Meeting Materials
MAA Southwestern Section Spring Meeting
March 30–31, 2012
Pima Community College Downtown Campus
Tucson, AZ

This was the first meeting with online registration, which was done with Google Sites and PayPal. The conference web site is

https://sites.google.com/site/2012march30/

and slides from the presentations and other post-conference news are being posted there.

Accommodations:

(1) Sahara Hotel/Apartments
$60 for single occupancy; $75 for double occupancy.
919 North Stone Avenue
Tucson, AZ 85705

(2) Four Points by Sheraton
is offering a special group rate for Conference attendees:
$110 with breakfast buffet; $100 with no breakfast.
(Also the location of the Friday Night Banquet.)
1900 East Speedway
Tucson, AZ 85719

Fees:

Early registration was $30, including Friday lunch and Friday banquet, plus $10 for the optional Saturday lunch.

On-site registration was $35 but did not include the banquet.

More detailed information about the program is in the program booklet.

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Pima County Community College District
Tucson, Arizona

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THE UNIVERSITY OF ARIZONA

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Save the Dates!

October 12, 2012: Fall ArizMATYC Meeting, Yavapai College, Prescott, Arizona
November 8-11, 2012: 38th AMATYC National Conference, Jacksonville, Florida
Spring 2013 Joint meeting, NMATYC and MAA Southwestern Section , New Mexico Institute of Mining and Technology in Socorro, NM

Joint Conference Program

SUnMaRC, MAA, ArizMATYC

This, therefore, is Mathematics:

She reminds you of the invisible forms of the soul;

She gives life to her own discoveries;

She awakens the mind and purifies the intellect;

She brings to light our intrinsic ideas;

She abolishes oblivion and ignorance which are ours by birth ...

Diadochus Proclus (410-485)

Friday, Saturday & Sunday

March 30, March 31, April 1

2012

SUnMaRC
Southwestern Undergraduate Mathematics Research Conference

MAA
MATHEMATICAL ASSOCIATION OF AMERICA

ArizMATYC since 1983

Welcome!

The Organizing Committee would like to take the time to thank you for attending our Joint Conference this year.

In the center of the program, you will find a quick guide to the presentations over the weekend. The main program contains full abstracts and biographies of the invited speakers along with a map of the Campus on page 30. Free Wifi is available anywhere on Campus. Link to the PIMA network; no password required.

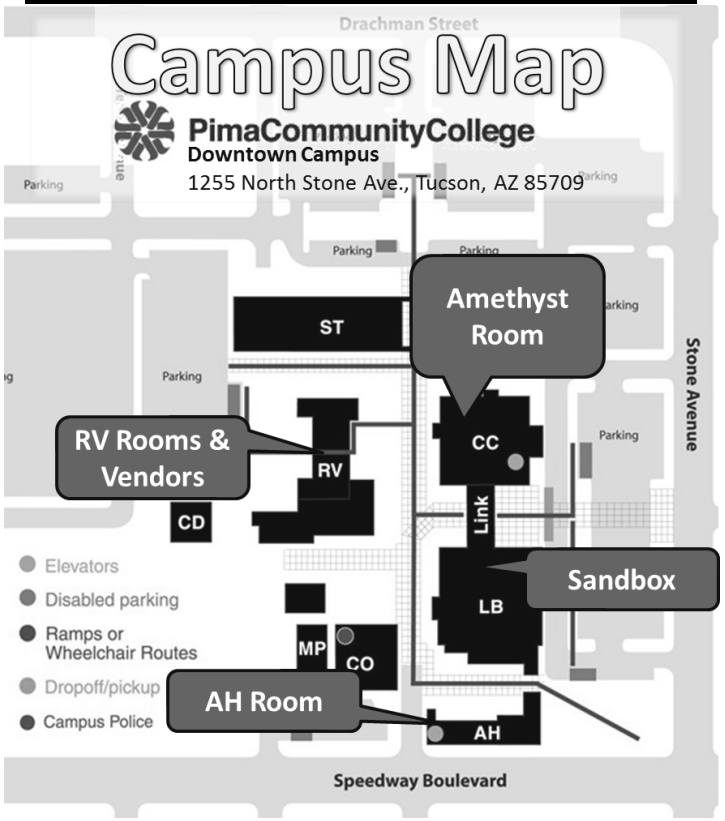
This year we have the unique opportunity of a joint conference with three wonderful organizations. ArizMATYC and MAA Sessions run on Friday and Saturday, and SUnMaRC sessions on Saturday and Sunday, beginning with the Friday night banquet. The banquet will be held just a short drive away at the Sheraton Hotel on the corner of Campbell and Speedway.

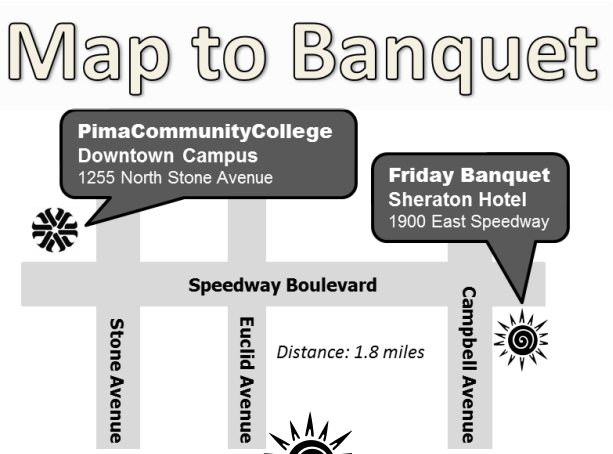
This year's program is filled with presentations from faculty, instructors, K-12 teachers, graduate students and undergraduates coming from Arizona, New Mexico, Texas, Nebraska and Michigan. We welcome and encourage everyone, regardless of affiliation, to attend talks from all three organizations throughout the three days.

We also would like to take this opportunity to inform you of future conferences:

2012 Joint Conference Organizing Committee
SUnMaRC: William Y. Vélez
MAA: Silvia Saccon and Erin Militzer
ArizMATYC: Ana Jiménez

Conference Maps





With Sincere Gratitude

Special Thanks Go To...

Pima Community College Interim Chancellor Dr. Suzanne Miles and PCC Downtown Campus President Dr. Luba Chliwniak for supporting the Conference through funding, hosting and providing a warm welcome.

U of A and PCC support staff and faculty, especially Jennifer Garcia, Angela Moreno and Nikki Quinn for assisting with organization and logistics.

PCC Downtown Campus IT staff Del Benally, Kevin Milton and Tim Wooldridge for providing flawless technological support, and Librarians Theresa Stanley and Nancy Schuler for hosting the Technology Sandbox.

Finally, thanks to all of the participants, presenters and presiders for making this conference such a huge success.

Sincerely,

2012 Joint Conference Organizing Committee

SUnMaRC: William Y. Vélez
MAA: Silvia Saccon and Erin Militzer
ArizMATYC: Ana Jiménez

Table of Contents & Events

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SPECIAL EVENTS

Friday Breakfast, & Lunch	**Amethyst Room**
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Saturday Lunch	**Amethyst Room**
Saturday Panel Discussion	**Amethyst Room**
Vendor Booths	**RV Breezeway**

Keynote Speakers

Dr. Phil Kutzko

The National Alliance For Doctoral Studies in the Mathematical Sciences: A community based approach to broadening participation

Friday, March 30 at 10:00 am
Amethyst Room

The National Alliance began ten years ago as a partnership between faculty at the three Iowa Regents universities and four Historically Black Colleges and Universities (HBCUs). Its original goal was to increase the number of African American students who would enter graduate programs in the mathematical sciences and then receive a doctoral degree in one of these fields. The Alliance was successful and has now grown into a national partnership of consisting of more than 200 math sciences faculty at undergraduate institutions together with graduate faculty at twenty one departments of mathematics and statistics. The Alliance presently serves more than 400 students from backgrounds that are traditionally underrepresented in the math sciences. I will discuss the underlying principles on which the Alliance is founded and will then describe our present structure and activities as well as our plans for the future.

Dr. Phil Kutzko received his doctorate in mathematics from the University of Wisconsin at Madison in 1972 and has been a professor at the University of Iowa since 1974. Dr. Kutzko is the recipient of a prestigious 2009 Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring. His research focuses the representation theory of p-adic groups with applications to number theory.

Dr. Steven R. Dunbar

Olympiad Problems for Fun, Learning and Research with Dynamical Software

Friday, March 30 at 7:30 pm
Banquet Speaker at
The Sheraton Four Points

Problems from Mathematical Olympiads are rich starting places for mathematical investigations. I'll give a brief overview of the history and role of Mathematical Olympiads in mathematical culture. Then I'll present some interesting problems from recent Olympiads focusing on combinatorial geometry, illustrating and investigating them with dynamical software. Can you take them further?

Steve Dunbar received his doctorate at the University of Minnesota in 1981and teaches at the University of Nebraska-Lincoln since 1985. He received the MAA Distinguished Teaching Award for the Nebraska - Southeast South Dakota Section in 1997. In 2001, he was appointed as Director of the MAA's American Mathematics Competitions program.

Notes

Notes

Keynote Speakers

Dr. Omayra Ortega

Realizing the dream of parity in STEM Education

Saturday, March 31 at 2:00 pm
Amethyst Room

Being a natural mathematician from birth, Dr. Ortega was motivated to attain a PhD in Applied Mathematics because of the staggeringly low number of women and people of color attaining PhDs in STEM fields at the turn of the century. Dr. Ortega will discuss her interesting and rocky road to her current position as an assistant professor of Applied Mathematics at Arizona State University and her current research in mathematical epidemiology

Dr. Omayra Ortega earned a PhD in applied mathematics and computational sciences from the University of Iowa with a dissertation in the field of mathematical epidemiology. Dr. Ortega is currently an Assistant Professor of Applied Mathematics at Arizona State University. p. 12

Dr. Rebecca McGraw

The wide, wide world of mathematics education

Sunday, April 1 at 10:00 am
Amethyst Room

Mathematics educators are primarily concerned with how people learn mathematics, and how instruction can be designed to maximizing learning. The field of mathematics education extends well beyond preparation for teaching elementary, middle, and high school students, and includes numerous areas of focus. Such areas include uses of technology, cross-cultural comparisons, curriculum and assessment development, and psychology of learning, just to name a few. In this talk, I will discuss some of these research areas, and describe opportunities for graduate studies in mathematics education.

Rebecca McGraw is an Associate Professor in the Department of Mathematics at The University of Arizona. Prior to coming to Arizona, Dr. McGraw worked as a full-time high school mathematics teacher in Bloomington, Indiana, and completed her graduate studies at Indiana University. At the UofA, Dr. McGraw teaches mathematics, and methods of teaching mathematics, to future teachers, as well as graduate courses in mathematics education research. Her research interests include the integration of mathematical and pedagogical knowledge development in teacher preparation, equity in educational opportunities and outcomes, and mathematics classroom discourse.

Friday Session Descriptions

Aly, Geillan
"Service learning"
Service learning is a pedagogical method combining community service with content knowledge. This workshop will introduce this method of instruction that engages students and solidifies content. Incorporating service learning into the curriculum and the design of service learning projects will be discussed.
MAA Special Session: *Teachers engaging students in mathematics;* organizers: Priya Prasad & Chantel Blackburn • Friday, 03/30 • 1:00—1:20 pm • RV 120

Anhalt, Cynthia & Liston, Janet
"Teaching through Letters-Pen Pal Project"
This session will showcase a semester-long pen pal project in which secondary mathematics pre-service teachers exchanged letters algebra high school students. The letters contained mathematics problems for the high school students to think about, solve, and explain their reasoning. The pre-service teachers assessed the solutions and provided feedback via subsequent letters with oftentimes some personal touches.
MAA Special Session: *Teachers engaging students in mathematics;* organizers: Priya Prasad & Chantel Blackburn • Friday, 03/30 • 1:30—1:50 pm • RV 120

College Reports

Find out what's happening throughout the state of Arizona.

Friday 03/30 at 11:00 am in the Amethyst Room

Sunday Session Descriptions

Zowada, Michael
"An Introduction to Hadamard Matrices"
An overview of the history of Hadamard matrices and the Hadamard Conjecture will be accompanied by an explanation of the properties of the matrices and what makes them so special. Classic construction techniques will be discussed that show what progress has been made towards verifying the Hadamard Conjecture. Generalizations of certain properties will be explored to pave the way for a talk on higher-dimensional Hadamard-like arrays.
SUnMaRC Session • Sunday, 04/01 • 11:00—11:15 am• RV 113

VISIT TUCSON

Extend your stay and enjoy!

Wild West Days at Old Tucson
Mar 31—Apr 1
201 S. Kinney Road, Tucson, AZ 85735

Arizona Renaissance Festival 2012
Mar 30—Apr 1, 10am —6 pm
12601 E Highway 60

MoCtoberFest—April Fool's Carnival
Mar 31, 12 noon—midnight
100 S. Avenida del Convento, Downtown Tucson

Tucson's First Walking Food Tour
Downtown Tucson

Complex Hadamard Cubes. Yang's Product Construction will be explained and expanded (with a proof) to the 4x4x4 case.
SUnMaRC Session • Sunday, 04/01 • 11:20—11:35 am• RV 113

Nguyen, John
"Dynamics of Bucket Brigades with Overtaking Protocol"
The dynamics and performance of bucket brigades have been studied in a variety of environments. A previous study have found that chaotic behavior can occur in bucket brigades with night walk-back time if workers do not follow a convergence rule. We assume the normative bucket brigade model and propose a new reset protocol that allows for workers to overtake one another during the processing of work and upon the handover. We use simulation and dynamical systems theory to analyze the dynamics of the two- and three- worker system with this overtaking protocol. We show that the two- and three-worker system have a variety of dynamics including chaos unless workers follow the slowest to fastest arrangement.
SUnMaRC Session • Sunday, 04/01 • 11:00—11:15 am• RV 120

Pietromonaco, Stephen
"L^p Norms on Eigenfunctions of the Spherical Laplace Operator"
Special Functions arise in mathematics as solutions to specific, important differential equations. One example, the Legendre polynomials, leads naturally to the well-known set of spherical harmonics. The spherical harmonics form an infinite, orthonormal basis for the function space of all square integrable functions living on the sphere. In addition, they are eigenfunctions of the Laplace Operator restricted to the sphere. I have been studying the L^p norms of the spherical harmonics. Such an endeavor gives us information about the size and concentration of our eigenfunctions over the sphere. We can also observe quantum behavior converging to classical behavior in the limit of large quantum numbers.
SUnMaRC Session • Sunday, 04/01 • 9:00—9:15 am• RV 113

Beaudrie, Brian
"Using GeoGebra in the geometry classroom"
GeoGebra is a free, ready-to-use mathematics software that mimics several of the abilities of Geometer's Sketchpad and a graphing calculator. It can be used online (through a web browser) or offline (by downloading the program on to your computer). Come and experience how GeoGebra can be used to allow students to conduct hands-on exploration of several Geometry topics.
MAA Special Session: *Technology and mathematics education*; organizer: Nadia Monrose • Friday, 03/30 • 1:30—1:50 pm • RV 125

Beaudrie, Brian & Boschmans, Barbara
"Technology in K-8 mathematics"
Prospective elementary teachers need a strong background in technology, especially the integration of technology and mathematics. At NAU, technology projects were developed for a mathematics content course for prospective elementary teachers. This presentation will discuss the projects and how they satisfy both the national mathematics standards and the national technology standards for teachers. Students enrolled in the mathematics content course during the Spring 2012 semester completed a pretest and a post-test, measuring their attitude towards technology in mathematics and how likely they would be to integrate technology in their future classroom. The preliminary results of this quantitative study will be presented.
MAA Special Session: *Technology and mathematics education*; organizer: Nadia Monrose • Friday, 03/30 • 1:00—1:20 pm • RV 125

EVALUATE YOUR SESSION ONLINE!
http://tinyurl.com/73e3258

Friday Session Descriptions

Byerley, Cameron

"An approach to calculus made possible by technology"

Most textbooks develop the ideas of calculus by first defining limits and the derivative as a limit. Integration is developed as "area under a curve". We take a different approach, motivated by this characterization of calculus: Calculus exists to solve two basic problems—(1) You know how fast something is changing and you want to know how much of it you have; (2) You know how much of something you have and you want to know how fast it is changing. Our presentation will demonstrate the centrality of technology to making this approach to building students' understanding of the calculus.

MAA Special Session: *Technology and mathematics education*; organizer: Nadia Monrose • Friday, 03/30 • 2:30—2:50 pm • RV 125

Dudley, Anne & Watkins, Laura

"Active math"

The presenters will share a variety of activities to engage students in active math. These activities will require students to get up and move to help them retain the math. The presenters will share activities from many levels of mathematics and invite attendees to share their favorite activities as well.

Presider: Darla Aguilar, Pima CC, Tucson, AZ

ArizMATYC Session • Friday, 03/30 • 2:00—2:50 pm • RV 113

Articulation Task Force Meeting:

Friday at 1:00 pm, Amethyst Room

Join us as we discuss articulation of mathematics courses throughout the state of Arizona

Sunday Session Descriptions

Alexander Gutierrez

"Recovery of Fourier Transforms Using Edge Information"

The reconstruction of piecewise smooth functions from non-uniform Fourier data is an important problem in applications such as sensing (e.g. Magnetic Resonance Imaging). In this talk we present a new method of approximating the Fourier transform $\hat{f}(\omega)$ of an underlying piecewise smooth function f as an asymptotic expansion of mapped Chebyshev polynomials. This research leverages recently developed edge detection methods from non-uniform Fourier data in the recovery of the Fourier coefficients. The method is shown to converge exponentially in the (finite) Fourier transform domain given the exact edge locations, and in particular can be approximated on uniform modes. When the exact jump locations are not known, an optimization procedure is used to improve edge estimates and accuracy of the representation.

SUnMaRC Session • Saturday, 03/31 • 9:40—9:55 am• RV 113

Hudson, Jarred

"Evolutionary Dynamics and Strong Allee Effects"

The program is an REU, i.e. Research Experience for Undergraduates, in the Mathematics Department at the University of Arizona. In the program, I was introduced to the basics of conducting a research project. Furthermore, this program gives me the opportunity to meet peers interested in similar topics as well as get published.

SUnMaRC Session • Sunday, 04/01 • 9:40—9:55 am• RV 120

Lantz, Ben

"Yang's Product Construction and 3-D Complex Hadamard Cubes"

An exploration of complex Hadamard Matrices and 3-D Hadamard arrays will be presented to help define 3-D Hadamard and 3-D

Sunday Session Descriptions

Cross, Daniel

"Confirming the scaling factor of the distribution of bridge heights of a self-avoiding walk"

We numerically confirmed the scaling factor of the distribution of bridge heights of a self-avoiding random walk in the upper half of the complex plane. Our results match the conjectured result of 4/3 within a few hundredth of a percent.

SUnMaRC Session • Sunday, 04/01 • 9:20—9:35 am• RV 113

Giunta, Angela

"Symmetric Latin Squares and Their Properties"

A brief overview of Latin squares, focusing on symmetric Latin squares. I will discuss isotopy and isotopy classes as well as the properties of symmetric Latin squares. Sudoku will be discussed as specific examples of Latin squares.

SUnMaRC Session • Sunday, 04/01 • 9:20—9:35 am• RV 120

Gordon, Jeffrey

SUNDAY SESSIONS

Although MAA and ArizMATYC Sessions end after lunch on Saturday, all groups are welcomed to attend the Sunday morning SUnMaRC sessions.

"Visualization of Chaos and Legendre Polynomials"

I will be discussing the visualization of chaotic and non-linear systems. There are a variety of methods of analyzing these systems visually, which includes the evolution of the paths in systems like the Lorenz attractor, Poincare' sections, and bifurcation surfaces. A demonstration of the advantages of these representations and how to analyze them will be presented. There will also be a discussion of the Legendre Polynomials and their application to the Spherical Harmonics. Some interesting behavior in the plots of these systems will also be shown.

SUnMaRC Session • Sunday, 04/01 • 9:40—9:55 am• RV 113

Friday Session Descriptions

Dumitrascu, Gabriela

"Generalization in mathematics from elementary school to college"

ArizMATYC Business Meeting

3:30—4:20 pm • Amethyst Room

All are welcomed to attend!

The program will be divided into two parts. First, I will use a power point presentation format to describe a way to define the practice of generalization in mathematics. The presentation will include a theoretical definition and examples from textbooks how this definition may be used to organize mathematics instruction from elementary school level to high school and college levels. In the second part of the program, the participants will discuss how the practice of generalization is reflected in the Common Core State Standards for Mathematics.

Presider: Diann Porter, Pima CC, Tucson, AZ

ArizMATYC Session • Friday, 03/30 • 3:30—4:20 pm • AH 141

Franklin, Ayanna & Monrose, Nadia

"An analysis of student justifications on probability concepts and implications for instruction using technology "

We will present our findings on students performance on an assessment on probability and statistics concepts. We will then end the session with tasks that address these themes using TinkerPlots, Excel, Fathom, and Probability Explorer.

MAA Special Session: *Technology and mathematics education*; organizer: Nadia Monrose • Friday, 03/30 • 2:00—2:20 pm • RV 125

Friday Session Descriptions

Howe, Jason & Werbylo, Roger
"MyMathLab and Course Redesign Workshop"
Interested in Course Redesign for your developmental math series? This workshop will address options for your redesign and proven efficacy of using MyMathLab to generate improved student success. Guest speaker, Roger Werbylo from Pima CC West Campus, will be available to answer any peer to peer questions and to discuss the course redesign that is taking place at Pima CC.
Commercial Presentation • Friday, 03/30 • 1:00—1:50 pm • AH 141

Hsieh, Ping-Chi
"Taking a close look at an elementary preservice teacher's reflective thinking: A Case Study"
This case study closely examines the degree of reflection of one preservice teacher from her mathematics methods course in a large university located in the southwestern part of the United States. The purpose of this study is to provide in-depth analysis of how Francis (a pseudonym) reflects on her mathematics learning and teaching experiences. The reflective journals assigned to the preservice teachers from the teacher preparation program provide them with opportunities to reflect on their teaching. However, the quality of students' reflection in their journals depends on each student's involvement in the reflective process. Through Dewey's (1933) concepts of reflection, preservice teachers may improve the quality of their reflections on their own teaching and learning practices. The data indicate that Francis tried to incorporate some of her beliefs, prior knowledge, and previous and existing experiences into her field experience.
MAA Special Session: *Teachers engaging students in mathematics;* organizers: Priya Prasad & Chantel Blackburn • Friday, 03/30 • 2:00—2:20 pm • RV 120

Sunday Session Descriptions

SUNDAY SPEAKER: DR. MCGRAW

At the U of A, Dr. McGraw teaches mathematics, and methods of teaching mathematics, to future teachers, as well as graduate courses in mathematics education research. Her research interests include the integration of mathematical and pedagogical knowledge development in teacher preparation, equity in educational opportunities and outcomes, and mathematics classroom discourse.

9:00—9:15 am• RV 120

Benedict, Alex & Gordon, Jeffrey
"Fast Waveform Extraction on Short Computational Domains"
An overview of the method of Alpert, Greengard, and Hagstrom for implementing radiation boundary conditions for the ordinary flat-space wave equation and its extension to the Regge-Wheeler equation, which describes axial perturbations of a Schwarzschild black hole, followed by a brief discussion on how the method can be used to extract the asymptotic waveform from a time series recorded at a finite radius.
SUnMaRC Session • Sunday, 04/01 • 11:20—11:35 am• RV 120

Burnham, Randy
"A brief introduction to pseudoreplication"
Experimental studies often have to address the issue of pseudoreplication, which can be thought of as experimental replication that is nested within replications of the true variable (s) of interest. Our research is focused on evaluating competing methods for estimation under different experimental scenarios in order to understand which method should be used in a given analysis.
SUnMaRC Session • Sunday, 04/01 •

Saturday Session Descriptions

Yan, Donglin

"A simulation analysis of competing methods for addressing pseudoreplication"

Experimental studies often have to address the issue of pseudoreplication, which can be thought of as experimental replication that is nested within replications of the true variable(s) of interest. Our research is focused on evaluating competing methods for estimation under different experimental scenarios in order to understand which method should be used in a given analysis.

SUnMaRC Session • Saturday, 03/31 • 12:15—12:30 pm • RV 102

Zhiwei Tan

"Modeling Renminbi / U.S. Dollar Exchange Rate Based on Time Series Analysis"

Since June, 2010, the Chinese currency, Renminbi (RMB) has appreciated against the U.S. dollar by more than 6 percent. The appreciation of the RMB catches worldwide attention. This paper evaluates the performances of basic time series models for modeling the daily yield rate of the RMB over 100 U.S. dollars. After analyzing the dataset and comparing different models, the autoregressive model with lag 1 (the AR(1) model) is chosen as the most appropriate. Simulation results show the selected model meets the expectation of forecasting the exchange rate.

SUnMaRC Session • Saturday, 03/31 • 11:35—11:50 am• RV 102

Evaluate Your Session!

Go to:

http://tinyurl.com/73e3258

to evaluate each of your sessions

Friday Session Descriptions

Hughes-Hallett, Deborah & Lozano, Guadalupe

"Mathematics and sustainability"

The emphasis in the Common Core Curriculum Standards on mathematical structure and modeling, and the worldwide concern with sustainability, can be combined into engaging materials for use in pre-calculus and calculus, as well as in quantitative reasoning and college algebra.

Presider: Scott Collins, Pima CC, Tucson, AZ

ArizMATYC Session • Friday, 03/30 • 3:30—4:20 pm • RV 113

Kozak, Kathryn

"AMATYC Proctored Testing Position Statement"

This session will be an open forum to collect input on the draft of the AMATYC Position Statement on proctored testing.

Presider: Nina Corson, Pima CC, Tucson, AZ

ArizMATYC Session • Friday, 03/30 • 2:00—2:50 pm • Amethyst Room

Friday Session Descriptions

Mendel, Marilou

"WeBWorK demonstration"

This session will provide attendees with an overview of WeBWorK, an open-source online homework system. WeBWorK is hosted by the MAA and is accompanied by a National Problem Library that consists of more than 20,000 homework problems. Students are provided with individualized problems, immediate feedback on the correctness of their responses, and an opportunity to make repeated attempts to obtain the correct answers. Instructors are provided with automatic grading of assignments and detailed statistical information about the performance of the students. We will examine the student and instructor interfaces, explore the National Problem Library, and discuss how to obtain WeBWorK.

Presider: Anne Franklin, Pima CC, Tucson, AZ

ArizMATYC Session • Friday, 03/30 • 2:00 – 2:50 pm • AH 141

Schettler, Jordan & Collingwood, Charles

"Occupy Calculus! The math behind the 99%"

We will explore Lorenz curves for income and explain how tools from integral and differential calculus can be used to analyze trends in the unequal distribution of wealth. We will discuss a powerful student project which helps build analytical skills and social consciousness.

Presider: Tony Vinton, Pima CC, Tucson, AZ

ArizMATYC Session • Friday, 03/30 • 3:30—4:20 pm • RV 125

MAA Book Table

Stop by the Vendor Tables in the RV breezeway to browse through the MAA Book Table and more!

Saturday Session Descriptions

Welch, Eric & Martin, Jenifer

"Unlocking the secrets of counting problems"

Participants will solve problems suitable for 4th through 8th grade students that clarify the overarching concepts and elicit the habits of mind used to solve systematic listing and counting problems. The concepts range from the addition principle of counting to the meaning behind the formulas for permutations and combinations. Bring your willingness to change hats, approaching problems like a middle grades student while thinking about instructional moves like a middle school teacher.

Presider: Pat Townsend, Pima CC, Tucson, AZ

ArizMATYC Session • Saturday, 03/31 • 11:15 am—12:05 pm • Amethyst Room

Wolfe, Rosalynn

"Rethinking Homework Policies in High School and Undergraduate Math Courses"

Often professors lament that students will not or do not come in to office hours. Math homework for some math courses is often turned in incomplete or complete but largely inaccurate. What are some strategies that will work to encourage students to come in and get the help they need?

MAA Session • Saturday, 03/31 • 11:45 am—12:05 pm • RV 160

Xu, Jason

"The artificial phase transition for perfect simulation of repulsive point processes"

We examine the critical intensity value for a birth-death Markov chain model, above which the expected run-time of the process becomes infinite. An analytic improvement of a previous lower bound on this value is introduced, and data from computer simulations provide a more precise estimate of the critical value.

SUnMaRC Session • Saturday, 03/31 • 9:20—9:35 am • RV 115

and methods (primarily the isoperimetric problem and the arithmetic mean - geometric mean inequality). Ivan Niven's 1981 Dolciani Mathematical Exposition, "Maxima and Minima without Calculus," is the source of the talk's title and some of its content.

MAA Session • Saturday, 03/31 • 8:30—8:50 am • RV 120

Vega, Erick

"Maintaining an Engaged Classroom: Demonstrations for Provoking and Maintaining Mathematical Curiosity"

This presentation will explore the physical implications of certain mathematical models and how they can be used to create curiosity among young students of mathematics. Topics covered include Chladni patterns, ferrofluid structures, and non-Newtonian fluids with brief discussions on the mathematics behind them. The emphasis will be on framing mathematics not only as tool for solving problems, but also as a means of understanding complex and aesthetically captivating phenomena.

SUnMaRC Session • Saturday, 03/31 • 12:35—12:50 pm • RV 113

Walicki, Heather

"Viewing Mathematics Linguistically"

The study examines how native language can affect one's mathematical abilities.

SUnMaRC Session • Saturday, 03/31 • 11:15—11:30 am • RV 113

SATURDAY AFTERNOON

Although MAA and ArizMATYC Sessions end after lunch on Saturday, all groups are welcomed to attend the Saturday afternoon SUnMaRC sessions.

Sutton, Talesin & Stoehr, Kathy & Kalinec-Craig, Crystal & Kersting, Nicole

"Measuring teacher knowledge of mathematics through video clips of authentic classroom instruction"

We discuss a novel approach to assess knowledge of teaching, and present our results supporting the validity of the measure. Additionally we demonstrate how the online assessment can be customized for professional development, teacher preparation program, and online research projects.

MAA Special Session: *Teachers engaging students in mathematics;* organizers: Priya Prasad & Chantel Blackburn • Friday, 03/30 • 3:30—3:50 pm • RV 120

Dr. Steven R. Dunbar

Olympiad Problems for Fun, Learning and Research with Dynamical Software

Problems from Mathematical Olympiads are rich starting places for mathematical investigations. I'll give a brief overview of the history and role of Mathematical Olympiads in mathematical culture. Then I'll present some interesting problems from recent Olympiads focusing on combinatorial geometry, illustrating and investigating them with dynamical software. Can you take them further?

Thomas, Matthew

"Developing a Protocol for Analyzing the Quality of Classroom Interactions in an Undergraduate Calculus Course"

In this is a talk, I will discuss ongoing research on interactive engagement in introductory calculus classes at the undergraduate level. To better understand this, 15 one-hour-long videos of first-semester calculus classrooms were recorded and coded using a modified version of a quality of mathematics instruction protocol. In this session, I will discuss the development of this

protocol. Preliminary findings will be discussed. Results of these analyses will be used to measure types and quality of classroom interactions in an undergraduate calculus course and explore possible correlations between teaching practices and development of student understanding of calculus concepts.
MAA Special Session: *Teachers engaging students in mathematics;* organizers: Priya Prasad & Chantel Blackburn • Friday, 03/30 • 2:30—2:50 pm • RV 120

Whitesides, Ellen & Patterson, Cody
"Promoting teachers as professionals: Common Core Toolkit"
The CBMS' Ad Hoc Committee on Teachers as Professionals is producing, through the leadership of IM&E at UofA, a Mathematics Common Core Toolkit as a first step in an initiative to facilitate and develop collaboration between states implementing the CCSSM. The Toolkit works towards the broader goal of increasing the professional empowerment of teachers by allowing them the opportunity to design and facilitate their own professional development. While innovative in the field of PD as well as teacher empowerment, the goals of c-TaP promote content sharing across states, and increased access to training tools for every teacher in adopting states.

MAA Session • Friday, 03/30 • 4:00—4:20 pm • RV 120

EVALUATE YOUR SESSION ONLINE!

http://tinyurl.com/73e3258

Siegel, Murray
"Discovering the derivative with a graphing calculator"
Once a student knows the definition of the derivative, we typically prove the derivative for various functions. As an intermediary step, the graphing calculator is used to graph the derivative [$(f(x + h) - f(x))/h$] where .0001 is substituted for h. Then the student discovers the function that matches up to the derivative that was graphed. The technology is used to convince the student of the correct derivative for the various functions. Typically an instructor's mathematical proof does not do this for many students.

MAA Special Session: *Technology and mathematics education*; organizer: Nadia Monrose • Saturday, 03/31 • 8:00—8:20 am • RV 120

So, Maple
"Cloaking Against Thermal Imaging"
There has been a lot of recent interest in cloaking and invisibility in the mathematics and science communities, and in fact physically plausible mechanisms have been proposed (some built) for cloaking an object against detection using a variety of electromagnetic methods. The ideas are very general, however, and should allow one to design cloaks that work against other forms of imaging.
SUnMaRC Session • Saturday, 03/31 • 9:00—9:15 am • RV 115

Stenger, Allen
"Maxima and minima without calculus"
Many extremum problems used as examples in calculus courses can be worked with lighter-weight methods from algebra and geometry. A simple example from high-school algebra is the extremum of a quadratic expression. Some advantages from using these methods in the classroom include enrichment in courses before calculus, and encouraging mathematical thinking over "plugging into the formula". This talk will consider several problems

Sauls, Jaime

"Changing Perceptions of Computer Science"

Computer science is misrepresented as a science and such misperceptions may contribute to students' negative views and reluctance to join this field of study. The Laboratory for Computer Science creates interactive online lessons for high school students. This study examines how students' perceptions of computer science change upon completion of these labs. Identifying whether the stigmas or stereotypes are present with the students that experience these lessons and whether a deeper knowledge of the underlying theories in computer science will change these views is the goal.

SUnMaRC Session • Saturday, 03/31 • 11:35—11:50 am • RV 113

Selden, Annie

"Mathematical and non-mathematical university students' proving difficulties"

This presentation will discuss university students' mathematical and non-mathematical proving difficulties. A total of over forty proving difficulties have been observed and organized into nine categories. Of these difficulties, more than twenty will be described. These observations come from several years of teaching an experimental proving course to beginning graduate and advanced undergraduate mathematics students and from teaching an experimental voluntary proving supplement to an undergraduate real analysis course. We believe that discussing and categorizing these difficulties will lead to a greater understanding of students' thinking with regard to proof and potentially to better teaching.

MAA Session • Saturday, 03/31 • 12:45—1:05 pm • RV 120

FRIDAY NIGHT BANQUET

5:00 - 8:30 pm at the
Sheraton Hotel
1900 East Speedway

SUnMaRC/MAA/ArizMATYC

5:00 - 6:00 Registration for SUnMaRC and late registrants

5:30 - 6:30 Origami with M. Craig

6:30 - 7:30 Banquet

7:15 - 7:30 Presentation of MAA Award

7:30 - 8:30 Steven R. Dunbar: Olympiad Problems for Fun, Learning and Research with Dynamical Software

Door Prizes Awarded!
Need not be present to win

Anhalt, Ashley

"Analysis of Environmental Particles Through Holistic Approaches"

Most of the main determinants of water quality either consist of, or are controlled by, particles. Previous water quality research has focused on particular particles in isolation or in binary combinations. In this project, we are taking a holistic approach to the characterization of the particle load in water, focusing on the collective properties of the particles rather than individual components. Because the characterization of particles is often time-consuming, applying an informatics-based approach could speed up the evaluation of water quality and the assessment of treatment effectiveness.

MAA Session • Saturday, 03/31 • 3:35—3:50 pm • RV 102

MAA Business Meeting

Saturday at 9:00 in the Amethyst Room

Attanucci, Frank J.

"A note on the proportional partitioning of line segments, triangles and tetrahedra"

In the first part of this paper I solve the following problem: Where can one place a point G inside or on a triangle so that line segments from G to each of the vertices divide the triangle into three sub triangles whose areas A1, A2 and A3, respectively, satisfy the proportion: A1:A2:A3 = w1:w2:w3, where the wi's are non-negative constants with positive sum? I then state and prove an analogous result for tetrahedra. I finish with a theorem concerning the centroid of n! points. Along the way, everything is made more intriguing by allowing the wi's to be parameterized functions.

Presider:

ArizMATYC Session • Saturday, 03/31 • 12:15—1:05 pm • RV 116

EVALUATE YOUR SESSION ONLINE!

http://tinyurl.com/73e3258

Muniz, Abigail Damaris & Loya, Jesus

"Matrix Product Application to Fibonacci Sequence"

We will discuss a procedure that leads to the computation of the "nth" Fibonacci number applying matrix product. We will discuss matrix product connection to Fibonacci sequence and we will look at diagonal matrices and the power operation on them. At the end of our talk, we will reveal how matrix product and power operation on diagonal matrices allow one to calculate any value in the Fibonacci Sequence. We will need a projector and a computer for our power point presentation.

SUnMaRC Session • Saturday, 03/31 • 12:15—1:10 pm • RV 113

Sannier, Andrew

"Evolutionary Games on the Lattice"

My advisor and I worked on a set of seven spatial, stochastic processes that combine evolutionary game theory (EGT) and interacting particle theory. By placing EGT players on a lattice and limiting interactions only to neighbors, we get a model that more accurately represents ideas from EGT, since evolutionary systems are almost always in some kind of spatial context. I also wrote a program that simulates these processes with an animation, so I have something neat to put in the slideshow, too.

SUnMaRC Session • Saturday, 03/31 • 12:35—12:50 pm • RV 102

Mayo, Tim

"Lucky Larry and lines of verse"

A sampling of "Lucky Larry" problems will be worked out live, with humorous anecdotes and poetry lines used by the instructor in his classes. The pedagogical merits of these problems will be discussed. Attendees will have the opportunity to present "Lucky Larry" problems they have encountered.

Presider: Matthew S. Benander, Pima CC, Tucson, AZ

ArizMATYC Session • Saturday, 03/31 • 8:00—8:50 am • RV 116

McCallum, William

"The Illustrative Mathematics Project"

The Illustrative Mathematics Project is building a community of mathematicians, educators, and teachers dedicated to designing high quality tasks to illustrate the Common Core State Standards in Mathematics. The core of the project is an interactive website where tasks are submitted, reviewed, edited and published by the community.

Presider: Mohamed Ait Nouh, UTEP,El Paso, TX

ArizMATYC Session • Saturday, 03/31 • 12:15—1:05 pm • Amethyst Room

McDevitt, Caitlin

"Cut Costs with Combination Courses"

Thinking about combining course materials to streamline classes, redesign course formats, and lower costs for students? Hawkes Learning Systems provides the support you need for successful implementation! Learn more about our new combination course offerings and how Hawkes leads to success in a variety of class.

Commercial Presentation • Saturday, 03/31 • 9:00—9:50 am • RV 116

Aurand, Eric

"An intrusive advising approach to online developmental mathematics"

Mohave Community College is piloting a program for Online Developmental Math where intrusive advising measures are being used to help with student success. This includes an online application process and an embedded advisor in the class. The structure of the pilot and lessons learned in implementation of the pilot will be presented and discussed with participants.

MAA Session • Saturday, 03/31 • 12:15—12:35 pm • RV 160

Baumann, Rachel

"Wynn's ϱ-algorithm for sequence acceleration using high precision arithmetic"

In this study we explored several variants of Wynn's ϱ-algorithm for sequence acceleration using high precision arithmetic both in Matlab and Mathematica. The results were compared to Osada's theoretical error estimates. We found that Matlab's implementation of high precision still has limited number of significant digits; this problem was not seen in Mathematica. Applications to several standard sequences and Jacobi Theta function will be used to illustrate the results.

SUnMaRC Session • Saturday, 03/31 • 9:00—9:15 am • RV 113

Baxter, Andrew

"Statistics and Chem-Cam"

Chem-Cam is a set of instruments on the Mars Science Laboratory rover that will land on Mars in August 2012. For the past 5 months I have been working with Professor Horton Newsom on several statistics questions about Chem-Cam's ability to detect, with significant probability, small scale sedimentary layers on Mars. My talk will focus on the issue of properly phrasing the questions, an elegant solution using Poisson distributions, and a rough

outline of procedural suggestions that could help the Mars rover team use statistics to make real time decisions about which sediments to measure.
SUnMaRC Session • Saturday, 03/31 • 11:55am —12:10 pm • RV 102

Beal, Melissa
"What is Mathematics Education Research?"
Unlike research done by many mathematics contemporaries, the process of Mathematics Education research includes both quantitative and qualitative analysis that covers a wide variety of topics. This presentation is designed to expose traditional mathematics undergraduates to the motivations and processes of mathematics education research, and highlight similarities and differences between traditional Mathematics research and Mathematics Education Research. An overview of the process used during Mathematics Education Research will be given as well as the key motivations that drive the research, the process used to analyze data and the way research findings affect the mathematics education community.
SUnMaRC Session • Saturday, 03/31 • 11:55 am—12:10 pm • RV 113

TECHNOLOGY SANDBOX

Come and play with technology during the conference at our Technology Sandbox.
Showcasing:
✸ SMART Board ✸
✸ iPads apps for learning and teaching
✸ Wikis and blogs in instruction ✸
✸ Google docs and sites ✸
✸ Online videos and other resources ✸
✸ Classroom Polling tools ✸

Available 10 am - 2 pm
Saturday, 03/31

Loesl, Allison
"Trees of Irreducible Numerical Semigroups"
A recent paper by Blanco and Rosales describes an algorithm for constructing a directed graph of irreducible numerical semigroups with fixed Frobenius number. After presenting background information, we will explain the algorithm, construct specific examples, and present some open questions associated with these graphs.
SUnMaRC Session • Saturday, 03/31 • 9:20—9:35 am • RV 102

Louchart, Katie & Daugherty, Robert
"Mathematics placement at Northern Arizona University"
The presenters will discuss the results of a recent analysis of the effectiveness of the mathematics placement system currently in use at NAU. The types of analyses, specific difficulties in accessing the necessary data and some confounding issues will also be discussed.
MAA Session • Saturday, 03/31 • 12:45—1:05 pm • RV 160

SATURDAY SPEAKER: DR. ORTEGA

Dr. Omayra Ortega earned a PhD in applied mathematics and computational sciences from the University of Iowa with a dissertation in the field of mathematical epidemiology. Dr. Ortega is currently an Assistant Professor of Applied Mathematics at Arizona State University.

Lamb, Christopher

"A Pilot Study on Inverted Pedagogy"

There is currently a growing disconnect between students' technological engagement with the world around them and their largely traditional experiences in school. This study in Inverted Pedagogy analyzed the effects of using Screencasting technology to invert traditional pedagogy on student affect and achievement in a business mathematics course at N.A.U. This pilot study was used to identify key variables and concerns that will guide the development of future full-scale studies. The pilot study provided both critical feedback to consider when moving to a full-scale study and positive written feedback from the students in the experimental class.

SUnMaRC Session • Saturday, 03/31 • 12:15 am—12:30 pm • RV 113

Lodder, Jerry

"Teaching from historical sources: Mercator's Map of the World and Integral Calculus"

While modern textbooks offer a highly polished presentation of mathematics, in this talk we explore teaching the subject from historical sources. As a case study, a classroom teaching module is discussed that highlights Gerardus Mercator's (1512--1594) angle-preserving map of Earth and its relation to more modern ideas from integral calculus. Mercator constructed his map so that a compass bearing making a fixed angle with a curve of constant longitude on the globe would be represented by a line forming the same angle on a flat map. This map required that lines of constant latitude be placed at a height given by "perpetual addition of the secants," which is recognized today as a Riemann sum.

MAA Session • Saturday, 03/31 • 11:15—11:23 am • RV 120

Beaudrie, Brian

"Improving the mathematical readiness of middle-achieving, college-bound students"

Based on more than six years of research, this presentation will discuss a practical two-tiered strategy designed to help college-bound students be better prepared for credit-bearing college mathematics courses before beginning their post-secondary education.

Presider: Jessica Knapp, PhD, Pima CC, Tucson, AZ

ArizMATYC Session • Saturday, 03/31 • 11:15 am—12: 05 pm • RV 116

Bezio, Ashley

"An Introduction to Numerical Semigroups"

A numerical semigroup is a nonempty set of nonnegative integers that contains 0, is closed under addition, and has a finite complement. Although motivated by deep problems in ring theory, they are interesting to investigate in their own context. This talk will present the basic notation and properties of numerical semigroups, and will lay the foundation for the next talk.

SUnMaRC Session • Saturday, 03/31 • 9:00—9:15 am • RV 102

Chaidez, Eric

"Snell's Law Application to Light Waves in Optical Fiber Technology"

In studying how light waves travel through an optical fiber, the model of Snell's Law will be analyzed to understand how these electromagnetic waves propagate at the surface of different optical mediums. The mathematical theory behind this concept will be reviewed, including how vector analysis can be used to represent light rays traveling through a given medium, such as air or water. As an application, we will also briefly discuss how Snell's Law can be applied to light detections of deformities in composite fiber optic materials.

SUnMaRC Session • Saturday, 03/31 • 9:40—9:55 am • RV 115

Delgado, Adrian

"Compression algorithms for digital images"

Image compression is widely used to reduce the storage requirement for digital photos while maintaining sufficient image quality. In our talk we will introduce the basics of digital signal processing and present the two standard algorithms: JPEG and JPEG2000. The material is suitable for a challenging student project in an applied mathematics or linear algebra course.

MAA Session • Saturday, 03/31 • 8:00—8:20 am • RV 160

Dumitrascu, Gabriela

"Didactic and mathematical analysis of the concept of function in USA, French, and Romanian textbooks"

The work done on this project revealed the importance of using a theoretical frame in analyzing a mathematics curriculum. By reflecting on the outcomes of my analysis, I was able to distinguish three different approaches to the development of the concept of function and to identify the building blocks of each approach. By comparing and contrasting these elements, innovative ways and perspectives are open in the domain of creating meaningful tools that promote mathematical learning.

MAA Session • Saturday, 03/31 • 11:45 am—12:05 pm • RV 120

Dunbar, Steven R.

"A dozen proofs of Stirling's Formula"

This presentation will provide a survey of Stirling's Formula (and its close companions Wallis' Formula, the Gamma function and the probability integral) in increasing specificity. I'll categorize a dozen different proofs, ranging from very elementary to quite advanced, including my favorite, using probability theory to prove Stirling.

MAA Session • Saturday, 03/31 • 11:15—11:35 am • RV 160

Knapp, Jessica

"Understanding student proving using the Conditional Implies Conditional structure"

The conditional implies conditional statement (i.e., $(p \rightarrow q) \rightarrow (r \rightarrow s)$) is inherent in many early proving experiences. We explore ways that university students handle proving statements that have this overall structure. We structure our analysis using the theory of conceptual blending. Initially students recruited a proving frame from their experience, which started with the totality of $(p \rightarrow q)$ in ways that were problematic. Ultimately the students brought to bear a more effective proving frame. We describe this frame and how the students used it together with a key geometric idea to develop a complete proof.

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http://tinyurl.com/73e3258

MAA Session • Saturday, 03/31 • 12:45—1:05 pm • RV 120

Lai, Tim

"Lagrangian Transport of Radioactive Particles after Fukushima"

Using data from the Weather Research and Forecasting Model (WRF), which uses real atmospheric data, we analyzed Lagrangian transport of inertial particles of different sizes across the Pacific Ocean after the Fukushima disaster. The results allowed us to identify and distinguish features that control transport patterns, known as Lagrangian Coherent Structures for inertial radioactive particles. We have studied the coherent structures associated with realistic aerosols and have found that the evolution of the particles' trajectories depend on their sizes in a predictable fashion.

SUnMaRC Session • Saturday, 03/31 • 3:15—3:30 pm • RV 102

Jibrin, Shafiu

"An interior point method for solving semidefinite programs using cutting planes and weighted analytic centers"

We investigate solving semidefinite programs (SDPs) with an interior point method call SDP-CUT which involves weighted analytic centers and cutting plane constraints. We have also compared our algorithm to the well-known primal barrier method and found that SDP-CUT gets into the neighborhood of the solution in less iterations, but the primal barrier method converges to a more accurate solution in the end.

MAA Session • Saturday, 03/31 • 8:30—8:50 am • RV 160

Kelow, Simon

"Time-Fractional Heat Equation"

SUnMaRC presentation of an application of Fractional Calculus to solve the Heat Equation when the time derivative is not necessarily an index of one.

SUnMaRC Session • Saturday, 03/31 • 12:55—1:10 pm • RV 102

Knapp, Jessica

"Teaching foundations: new courses to prepare future teachers"

A statewide Project NEXT grant has developed a set of course materials to improve the mathematical content knowledge for pre-service elementary school teachers in Arizona. We will discuss the rubric of higher order thinking developed by the Teaching Foundations faculty to serve as a guide in the course preparation as well as present some of the courses and course materials. We will explain the courses which have been developed and discuss some of the early results from the piloters. We will also give examples of the course materials being used and compare them to recommendations made by other mathematics education research projects.

Presider: Edward Smith, Pima CC, Tucson, AZ

ArizMATYC Session • Saturday, 03/31 • 8:00—8:50 am • Amethyst Room

Panel Discussion

The Bachelor's Degree in Mathematics: Finding a job in industry

Presider: William Y. Velez

Panelists:

- **Chris Elofson**, Senior Software Engineer, Raytheon
- **Rene Bernal**, Applied Software Engineer, Honeywell
- **Carolyn Lanser**, Senior Member of the Technical Staff, Rincon Research

10:00 - 11:00 AM • Amethyst Room
Saturday, 03.31

Fernandez, Jonathan

"An introductory Look at the Abelian Sandpile Model"

Have you ever wondered what type pf amazing graphs you could make with sand grains? This introductory presentation will take a look at the Abelian Sandpile Model. We will learn what it is, how it "works", and how to construct such model, through definitions and visuals.

SUnMaRC Session • Saturday, 03/31 • 3:35—3:50 pm • RV 113

Fox, Brooke

"Higher Dimensional Perfect Bricks"

A numerical semigroup S is a subset of nonnegative integers such that S contains 0, S is closed under addition, and its complement is finite. This presentation considers a subset of numerical semigroups, namely perfect bricks, which have additional properties. We will also show the existence of an infinite family of perfect bricks.

SUnMaRC Session • Saturday, 03/31 • 9:40—9:55 am • RV 102

Glenn, Rick

"Kinetic Digital Textbooks for Math and Science"

See the new comprehensive science and math digital textbooks from Kinetic Books designed from the ground up to take maximum advantage of current technology. Through interactive activities, digital simulations, self assessment, and step-by-step problem solving support, Kinetic Books allow teachers and students to realize the promise of a digital learning environment today! Kinetic Books contain hundreds of interactive activities that bring concepts to life, digital simulations with step-by-step narrated instruction, and interactive problems throughout each chapter that provide real time feedback.

Commercial Presentation • Saturday, 03/31 • 9:00—9:50 am • RV 116

Graf, Alessandra

"A Comparative Survey of Graceful and Harmonious Labelings"

A graph labeling is an assignment of integer labels to the edges and vertices of a simple connected graph subject to specified conditions. First investigated by Rosa in 1967, his "graceful labeling" now has several variants. This presentation will compare various forms of graph labelings as well as provide examples of families of graphs that have these labelings. No prior knowledge of graph theory is needed.

SUnMaRC Session • Saturday, 03/31 • 3:15—3:30 pm • RV 113

SATURDAY AFTERNOON

Although MAA and ArizMATYC Sessions end after lunch on Saturday, all groups are welcomed to attend the Saturday afternoon SUnMaRC sessions.

Herring, Andrew

"Analytic Continuation of the Riemann Zeta Function"

The Riemann zeta function defined to be the sum from n=1 to ∞ of n^(-s) for a complex number s appears to be defined in the half plane Re(s) >1. Riemann proved however, that zeta is analytic throughout the complex plane with only a simple pole at s=1 by demonstrating that zeta satisfies the functional equation ζ(s)=ζ(1-s). I will outline this proof using some basic Fourier analysis and complex variable theory. Then, time permitting; I will discuss a potential discrete analogue of zeta over the finite field Fp.

SUnMaRC Session • Saturday, 03/31 • 9:20—9:35 am • RV 113

Islas, Gregory & Vergara, Jorge

"Love and Bats: Have differences in the mating chirps of Tardarida brasiliensis from different regions arisen?"

Brazilian free-tailed bats (Tardarida brasiliensis) make distinct courtship "chirps." This research explores the possibility that differences exist in individual syllables of bats from different regions. Using nineteen bats from Austin and thirteen from college station, attempts were made to classify these chirps using several different methods. Since the syllables were of varying lengths and quality, several methods were devised which attempted to make a comparison between the chirps possible. The use of visual aids known as spectrograms aided greatly in understanding the data, along with more rigorous mathematical comparisons. The results seem to suggest that differences may exist, with some classification results reaching as high as 85%.

SUnMaRC Session • Saturday, 03/31 • 11:15—11:30 am • RV 102

Friday Schedule "At a Glance" – March 30, 2012

12:00 – 4:00 pm Vendor Exhibits in the RV Breezeway

MAA Session | ArizMATYC Session | Commercial Presentation

	Amethyst Room	RV Room 113	RV Room 120	AH Room 141	RV Room 125
8 am – 4 pm	Registration & Check-in	***Note: Friday Session Descriptions begin on page 5 and are listed alphabetically by the speaker's last name.***			
8: 20 – 9:45 am	Breakfast				
9:45 – 10 am	Welcoming Remarks				
10:00 – 10:50 am	Keynote Speaker: Dr. Phil Kutzko				
11:00 – 11:50 am	Campus Reports				
12:00 – 12:50 pm	Lunch				
1:00 pm	Articulation Task Force Meeting 1:00 – 1:50 pm		Service Learning – Aly 1:00 – 1:20 pm	MyMathLab and Course Redesign Workshop – Howe & Werbylo 1:00 – 1:50 pm	Technology in K-8 Mathematics – Beaudrie & Boschmans 1:00 – 1:20 pm
1:30 pm			Teaching Through Letters-Pen Pal Project – Anhalt & Liston 1:30 – 1:50 pm		Using GeoGebra in the Geometry Classroom – Beaudrie 1:30 – 1:50 pm
2:00 pm	AMATYC Proctored Testing Position Statement – Kozack 2:00 – 2:50 pm	Active Math – Dudley & Watkins 2:00 – 2:50 pm	Taking a Close Look at an Elementary Preservice Teacher's Reflective thinking: A Case Study – Hsieh 2:00 – 2:20 pm	WebWork Demonstration – Mendel 2:00 – 2:50 pm	An Analysis of Student Justifications on Probability Concepts and Implications for Instruction using Technology – Franklin & Monrose 2:00 – 2:20 pm
2:30 pm			Developing a Protocol for Analyzing the Quality of Classroom Interactions in an Undergraduate Calculus Course – Thomas 2:30 – 2:50 pm		An approach to calculus made possible by technology – Byerley 2:30 – 2:50 pm
3:00– 3:30 pm	Break				
3:30 pm	ArizMATYC Business Meeting 3:30 – 4:20 pm	Mathematics and Sustainability – Hughes Hallett & Lozano 3:30 – 4:20 pm	Measuring Teacher Knowledge of Mathematics Through Video Clips of Authentic Classroom Instruction – Sutton & al. 3:30 – 3:50 pm	Generalization in Mathematics from Elementary School to College – Dumitrascu 3:30 – 4:20 pm	Occupy Calculus! The Math Behind the 99% – Schettler & Collingwood 3:30 – 4:20 pm
4:00 pm			Promoting Teachers as Professionals: Common Core Toolkit – Whitesides & Patterson 4:00 – 4:20 pm		
5 – 8:30 pm	Banquet at the Sheraton Hotel (map on page 38) Oragami with M. Craig, Banquet Dinner, Presentation of MAA Awards, Speaker Steven R. Dunbar, Door Prizes *(Need not be present to win.)*				

Saturday Schedule "At a Glance" – March 31, 2012

9 am – 3 pm Technology Sandbox in Library Learning Studio: LB Room 153

9 am – 4 pm Vendor Exhibits in the RV Breezeway

MAA Sessions | ArizMATYC Sessions | SUnMaRC Sessions | Commercial Presentation

	Amethyst Room	RV Room 102	RV Room 113	RV Room 115	RV Room 120	RV Room 116	RV Room 160
8:00 am	Teaching Foundations: New Courses to Prepare Future Teachers – Knapp 8:00 – 8:50 am				Discovering the Derivative with a Graphing Calculator – Siegel 8:00 – 8:20 am	Lucky Larry and Lines of Verse – Mayo 8:00 – 8:50 am	Compression Algorithms for Digital Images – Delgado 8:00 – 8:20 am
8:30 am					Maxima and Minima without Calculus – Stenger 8:30 – 8:50 am		An Interior Point Method for Solving Semidefinite Programs Using Cutting Planes and Weighted Analytic Centers – Jibrin 8:30 – 8:50 am
9:00 am	MAA Business Meeting 9:00 – 9:50 am	An Introduction to Numerical Semigroups – Bezio 9:00 – 9:15	Wynn's ρ-algorithm for sequence acceleration using high precision arithmetic – Baumann 9:00 – 9:15	Cloaking Against Thermal Imaging – So 9:00 – 9:15	Kinetic Digital Textbooks for Math and Science – Glenn (Kinetic/Perfection Learning – Commercial Presentation) 9:00 - 9:50am	Cut Costs with Combination Courses – McDevitt (Hawkes – Commercial Presentation) 9:00 – 9:50 am	
		Trees of Irreducible Numerical Semigroups" – Loesl 9:20 – 9:35	Analytic Continuation of the Riemann Zeta Function – Herring 9:20 – 9:35	The artificial phase transition for perfect simulation of repulsive point processes – Xu 9:20 – 9:35			
		Higher Dimensional Perfect Bricks – Fox 9:40 – 9:55	Recovery of Fourier Transforms Using Edge Information – Gutierrez 9:40 – 9:55	Snell's Law Application to Light Waves in Optical Fiber Technology – Chaidez 9:40 – 9:55			
10 – 11:00 am	Panel: The Bachelor's Degree in Mathematics: Finding a job in industry						
11 – 11:15 am	Break						

Note: Saturday Session Descriptions begin on page 13 and are listed alphabetically by the speaker's last name.

Saturday Schedule "At a Glance" – March 31, 2012

	Amethyst Room	RV Room 102	RV Room 113	RV Room 120	RV Room 116	RV Room 160
11:15 am	Unlocking the Secrets of Counting Problems – Welch & Martin 11:15 am – 12:05 pm	Love and Bats: Have differences in the mating chirps of Tardarida brasiliensis from different regions arisen? – Islas & Vergara 11:15 – 11:30	Viewing Mathematics Linguistically – Walicki 11:15 – 11:30	Teaching from Historical Sources: Mercator's Map of the World and Integral Calculus – Lodder 11:15 am – 11:35 am	Improving the Mathematical Readiness of Middle-Achieving, College-Bound Students – Beaudrie 11:15 am – 12:05 pm	A dozen proofs of Stirling's Formula – Dunbar 11:15 am – 11:35 am
11:35 am		Modeling Renminbi / U.S. Dollar Exchange Rate Based on Time Series Analysis – Zhiwei 11:35 – 11:50	Changing Perceptions of Computer Science – Sauls 11:35 – 11:50	Didactic and Mathematical Analysis of the Concept of Function in USA, French, and Romanian Textbooks – Dumitrascu 11:45 am – 12:05 pm		Rethinking Homework Policies in High School and Undergraduate Math Courses – Wolfe 11:45 am – 12:05 pm
		Statistics and Chem-Cam – Baxter 11:55 – 12:10	What is Mathematics Education Research? – Beal 11:55 – 12:10			
12:15 pm	The Illustrative Mathematics Project – McCallum 12:15 – 1:05 pm	A simulation analysis of competing methods for addressing pseudoreplication – Yan 12:15 – 12:30	A Pilot Study on Inverted Pedagogy – Lamb 12:15 – 12:30	Mathematical and non-mathematical university students' proving difficulties – Selden 12:15 – 12:35 pm	A Note on the Proportional Partitioning of Line Segments, Triangles and Tetrahedra – Attanucci 12:15 – 1:05 pm	An Intrusive Advising Approach to Online Developmental Mathematics – Aurand 12:15 – 12:35 pm
		Evolutionary Games on the Lattice – Sannier, Andrew 12:35 – 12:50	Maintaining an Engaged Classroom: Demonstrations for Provoking and Maintaining Mathematical Curiosity – Vega 12:35 – 12:50	Understanding Student Proving using the Conditional Implies Conditional Structure – Knapp 12:45 – 1:05 pm		Mathematics Placement at NAU – Louchart & Daugherty 12:45 – 1:05
		Time-Fractional Heat Equation – Kelow 12:55 – 1:10	Matrix Product Application to Fibonacci Sequence – Muniz & Loya 12:55 – 1:10			
1:15– 2 pm	Lunch					
2 – 3 pm	Keynote Speaker Dr. Omayra Ortega					
3– 3:10 pm	Break					
3:15 pm		Lagrangian Transport of Radioactive Particles after Fukushima – Lai 3:15 – 3:30	A Comparative Survey of Graceful and Harmonious Labelings – Graf 3:15 – 3:30			
		Analysis of Environmental Particles Through Holistic Approaches – Anhalt 3:35 – 3:50	An introductory Look at the Abelian Sandpile Model – Fernandez 3:35 – 3:50			
4:00 pm		Application of Continuous Wavelet Transforms to the Study of Short-Term Variability in Methanol Masers – Bonin 3:55 – 4:10	Princes and Dragons – Sieben 3:55 – 4:10			

Sunday Schedule "At a Glance" – April 1, 2012

SUnMaRC Sessions (All are welcome to attend.)

	Amethyst Room	RV Room 113	RV Room 120
9:00 am		L^p Norms on Eigenfunctions of the Spherical Laplace Operator – Pietromonaco 9:00 – 9:15	A brief introduction to pseudoreplication – Burnham 9:00 – 9:15
		Confirming the scaling factor of the distribution of bridge heights of a self-avoiding walk – Cross 9:20 – 9:35	Symmetric Latin Squares and Their Properties – Giunta 9:20 – 9:35
		Visualization of Chaos and Legendre Polynomials – Gordon 9:40 – 9:55	Evolutionary Dynamics and Strong Allee Effects – Hudson 9:40 – 9:55
10 – 11:00 am	Keynote Speaker: Dr. Rebecca McGraw		
11:00 am		An Introduction to Hadamard Matrices – Zowada 11:00 – 11:15	Dynamics of Bucket Brigades with Overtaking Protocol – Nguyen 11:00 – 11:15
		Yang's Product Construction and 3-D Complex Hadamard Cubes – Lantz 11:20 – 11:35	Fast Waveform Extraction on Short Computational Domains – Benedict & Gordon 11:20 – 11:35

Note: Sunday Session Descriptions begin on page 31 and are listed alphabetically by the speaker's last name.