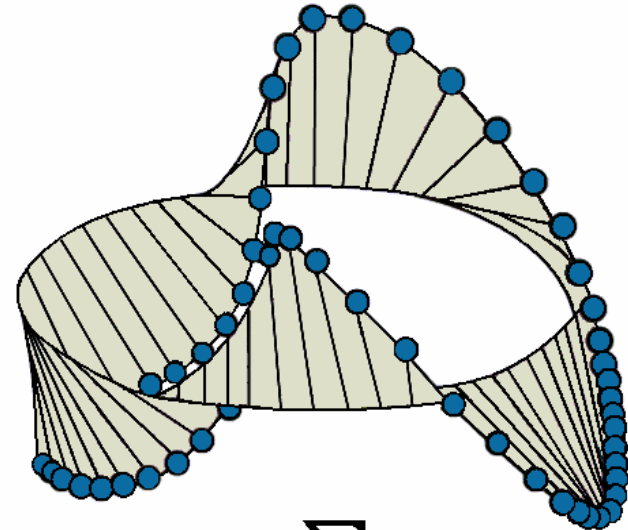


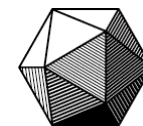
**Garden State Undergraduate Math Conference
2007**



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**Rowan University
Glassboro, NJ**

Saturday, March 31, 2007



MAA-NJ

Greetings!

Welcome to the fourth annual Garden State Undergraduate Mathematics Conference (GSUMC) hosted by the New Jersey section of the Mathematical Association of America (MAA-NJ). GSUMC promotes opportunities for undergraduate students to present their mathematical work, participate in a mathematical problem-solving contest, attend career workshops and foster interactions with fellow students. GSUMC attendees are welcome to attend any events of the MAA-NJ section meeting.

If you have any questions or problems, don't hesitate to ask any members of the GSUMC staff for assistance.

Thomas Hagedorn
GSUMC Director

Keynote Speaker

Primes and Orbits

Peter Sarnak, Princeton University and the Institute for Advanced Study

Euler asked about primes in progressions as well as in other sequences, he also provided one of the basic tools for this study. I will review some of these and then explain some recent advances and settings, especially geometric ones associated with orbits, for seeking primes.

Peter Sarnak, Eugene Higgins Professor of Mathematics at Princeton University and currently also a member of the Institute for Advanced Study, was born in Johannesburg, South Africa, did his undergraduate work at the University of Witwatersrand, and then his Ph.D at Stanford University. Prior to coming to Princeton, he was a faculty member at the Courant Institute and at Stanford University. Sarnak has made major contributions to number theory, and to questions of analysis often motivated by number theory. He has received numerous prizes: the AMS Frank Nelson Cole Prize and, jointly with N. Katz, the Levi L. Conant Prize, the Ostrowski Prize from the Ostrowski Foundation, Basel, the Polya Prize of Society of Industrial & Applied Mathematics, and many others. He is a Member of the National Academy of Sciences (U.S.A.), and Fellow of the Royal Society (U.K.). He has served on numerous scientific advisory committees.

Workshops

Careers in Middle School Mathematics (Wilson 203)

There is a growing need for qualified and engaging teachers at the middle school level. This workshop will be run by several veteran middle school mathematics teachers describing everyday job responsibilities and experiences. Career option information and specialized educational opportunities will be provided for

	1:50 - 2:10	2:15 - 2:35	2:40 - 3:00
Session 1 Wilson 212	Paul Hutchison (Muhlenberg) <i>Pitch Counts and their Relation to Traditional Methods of Measuring Pitching Effectiveness</i>	Daniel Jordon and Daniel Szymkowiak (Drexel) A <i>mathematical model of gliomas brain tumors</i>	Robin Augustine Thottungal (SUNY New Paltz) <i>Frequency Domain Analysis of Logistic Equations</i>
Session 2 Wilson 203	Ivan Ivanov (Ramapo) <i>Methods of Solving Least Squares Problems</i>	Robert Booth (Rowan) <i>If Only Bernoulli Knew About Matrices: A Determinant Formula For Bernoulli's Polynomials Based on His Figurate Triangle</i>	Michael Wilson (Montclair) <i>Polynomial Models of Discrete "Jordan-Like" Time Series</i>
Session 3 Wilson 205	Brian Kolarovic (Rutgers, Camden) <i>Fibonacci Numbers and Binomial Coefficients</i>	Robert Buonpastore (Rowan) <i>Skipping Rows in Pascal's Triangle</i>	Zulma Valcarcel (Ramapo) <i>On the Josephus Problem</i>
Session 4 Wilson 214	Andrew Robertson (Rowan) <i>Euler's Little Summation Formula</i>	Walter Jacob (Rowan) <i>A look at Euler's E46</i>	Lucas Willis (Rowan) <i>Euler's use of Abel sums to evaluate direct power series</i>
Session 5 Wilson 215	Krystle Hinds (Monmouth) <i>The Mathematics of Google</i>	Rachel McCormick and Steven Fardella (Rutgers, Camden) <i>Protecting your privacy with RSA</i>	Brandon Creel (Rutgers, Camden) <i>Let's Untangle Your Garden Hose - An Introduction to Knot Theory</i>
Session 6 Wilson 114	Matthew Oster (Rowan) <i>A Spiral of Right Triangles Related to the Great Pyramid</i>	Laura Doot (Rowan) <i>A Look into Farey Sequences</i>	Christy Hediger (Muhlenberg) <i>Reformulating San Gaku Problems in Spherical Geometry</i>

Garden State Undergraduate Mathematics Conference Organizing Committee:

Thomas Hagedorn, The College of New Jersey (Conference Director and Speakers)
Karen Clark, The College of New Jersey (Advertising and Program Editor)
Abdul Hassen, (Chair, Local Arrangements)
Theresa Michnowicz, (Speakers)
Katarzyna Potocka, Ramapo College (Contest Co-director)
John T. Saccoman, Seton Hall University (Student Talks and Poster Session)
Diana Thomas, Montclair State University (Workshop Organizer)
Ben Weng, Ramapo College (Contest Co-director)

Garden State Undergraduate Mathematics Competition Committee:

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Pangyen Ben Weng, Ramapo College, contest co-director
Aihua Li, Montclair State University
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Acknowledgements

GSUMC wishes to thank the following people and organizations:

- The New Jersey Section of the MAA and the Mathematical Association of America (RUMC-NSF Grant DMS53991) for their financial support.
- Rowan University and its Department of Mathematics for hosting this conference.
- Sponsors for contributing to the door prizes: Princeton University Press, John Wiley & Sons and Springer

students participating in this workshop. The panel will be chaired by Dr. Ken Wolff, the program advisor of the Middle Grades Mathematics program at Montclair State University. Ken Wolff received his doctorate in mathematics education from NYU and has been teaching at Montclair State University since 1967. He is the program advisor for the 12 active doctoral students in the Specialization in Mathematics Education of the Ed.D. in Pedagogy. He is also the Program Advisor for approximately 25 MA students and 80+ post-baccalaureate certificate students in their respective Teaching Mathematics in the Middle Grades programs.

What is a Research Experience for Undergraduates Program (REU) and how do I participate? (Wilson 205)

Research at the undergraduate level is becoming more commonplace with many student projects originating from REU summer programs. Dr. Brenda Latka, Associate Director of DIMACS along with alumni from the DIMACS REU program will share their experiences involving the application process, the program itself and the outcomes of the REU with the workshop participants. Brenda J. Latka is the Associate Director of DIMACS, the Center for Discrete Mathematics and Theoretical Computer Science, and the Education Director of DyDAn, the Homeland Security Center for Dynamic Data Analysis, both located at Rutgers University. She is an Emerita Professor of Mathematics at Lafayette College, Easton, Pa. Her major research interests are combinatorial problems arising in model theory, the structure of tournaments, and well-quasi-orderings.

Careers in Actuarial Sciences (Wilson 212)

One of the most natural careers for mathematics majors is in the actuarial sciences. This workshop, run by ACTEX Publications a leading provider of study materials, seminars and on line courses for the actuarial examinations, will provide information to students on actuarial exams and careers. The workshop will be led by Dr. Gail Hall (FSA, MAAA), the President of ACTEX. Gail Hall has been with ACTEX Publications since September 2003. She is currently responsible for product development and all administrative aspects of the company. Prior to joining ACTEX, she was in the life insurance industry for over 25 years. Gail has been very active in Society of Actuaries activities. She served on the Board of Governors from 1998 through 2000. She was active on the Education and Examination committee for many years, most recently serving as its Chairman in 1999. Gail is currently serving on the Management and Personal Development Section Council.

Schedule for student contributed paper sessions

Student paper session organized by John T. Saccoman, Seton Hall University

Session 1 Wilson 212

Presider: John T. Saccoman, Seton Hall University

- 1:50-2:10 Paul Hutchison, Muhlenberg College, ph230628@muhlenberg.edu
Pitch Counts and their Relation to Traditional Methods of Measuring Pitching Effectiveness
- 2:15-2:35 Daniel Jordon, Drexel University (with Daniel Szymkowiak)
dmi36@drexel.edu
A Mathematical Model of Gliomas Brain Tumors
- 2:40-3:00 Robin Augustine Thottungal, State University of New York, New Paltz,
robinthottungal@yahoo.com
Frequency Domain Analysis of Logistic Equations

Session 2-Wilson 203

Presider: Kaaren Finberg, Ocean County College

- 1:50-2:10 Ivan Ivanov, Ramapo College of New Jersey, iivanov@ramapo.edu
Methods of Solving Least Square Problems
- 2:15-2:35 Robert Booth, Rowan University, boothr84@students.rowan.edu
If Only Bernoulli Knew about Matrices: A Determinant Formula for Bernoulli's Polynomials Based on His Figurate Triangle
- 2:40-3:00 Michael Wilson, Montclair State University
wilsonm7@mail.montclair.edu
Polynomial Models of Discrete "Jordan-Like" Time Series

Session 3-Wilson 205

Presider: Melkamu Zeleke, William Paterson University

- 1:50-2:10 Brian Kolarovic, Rutgers University, Camden
genesis1@camden.rutgers.edu
Fibonacci Numbers and Binomial Coefficients
- 2:15-2:35 Robert Buonpastore, Rowan University, buonpa20@students.rowan.edu
Skipping Rows in Pascal's Triangle
- 2:40-3:00 Zulma Valcarcel, Ramapo College of New Jersey,
zvalcarc@ramapo.edu
On the Josephus Problem

4. Edme Soho, Montclair State University, sohoe1@mail.montclair.edu

A Closter Dynamic Model of Tuberculosis of Two Strains and Its Applications to Benin

We built a mathematical model for a Tuberculosis transmission that incorporates local and individual interactions. This model contains two strains, drug sensitive and drug resistance, in which individuals are at risk of infection from close contact in generalized household (clusters) as well as from casual contact. We ran the simulation with statistical data from Benin (Africa) to carry out the local steady state analysis to get the basic reproductive number of the model.

5. Joshua Dunn, Walter Jacob, Matt Oster, Rowan University,
dunnj62@students.rowan.edu

2007 MCM Ben Fusaro Award Winners

Rowan University took part in the Mathematical Contest in Modeling again this year. The problem that our team chose was problem B: The Airline Seating Problem. Our team (consisting of Walter Jacob, Matthew Oster, and Josh Dunn) were the winners of the Ben Fusaro Award for originality and creativity in the modeling effort to solve the problem. For our poster, we will describe the problem as given and explain how the solution was developed. Specifically, we will discuss our use of randomizing functions with regards to walking, stowing and seating times and our creative use of programming with Matlab. Of course, we will reveal our final results using the data from our model.

Abstracts for Student Poster Session

Wilson Hall second floor balcony

3:00- 3:25

Student poster session organized by John T. Saccoman, Seton Hall University

1. Meghan Moratelli, Monmouth University, s0509637@monmouth.edu

A Mathematical Exploration of One and Two Dimensional Crystallographic Groups in Spanish Architecture

In mathematics, one dimensional and two dimensional objects can be classified according to their symmetries. Wallpaper patterns in the plane and frieze, or border, patterns are two such examples and prove to hold a special property of only admitting a finite number of possible symmetry groups. Within the architectural world, wallpaper and frieze patterns are common and have added to the beauty of many famous architectural monuments and buildings throughout the world. The patterns have been carefully studied for their symmetries within these famous architectural structures as well. This thesis provides an explanation and analysis of two dimensional crystallographic groups, or wallpaper patterns, and one dimensional crystallographic groups, or frieze patterns, by means of proving mathematical theorems and including examples of these patterns in Spanish architecture, particularly located in Segovia, Spain, which have been gathered and analyzed during a study abroad trip to Spain.

2. David Ortiz, Rutgers University, New Brunswick-Piscataway, daortiz6@eden.rutgers.edu

Wavelets

Wavelets are a technique for reconstructing images from data. Wavelets are often used in reconstructing medical images, communication signals, and other technical fields. This poster will describe some simple wavelet reconstruction methods. The long term goal of the research project is to recognize patterns in apparently chaotic signals.

3. Jeff Hatley and Glen Wilson, The College of New Jersey, hatley2@tcnj.edu, wilson47@tcnj.edu

Invariant Theory

Invariants are polynomial functions whose values remain unchanged under a group action. For example, the determinant and trace of a matrix are two invariant functions as their values remain constant under matrix conjugation. Invariant functions were a central topic in the development of algebra. The poster will discuss how to calculate invariants and the relationship to group representation theory.

Session 4-Wilson 214

Presider: TBA

1:50-2:10 Andrew Robertson, Rowan University, robert97@students.rowan.edu
Euler's Little Summation Formula

2:15-2:35 Walter Jacob, Rowan University, jacobw56@students.rowan.edu
A Look at Euler's E46

2:40-3:00 Lucas Willis, Rowan University, lucas.willis@gmail.com
Euler's use of Abel Sums to Evaluate Direct Power Series

Session 5-Wilson 215

Presider: TBA

1:50-2:10 Krystle Hinds, Monmouth University, s0509642@monmouth.edu
The Mathematics of Google

2:15-2:35 Rachel McCormick, Rutgers University, Camden (with Steven Fardella), rmxc03@msn.com
Protecting Your Privacy with RSA

2:40-3:00 Brandon Creel, Rutgers University, Camden
bcreel@camden.rutgers.edu, **Let's Untangle Your Garden Hose- An Introduction to Knot Theory**

Session 6-Wilson 114

Presider: TBA

1:50-2:10 Matthew Oster, Rowan University, osterm38@students.rowan.edu
A Spiral of Right Triangles Related to the Great Pyramid

2:15-2:35 Laura Doot, Rowan University, dootl91@students.rowan.edu
A Look into Farey Sequences

2:40-3:00 Christy Hediger, Muhlenberg College, ch230872@muhlenberg.edu
Reformulating San Gaku Problems in Spherical Geometry

**Garden State Undergraduate Math Conference
Spring 2007 Program**

8:30 – 10:00	Registration and Breakfast, Wilson Hall, second floor balcony
8:30 – 9:00	Check-in for Math Competition Wilson Hall, second floor balcony
9:00 – 12:00 (9:00 – 10:00) (10:00 – 12:00)	Garden State Undergraduate Math Competition Individual Session Team Session Headquarters: Wilson Hall 203
12:00 – 1:00	Lunch: Students, Wilson Hall Lobby Faculty, Student Center Marketplace
1:00 – 1:45	Career Workshops (running concurrently): <i>Panel: Careers in Middle School Mathematics</i> , Ken Wolff, Montclair State University moderator: Wilson 203 <i>What is a Research Experience for Undergraduates Program (REU) and how do I participate?</i> Brenda Latka, DIMACS: Wilson 205 <i>Careers in Actuarial Sciences</i> , Gail Hall, Actex Publications: Wilson 212
1:50 – 3:00	Students Talks: <i>Wilson Hall</i> Student Session 1: Wilson 212 Student Session 2: Wilson 203 Student Session 3: Wilson 205 Student Session 4: Wilson 214 Student Session 5: Wilson 215 Student Session 6: Wilson 114
3:00 – 3:25	Student Poster Session (Presenters will be at their posters and available for questions): Wilson second floor balcony Refreshments: Wilson Hall first floor (outside Boyd Hall)
3:25 – 4:20	Primes and Orbits , Peter Sarnak, Princeton University Wilson Hall 101 (Boyd Recital Hall) Presider: Aihua Li, Montclair State University
4:20 – 4:30	Contest Results, Awards, and Prizes, Wilson 101
4:30	End of Conference

**Mathematical Association of America
New Jersey Section
Euler 300th Anniversary (Spring 2007) Meeting Program**
All sessions except the concurrent sessions at 1:30 p.m. will take place in Wilson Hall 101 (Boyd Recital Hall)

8:30 – 9:15	Registration and Coffee, Wilson Hall, first floor
8:30 – 1:30	Book Exhibits, Wilson Hall first floor (outside Boyd Hall)
9:15 – 9:30	Welcome by Dr. Jin Wang, Associate Dean of the College of Liberal Arts and Sciences , Rowan University
9:30 – 10:25	<i>The Joy of Student-Professor Collaboration in Translating Euler's Papers</i> , Thomas Osler, Rowan University Presider: Jay Schiffman, Rowan University
10:25 – 11:05	Intermission, Wilson Hall first floor (outside Boyd Hall) Publisher presentations: <i>Content on Demand</i> , John Moncada, Key College Publishing, Wilson 105 <i>Eduspace</i> , Theresa Cortesini, Houghton Mifflin, Wilson 114
11:05 – 11:25	Chair's and Governor's Reports, and recognition of 25- and 50-year members, Presentation of Distinguished Service Award
11:25 – 12:20	<i>An Euler Trifecta</i> , William Dunham, Muhlenberg College Presider: F.Olcay Ilicasu, Rowan University
12:20 – 1:50	Lunch , Student Center Marketplace (Book exhibits end at 1:50.)
1:50 – 3:05	MAA-NJ Contributed paper sessions (concurrent): <i>All sessions are in Wilson Hall</i> The Life and Works of Leonard Euler: Wilson 206 Applications of Mathematics for Classroom Use: Wilson 207 Statistics: Continuing Challenges in Education and Practice: Wilson 105 General Contributed Paper Session: Wilson 204
3:05-3:25	Intermission and refreshments, Wilson Hall first floor (outside Boyd Hall) (Silent Auction bidding ends at 3:25)
3:25 – 4:20	Primes and Orbits , Peter Sarnak, Princeton University Presider: Aihua Li, Montclair State University
4:20 – 4:30	Contest Results, Awards, Drawing of door prizes, Silent Auction Winners announcement (must be present to win)
5:00	Dinner honoring Award Winners, Invited Speakers and Workshop Leaders