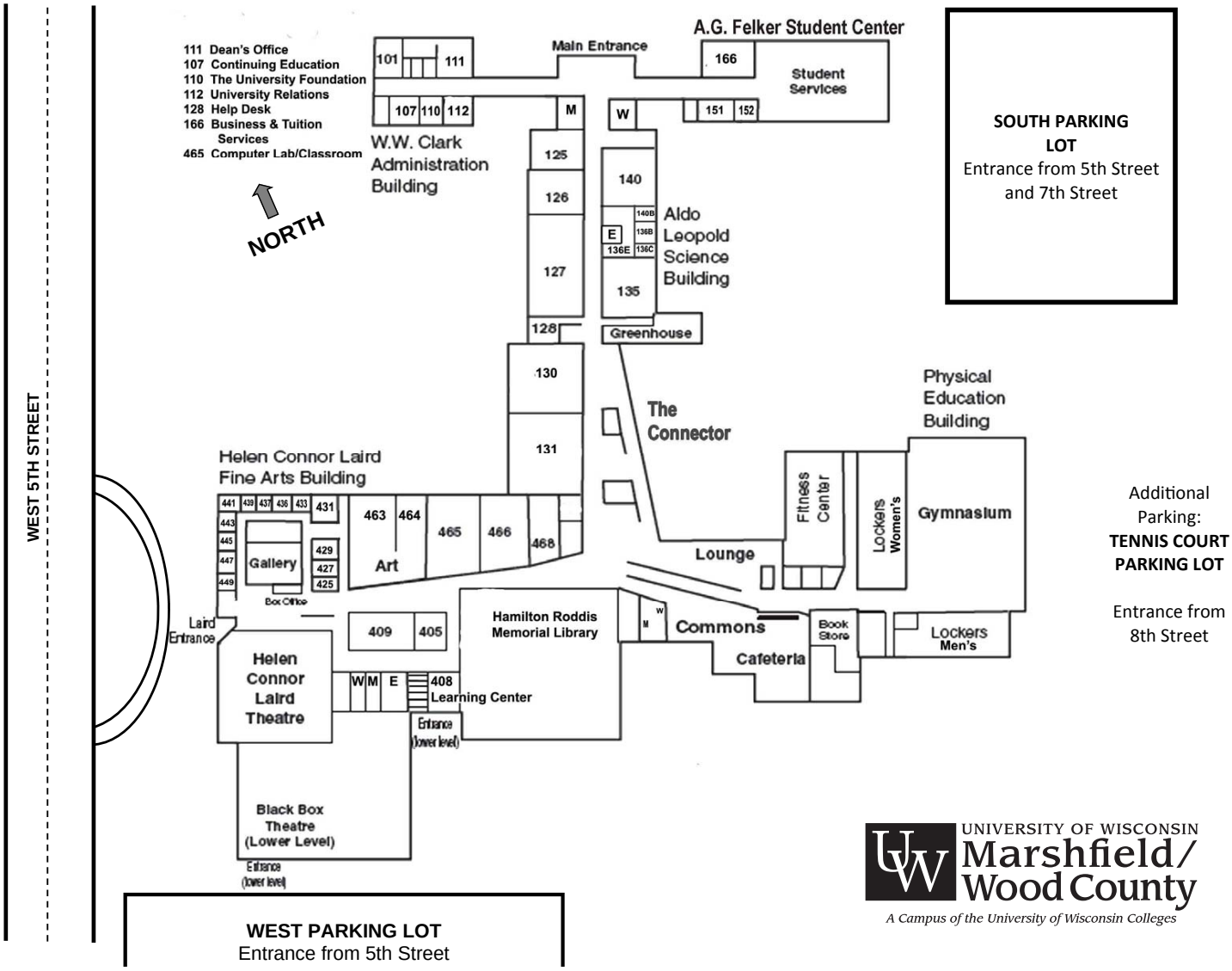
Welcome to the University of Wisconsin–Marshfield / Wood County!

2000 West 5th Street
Marshfield, WI 54449
Phone: (715) 389-6530

Wireless Internet

Wi-fi connectivity is available in the Aldo Leopold Science Building. Connect to the network UWMARSHFIELD – no password is required; or connect to MSF-GUEST, open the web browser on your mobile device and accept the terms of use before being able to have internet access.

*** denotes events appropriate for students**



UNIVERSITY OF WISCONSIN
Marshfield/ Wood County
A Campus of the University of Wisconsin Colleges

Invited Speakers

Diane Benjamin teaches at Edgewood College in Madison Wisconsin, and previously taught at UW-Platteville. Diane's area of specialization within mathematics is abstract algebra; where she has a short but happy list of publications. Throughout her career, she has also worked, quite concertedly, to build second path of (evolving) expertise in the scholarship of teaching; where she has a growing list of publications and presentations. Outside of her profession, her favorite things are tearing around with her best pal and grandson Keaton, knitting, and ripping up the back-roads of Ireland with her one-and-only in any order.

Walter Stromquist is the Editor of *Mathematics Magazine*. After attending the University of Kansas and Harvard University, he worked first for the U.S. Treasury's Office of Tax Analysis. He then joined Daniel H. Wagner, Associates, a mathematical consulting firm, where his work included applications of mathematics to submarine search, financial risk management, and valuation of oil fields. He has continued this work as an independent consultant, and has published papers related map coloring, permutation patterns, fair division, and applied topics. He has taught most recently at Bryn Mawr College and Swarthmore College and in the AwesomeMath Summer Program. He has been active in the MAA and in the EPADEL Section.

Robert Devaney is currently Professor of Mathematics at Boston University. He received his undergraduate degree from the College of the Holy Cross in 1969 and his PhD from the University of California at Berkeley in 1973 under the direction of Stephen Smale. He taught at Northwestern University and Tufts University before coming to Boston University in 1980. His main area of research is dynamical systems, primarily complex analytic dynamics, but also including more general ideas about chaotic dynamical systems. Lately, he has become intrigued with the incredibly rich topological aspects of dynamics, including such things as indecomposable continua, Sierpinski curves, and Cantor bouquets. He is President-elect of the Mathematical Association of America.

Conference Schedule

Friday, April 5

12:00–5:00	Registration*	Lobby, Aldo Leopold Science Building
12:00–5:00	Book Exhibits & MAA Book Sale*	Rm 466
12:00–5:00	Student Lounge*	Upper Commons

1:00–1:25 Meggan Hass (UW–Stevens Point student sponsored by Edwin (Jed) Herman)* Rm 125

Self-Similar Groups

A self-similar group is a type of group that has a natural relationship to fractal geometry. Our focus will be to introduce the concept of self-similar groups and to illustrate with examples, particularly the Basilica Group. Time permitting, we may also discuss the relationship between self-similar groups, fractals, and random walks.

1:00–1:25 Mark Snavely (Carthage College)* Rm 126

One Way to Run an Actuarial Science Course

I will present the format I have used to teach an actuarial science course at Carthage. I will discuss my course goals and how the course has evolved.

1:00–1:25 Edward J. Clemons (UW–Oshkosh)* Rm 131

Student Retention and Peer Tutoring for Developmental Math Courses

An overview of curricular improvements and peer tutoring related to a developmental math course and their impact on exam scores and the percentage of students earning all-exam averages of 80% or higher.

1:00–1:25 Eric Alan Eager (UW–La Crosse)* Rm 135

Global Asymptotic Stability of Structured Nonlinear Plant-Seed Bank Models

Many plant populations have seed banks. Seed banks are important for plant population dynamics because they buffer against environmental perturbations, reduce the probability of extinction, protect biodiversity and store important genetic information. Viability of the seeds in the seed bank can depend on the seed's age, hence it is important to keep track of the age distribution of seeds in the seed bank. In this talk we introduce a general, nonlinear plant-seed bank model where the seed bank is age-structured and coupled to an integral projection model (IPM) for the plant population. We show that, under reasonable biological assumptions, that the plant-seed bank population converges to a globally asymptotically stable equilibrium population, and there is an explicit formula for this equilibrium population. We conclude the talk with some open mathematical questions that are of interest to plant ecologists.

1:30–1:55 Abby Pekoske (Carthage College student sponsored by Mark Snavely)* Rm 125

Symbolic Dynamics over Free Groups

Symbolic Dynamics is used to model complex topological spaces. This work explores the symbolic dynamics over a non-Abelian group, the free group on two generators. It introduces the fundamentals of symbolic dynamics and Cayley graph coloring. We then explain the relationship between these fields and explore implications of shift invariant classes of subshifts over the free group.

1:30–1:55 Benjamin V.C. Collins and James A. Swenson (UW–Platteville)* Rm 131

Flipping the Discrete Math Classroom

The idea of "Flipping the Classroom" – recording the lectures for the students to view on their own time and using class time to work on problems – has been around for some time in math and science education. We will describe our experiences using this pedagogy in Math 2730, Discrete Mathematics. This course, like many Discrete Math courses, serves also as an introduction to proof techniques, and so has proven very challenging for many students. Sadly, flipping the classroom has not lead to universal success, but there are still some signs that it's a worthwhile investment of time and energy.

1:30–1:55 Melissa Bingham (UW–La Crosse) Rm 135

Distributions for Three-Dimensional Orientations

Three dimensional orientation data are common in areas such as materials science and human kinematics. Based on an intuitive, geometric construction, development of distributions for modeling such data will be discussed. Advantages of these distributions and statistical inference techniques will be considered.

2:00–2:50 Sarah Bennett (UW–BC)* Rm 127

Doing SoTL (Scholarship of Teaching and Learning) Projects

For this interactive discussion I would like to begin by summarizing a few SoTL projects I have done with some explanation of the findings. I would share some resources for getting started in doing research in our classrooms or teaching and learning research projects. Then, I would like to open a discussion and brainstorming time to talk about what some valuable and interesting projects might be that participants are interested in doing.

2:00–2:25 Steven Metallo (Carthage College student sponsored by Mark Snavely)* Rm 125

Dynamical Systems and Circle Maps

Dynamics is a branch of mathematics that uses function iteration to create a dynamical system. My focus is on the dynamics of $f_2(x) = 2x \bmod 1$ where n is a natural number and the domain is the continuous interval $[0, 1]$ where $0 \equiv 1$. This simple function leads to complicated dynamics; it has periodic points of every period as well as infinitely many non-periodic points. So in order to more efficiently analyze this system, we introduce symbolic dynamics. This is done by using a Markov partition to split up the domain into intervals

with specific properties. By applying the intervals of the Markov partition, we can construct a special matrix known as a Markov matrix. Then, for certain Markov partitions, the eigenvalues of the corresponding Markov matrices are 2 and the roots of unity.

2:00–2:25 Daniel Bero (UW–La Crosse student sponsored by Melissa Bingham)* Rm 126

A Permutation Test for Three Dimensional Rotational Data

Statistical inference procedures that require no distributional assumptions make up the area of nonparametric statistics. The permutation test is a common nonparametric test that can be used to compare measures of center for two data sets, but it is yet to be explored for 3-dimensional rotation data. A permutation test for such data is developed and the statistical power of this test is considered under various scenarios. The test is then applied to real-life three dimensional joint rotational data.

2:00–2:25 David Scott, McKenzie Lamb and Andrea Young (Ripon College)* Rm 131

Active Learning from Beginning to End

In this talk, we will discuss ways in which we use active learning techniques at all levels of the mathematics curriculum at Ripon College. In particular, we will discuss the use of inquiry-based learning in a mathematics for liberal arts course, a flipped calculus class, and a writing intensive inquiry-based hybrid approach in geometry and linear algebra. We will also highlight the benefits to our students and our department of having a consistent pedagogical approach.

2:00–2:25 Mu-Ling Chang (UW–Platteville)* Rm 135

Why is the Square Root of Two Irrational?

This is my third talk in a series of talks on the irrationality of the square roof of 2. In my previous two talks, more than ten different proofs were given. Just when I thought I had shown all of the algebraic proofs that students can understand, I found more. These new proofs are not difficult and will be given in this talk.

2:30–2:55 Brett Rosiejka, Zach Tully and Isaac Craig (UW–La Crosse students sponsored by Ted Wendt)* Rm 125

Can the U.S. Still Feed Itself?

Given twenty four hours to model one single question, our team of three competing in the 2012 Wisconsin Mathematical Modeling Challenge won by successfully answering the question of when the United States will not be able to feed itself. We modeled this problem by creating graphs from public data. Using calculus and lots of linear interpolation, we found the answer to be quite thought-provoking.

2:30–2:55 Xiang Han (UW–Whitewater student sponsored by Ki-Bong Nam)* Rm 126

The Invariants and Extension of Some Groups

I'll give a lecture about the extension of p-adic number rings and the invariants of some classic groups which are over the finite field or p-adic number field.

2:30–2:55 Richard Spindler (UW–Eau Claire)* Rm 131

The Chippewa Valley Math Teachers' Circle: Who, What, Why, How?

The Chippewa Valley Math Teachers' Circle (CVMTC) was formed in the summer of 2011 whose mission is to foster a culture of mathematical problem solving in the middle school classrooms in the Chippewa Valley. In this talk, I will discuss who we are, what we are about, why we are involved in this, and how it works.

2:30–2:55 Lee, Ki-Suk (Korea National University of Education)* Rm 135

Primitive roots, semi-primitive roots, quarter-primitive roots

Z_m* is a multiplicative group of modulo m. According to m, we may find primive roots, semi-primitive roots and quarter-primitive roots. Sometimes they are useful for modular calculation.

3:00–3:50 Kirthi Premadasa and Gregory Bard (UW–Baraboo, UW–Stout)* Rm 131

Emerging Technologies in Mathematics Instruction

The last few years has seen a surge of instructional technology, some of which, when used appropriately could help the instructor to create a better learning experience to the students. The idea behind this panel discussion is to provide Wisconsin mathematicians with a glimpse of some of these technologies which are most useful for the teaching and learning of mathematics. We will show how cell phones and twitter can be used be used as classroom response systems. We will also demonstrate you a variety of free mathematical software such as Sage, Sage-Aleph (The "wolfram alpha counterpart of Sage), wolfram alpha and the Microsoft math add-in. We plan to demonstrate some free or inexpensive screen cast options as well as the best options for handwriting on tablets that will no doubt help the math instructor in these times where flip classrooms and flex options have transformed the college math classroom. We will also showcase the instructional mind map created by Sherrie Serross which will provide links to a number of math databases which will contain both visualization and interactive learning tools, as well as contain a comprehensive coverage of all aspects of math related instructional technologies.

3:00–3:25 Jake Diekfuss and Kyle Steingraber (UW–Oshkosh students sponsored by Steven Winters)* Rm 125

C^3 Colored Cube Craziness

We will be giving a talk about the instant insanity cube stack puzzle. We will go over a brief history, and also some newer versions of the puzzle that have been created. We also will give an explanation of how to solve them and present our systematic approach to finding every possible solution(s) to these types of puzzles.

3:00–3:25 Denisa R Goia (UW–Whitewater student sponsored by Ki-Bong Nam)* Rm 126

Notes on Sylow Theorem

Let G_1 be a subgroup of a group G such that $|G| = p_1^{i_1} \cdots p_n^{i_n}$ where $p_1 < \ldots < p_n$ are primes. If G_1 has a normal Sylow p_n subgroup, then G is not simple where $|G_1| = p_1^{i_1} \cdots p_{n-1}^{i_{n-1}} p_n$.

3:00–3:25 Robert F. Allen (UW–La Crosse)* Rm 135

Mass-Action in Action: From Zombies to Undergraduate Research

Beginning in the fall of 2010, I have given a class project to study the spread of a zombie infection through a human population. This class project was inspired by an undergraduate research project, and has been used by other students as a springboard into other undergraduate research projects. In this talk, I will discuss mass-action transmission, and its role in the class project and current undergraduate research. Also, I will discuss other circumstances governed by mass-action processes, in hopes of inspiring undergraduate research in areas not typically investigated by mathematicians.

3:30–3:55 Nathan Harris (UW–Oshkosh student sponsored by Steve Winters)* Rm 125

Peg Solitaire on Arbitrary Boards

The game of peg solitaire has been analyzed in several different papers. The traditional English board and popular triangular board have both been extensively studied. More recent papers consider generalization to arbitrary boards, treating the boards as graphs. This talk examines the history of the game, recent research on the solvability of arbitrary boards, and original research on the solvability of arbitrary boards.

3:30–3:55 Melinda Bulin (UW–Stevens Point student sponsored by Edwin (Jed) Herman)* Rm 126

The Telegraph Equation

Partial differential equations are used in several fields and are considered essential in the field of applied mathematics. This talk will focus on the telegraph equation, its applications, how it relates to the more widely known wave equation, and how to solve it using the Fourier Transform.

3:30–3:55 Kenneth Price (UW–Oshkosh)* Rm 127

An Application of Compression Maps in Algebra

A compression map is a surjective function between the vertex sets of two directed graphs which preserves transitive triples and the number arrows. We use the compression map to define an injective ring homomorphism between the two blocked matrix rings determined by the directed graphs.

3:30–3:55 Ki-Bong Nam (UW–Whitewater)* Rm 135

Notes on Special Type Lie Algebra

We define a simple S-type Lie algebra on the Laurent extension of a polynomial ring. We find the automorphism group of some S-type Lie algebra.

4:00–5:00 **Invited Speaker*** Helen Connor Laird Theatre

Diane Benjamin (Edgewood College)

Mathematics Knowledge for *Teaching* (Middle/Secondary) Is there such a thing and, if so, what can it teach a mathematics professor?

Our role as teacher–educators, in training the next generation of middle/secondary mathematics teachers, offers distinct challenges and sometimes raises controversial questions. What mathematics content belongs in the preparation of future high school mathematics teachers? What understanding of and commitment to teaching that demonstrates integrity to the subject do we hope to instill? How do we prepare these future teachers the most public of ambassadors for mathematics to respond to their students in ways that are intellectually rich and engaging? Is there a customized *Mathematics Knowledge for Teaching*? This question will be examined (and stories told) through the lens of a 400-level undergraduate mathematics course with content that never rises above the 12^{th} grade level. Colleagues, consider this is a call to join the conversation!

5:00–6:30 Reception* and Cash Bar Commons

5:30–6:30 **Face Off*** Rm 131

6:30–7:45 **Banquet*** Commons

8:00–9:00 **Invited Speaker*** Commons

Walter Stromquist (Swarthmore College, Editor of the MAAs *Mathematics Magazine*)

The Mathematics of Three-Candidate Elections

Some observers say that the race between Bush and Gore in 2000 was influenced by the votes Ralph Nader won in Florida, or that Bill Clinton's 1992 election was influenced by the candidacy of Ross Perot. Did Chileans overlook a consensus centrist candidate when they elected Salvador Allende in 1970? What can we learn from John Anderson, Joe Lieberman, Lisa Murkowski, Charlie Crist, John Edwards, Jean-Marie Le Pen, and Vicente Fox? Each of them was involved in a famous three-candidate election. The 2012 Republican primaries offered weekly examples, and in a way, so did Wisconsin's recall election.

Would we do better if we asked voters to rank all of the candidates? We would then have to decide how to count the votes. Several systems have been proposed, including instant runoffs, Borda counts, approval voting, and Eric Maskin's "true majority" rule (which picks "Condorcet winners" and which has trouble with "Condorcet cycles"). They all have their advocates, and some are in use in various countries or organizations.

We might want a system that respects the "No Spoilers" rule—formally, the property of "Independence of Irrelevant Alternatives" or "IIA." This says that if X would beat Y in a head-to-head race, then Y should not be the winner of an X-Y-Z race. It seems a simple enough requirement, but the Arrow Impossibility Theorem tells us, essentially, that no such system is possible.

We will review this theorem and its significance and give some real and hypothetical examples. Along the way we will discuss expressive voting (voting for Nader when one prefers Gore), strategic voting (voting for Gore when one prefers Nader), and the kinds of institutions that arise from various rules for vote counting.

Saturday, April 6

8:00–11:30 Registration* Lobby, Aldo Leopold Science Building

8:00–11:30 Book Exhibits & MAA Book Sale* Rm 466

8:00–11:00 Student Lounge* Upper Commons

8:00–8:55 **Section Business Meeting*** Rm 131

9:00–9:50 Shubhangi Stalder and Paul Martin (UW–Waukesha, UW–Marathon)* Rm 131

Two for One: Redesigned Developmental and Intermediate Algebra into a Four-Credit Course by making use of the Flipped Classroom using technology like YouTube, and ALEKS

Discussion of a COBE grant funded 2 year project that redesigned the Developmental and Intermediate Algebra into a Four-Credit Course. The redesign involved the use of modular learning. The modules included mindfulness of learning component, and the mathematics course content was presented in a nontraditional format in four modules: vocabulary of different types of algebraic expressions and numbers, arithmetic of these expressions, solving equations and inequalities, and graphing and applications. In addition we made use of Flipped Classroom techniques where lectures are watched at home on YouTube, and the in-class time is used for problem solving, critical thinking activities and discussions. We also used the on-line ALEKS program for the drill and skill part of the course. In addition to saving time and financial cost for some college students who have to take developmental math (Mat 091) and intermediate algebra (Mat 105), we also were able to demonstrate significant progress in addressing high the failure rates in these courses.

9:00–9:25 Kseniya Fuhrman (Milwaukee School of Engineering)* Rm 125

Mathematical Biology: Introducing Students to Modern Applications of Mathematics

Mathematical Biology is an exciting, fast-growing field of mathematics. This subject can be taught to a very broad student audience. It can be used to introduce many exciting modern applications of mathematics and serve as a platform for undergraduate research projects and interdisciplinary collaborations between faculty. In this talk, I will share my experience of developing and teaching the Mathematical Biology course. I will provide several modeling examples that can be studied by students and highlight relevant lessons and tips.

9:00–9:25 Sara Kamoske, Ali Khalili and Andrew Bennett (UW–La Crosse students sponsored by Theodore Wendt)* Rm 126

Now We're Cookin'! An Optimization Model for Baking the Perfect Brownies

When baking brownies, there are two things that are natural to optimize: quality and quantity. Square pans tend to most efficiently use the oven space available to them, while

circular pans are best for evenly distributing heat around the edges. In order to develop the best brownie pan, both the number of pans able to fit in the oven and the evenness of heat flow around the edges must be balanced. We were tasked with finding the pan shape that optimizes both of these parameters. We developed and tested a model for each parameter for various pan shapes. We determined the shape of the pan based on changes in the exponent value of a Lame curve. We modeled the evenness of baking using a discretization of the 3-D heat equation from Fourier's Law of Conduction. We modeled the quantity of pans that could fit in an oven using elements of packing theory and geometric manipulation. We combined the results of these models to measure the overall fitness of our model. Additionally, we developed a utility function and weighted each parameter. Six pans could fit in the simulated oven when the exponent was constrained to $n = 2.52$. We also found a percent difference of only 0.86% from the optimal heat distribution for $n = 2.52$. Therefore we determined that a Lame curve with exponent $n = 2.52$ produced the optimal shape for both heat distribution and maximizing the quantity of pans in the oven. We performed sensitivity analysis on the thermal conductivity and threshold temperature parameters of our model.

9:00–9:25 Paul Kornacker and William Block (UW–Oshkosh students sponsored by Steve Winters)* Rm 127

Effects of Player Performance in Contract Years on Free Agent Contract Signings

The analysis done for this study looks to create a model for free agent salaries based on the offensive statistical performances of players (around 50 players) in the final year of their previous contracts. The offensive performance measures that will be explored include the number of games played (G), home runs (HR), wins above replacement (WAR), strikeouts (SO), and stolen bases (SB). Each of these attributes and player statistics will be examined to determine if they have a statistical relationship with free agent salaries earned.

9:00–9:25 Laura Schmidt (UW–Stout)* Rm 135

Self-efficacy of General Education Mathematics Students

Preliminary findings will be presented from a 2012-13 project studying students self-efficacy in a general education mathematics course. Weekly surveys were administered to the students to evaluate their levels of self-efficacy. The main objective is to see how students' self-efficacy changes throughout a semester and how that connects to course content and the timing of the surveys. Once the trends in self-efficacy levels are determined, interventions could be explored in future semesters to impact students self-efficacy and hence their performance in mathematics throughout the semester.

9:30–9:55 Jimmy Scott (UW–Stevens Point student sponsored by Edwin (Jed) Herman)* Rm 125

The Infinite Tower Function

The tower function $h(x) = x^{(x^{(x^{\cdots})})}$ is a real-valued recursive function with applications to diode current and quantum chemistry. Our primary focus will be to derive a power series

expansion for the function and estimate its radius of convergence. We will also extend the function to the complex plane and calculate some surprising values of it.

9:30–9:55 Chris Ahrendt (UW–Eau Claire)* Rm 126

The Time Scale Calculus and the Interval of Existence for Solutions of Certain Dynamic Equations

The time scale calculus is a means to unify continuous and discrete analysis. In particular, we use this calculus to unify and extend the results of differential equations and difference equations. We will focus our attention on the so-called logistic dynamic equation. This nonlinear dynamic equation has a general solution that exhibits some interesting features in regard to the interval on which the solutions exists. Since a time scale is a nonempty, closed subset of the real numbers and forms our domain on which we solve the dynamic equation, an extra layer of complication occurs when analyzing the interval of existence for these solutions. For the logistic equation, we will analyze these intervals of existence for several particular time scales. We then construct a sequence of time scales and analyze the asymptotic behavior of the solutions on that sequence of time scales.

9:30–9:55 Kevin Murphy (St. Norbert College)* Rm 127

Modeling and the Common Core State Standards for Mathematics

In Fall 2012 and Spring 2013, there was a two part workshop held at UW–La Crosse for local High School mathematics teachers. The first workshop centered on modeling in the classroom through a task-driven event with concrete examples provided to see modeling first hand. Teachers were strongly encouraged to give at least one modeling task in their classroom and provide sample student work to discuss at the second workshop. This talk will give an overview of the proceedings of these workshops and summarize some of the findings.

9:30–9:55 Leonida Ljumanovic (UW–Platteville)* Rm 135

The Golden Ratio

The Golden Ratio can be seen in many areas of arts and in many areas of mathematics. We will talk about the history of the Golden Ratio, about its properties and about some of its occurrences and applications in mathematics. In particular, we will discuss how the Golden Ratio can be represented by continued fractions and by continued (nested) roots.

10:00–10:50 Kevin McLeod, Diana Kasbaum and Doug Burge (UW–Milwaukee, Wisconsin DPI, Holmen SD)* Rm 127

Wisconsin's Adoption of the Common Core State Standards for Mathematics: What are the Implications for Higher Education?

The Common Core State Standards for Mathematics (CCSSM), adopted by Wisconsin in 2010, were designed around the principles of Focus, Rigor, and Coherence, and introduce new and higher expectations for mathematics teaching and education in grades K-12. As stated in the CCSSM, "*These Standards are not intended to be new names for old ways of doing business.* They are a call to take the next step. It is time for states to work together

to build on lessons learned from two decades of standards based reforms. It is time to recognize that standards are not just promises to our children, but promises we intend to keep. (Emphasis added.) This is a strong statement, with implications not only for K-12 educators, but also for institutes of higher education. Following a brief overview of the CCSSM, participants in this session will explore those implications. How should teacher preparation programs be adapted to align with CCSSM expectations for teachers? How should the current system of remedial and developmental mathematics courses change to account for the new K-12 student expectations? How, most importantly, can institutes of higher education be seen to support the Common Core?

10:00–10:25 David Penniston (UW–Oshkosh)* Rm 125

Elliptic Curves, Statistically Speaking

Elliptic curves have been a topic of great interest in number theory for many years. Most famously, they play a key role in Andrew Wiles' proof of Fermat's Last Theorem, a conjecture that remained unresolved for over 300 years. In this talk we look at elliptic curves from a statistical point of view, and present evidence for a conjecture that is considerably younger but which remains open.

10:00–10:25 Kathryn Litzau and Matthew Wisby (UW–Eau Claire students sponsored by Chris Ahrendt)* Rm 126

Small Scale Weather Patterns Modeled with Cellular Automata

In this work, we develop cellular automata to model small-scale weather patterns. Using standard PDEs for advection and discretizing these PDEs that model typical Wisconsin weather, we develop formulas that we use to create the rules of the cellular automata and construct a program to model weather movement. The underlying set of rules take into account information about typical components of weather, such as moisture, rain, wind, temperature, and topography. At the heart of the model are several different automatas, which represent each component. We also explore rotation within the wind automaton using Green's Theorem and its representation of curl. These different cellular automatas interact with each other in a way that models weather patterns. Several examples are presented that demonstrate how the model works.

10:00–10:25 Ibrahim A Saleh (UWC)* Rm 131

More Examples Versus Explicit Instructions in Reducing Word Problem Anxiety

In this talk, I will try to compare the electiveness of providing explicit instruction in developing equations from a description with providing additional examples of such problems. These techniques were used both with traditional algebra students at a university and non-traditional students taking algebra at a local army post. We will discuss which techniques worked best for which types of students. This talk is based on a joint work with Andrew G. Bennett.

10:00–10:25 Marc Corluy (UWC–Marshfield)* Rm 135

SDE Models of a Charged Particle in an Electromagnetic Field

Phenomenological theories of transport phenomena in plasmas are often based on modeling the effect of the bulk of the plasma on a test particle by random forces. Taking into account the separation of various timescales, it may be adequate to represent collisions by a Langevin force, i.e. a friction term and a random component. We derive a Fokker-Planck using Ito's integration theory. (talk based upon an article which is joint work with Alkis P. Grecos of from the University of Thessaly)

10:30–10:55 Eric Boll (UW-Oshkosh student sponsored by David Penniston)* Rm 125

k-Regular Partitions and Modular Forms

A partition of a number is a non-increasing sequence of positive integers that add up to it. So, for example, $4 + 2 + 1$ and $4 + 1 + 1 + 1$ are partitions of 7. It turns out that 4 has 5 partitions, 9 has 30 partitions, 14 has 135 partitions, and Ramanujan proved the following beautiful result: the number of partitions of $5n + 4$ is divisible by 5 for any integer n. The k-regular partition function restricts this counting to the number of partitions whose parts are not divisible by the integer k, and recent research has revealed divisibility properties for k-regular partition functions similar to those discovered by Ramanujan. In this talk we outline the basics of modular forms, demonstrate how they are useful in examining partitions, and present new results regarding the arithmetic of these objects.

10:30–10:55 Andrew Prudhom (UW–La Crosse student sponsored by Robert F. Allen)* Rm 126

Multiplication Operators on Iterated Logarithmic Lipschitz Spaces of an Infinite Tree

In recent years, research has been developed to study operators on spaces of functions whose domain is a discrete structure, in particular a tree. In 2012, Allen, Colonna, and Easley began investigating a family of such spaces called the iterated logarithmic Lipschitz spaces. They studied multiplication operators from one of these spaces into itself. Our work is to extend this to the study of multiplication operators between different spaces in this family. In this talk, we consider conditions for boundedness, and characterize the isometries among these operators.

10:30–10:55 Bradley Blank (St. Norbert College student sponsored by John Frohliger)* Rm 131

A Scale, Some Coins, A Problem

This is a variation of the classic counterfeit coin problem. Given a collection of n coins of weights 1, 2, or 3 grams and a balance scale, we prove the minimum number of weighings needed to determine the weight of each coin is n.

10:30–10:55 Yuriy Shlapak (UW–Marshfield/UWC–Online)* Rm 135

The Linear Algebra Behind the Google PageRank Algorithm

Ranking webpages by popularity is an important function of the modern web search engines

that allows users to see the important and popular webpages on the top of their search results and saves the most relevant webpages from being buried under thousands of junk web pages. In this talk, we discuss the basic ideas and equations behind the Google PageRank algorithm for ranking webpages. We show that the knowledge of linear algebra within the scope of a standard undergraduate linear algebra course is enough to understand how the Google PageRank algorithm works. We will look at a few examples to illustrate this algorithm and its modifications, and discuss some practical computational issues associated with implementation of this algorithm for very large sets of data (which the World Wide Web certainly is).

11:00-11:30	Reception*	Art Gallery

11:30-12:30 **Invited Speaker*** Helen Connor Laird Theatre

Robert Delaney (Boston University, President-elect of the MAA)

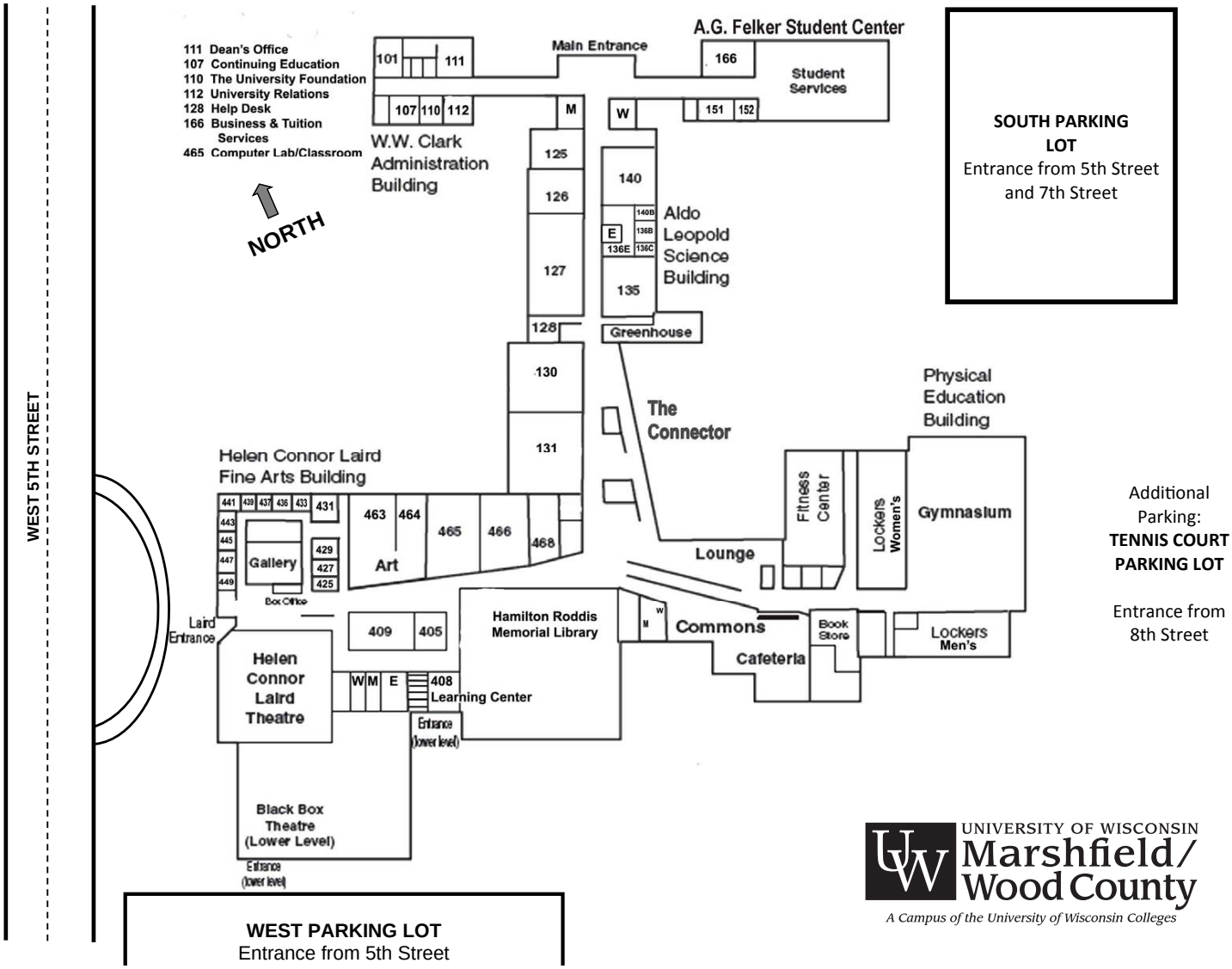
The Fractal Geometry of the Mandelbrot Set

In this lecture we describe several folk theorems concerning the Mandelbrot set. While this set is extremely complicated from a geometric point of view, we will show that, as long as you know how to add and how to count, you can understand this geometry completely. We will encounter many famous mathematical objects in the Mandelbrot set, like the Farey tree and the Fibonacci sequence. And we will find many soon-to-be-famous objects as well, like the Devaney" sequence. There might even be a joke or two in the talk. This talk only supposes a knowledge of complex numbers and is accessible to undergraduates.

12:30-3:30	**Project NExT-WI Meeting**	Rm 135
12:30-5:00	**UW Colleges Mathematics Department Meeting**	Rm 131

Congratulations to our Outstanding Middle–Secondary Mathematics Teachers!

- Brian Coughlin, Columbus High School, Marshfield
- Andy Follen, Abbotsford High School
- Ryan McCain, Abbotsford High School
- Bridget Christopherson, School District of Stratford.



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