Program of the Sessions

Seattle, Washington, January 6–9, 2016

Monday, January 4

AMS Short Course Registration

7:00 AM – 4:30 PM — **Willow B, 2nd Floor, Sheraton Seattle Hotel**

AMS Short Course on Rigorous Numerics in Dynamics, Part I

9:00 AM – 5:30 PM — **Willow A, 2nd Floor, Sheraton Seattle Hotel**

Organizers: **Jean-Philippe Lessard**, Université Laval
Jan Bouwe van den Berg, VU University Amsterdam

MAA Ancillary Workshop

9:00 AM – 4:30 PM — **Room 211, Washington State Convention Center**

Bringing passion to your introductory statistics classroom: a supportive, multidisciplinary project-based approach.

Organizers: **Lorey Burghard**, Pennsylvania State University
Lisa Dierker, Wesleyan University
Dennis Pearl, Pennsylvania State University

Presenter: **Lisa Dierker**, Wesleyan University

NSF-EHR Grant Proposal Writing Workshop

3:00 PM – 6:00 PM — **Redwood, 2nd Floor, Sheraton Seattle Hotel**

AMS Short Course Reception

5:30 PM – 6:30 PM — **Willow B, 2nd Floor, Sheraton Seattle Hotel**

Tuesday, January 5

AMS Short Course on Rigorous Numerics in Dynamics, Part II

8:00 AM – 4:45 PM — **Willow A, 2nd Floor, Sheraton Seattle Hotel**

Organizers: **Jean-Philippe Lessard**, Université Laval
Jan Bouwe van den Berg, VU University Amsterdam

AMS Department Chairs Workshop

8:00 AM – 6:30 PM — **Grand Ballroom A, 2nd Floor, Sheraton Seattle Hotel**

The time limit for each AMS contributed paper in the sessions is ten minutes. The time limit for each MAA contributed paper varies. In the Special Sessions the time limit varies from session to session and within sessions. To maintain the schedule, time limits will be strictly enforced.

For papers with more than one author, an asterisk follows the name of the author who plans to present the paper at the meeting.

Papers flagged with a solid triangle (▶) have been designated by the author as being of possible interest to undergraduate students.

Abstracts of papers presented in the sessions at this meeting will be found in Volume 37, Issue 1 of *Abstracts of papers presented to the American Mathematical Society*, ordered according to the numbers in parentheses following the listings. The middle two digits, e.g., 897-**20**-1136, refer to the Mathematical Reviews subject classification assigned by the individual author. Groups of papers for each subject are listed chronologically in the *Abstracts*. The last one to four digits, e.g., 897-20-**1136**, refer to the receipt number of the abstract; abstracts are further sorted by the receipt number within each classification. MAA abstracts are listed toward the back of the issue sorted by session name.

MAA Minicourse #1: Part A

9:00 AM – 11:00 AM **Room 2A, Washington State Convention Center**

Introductory proposal writing for grant applications to the NSF EHR/Division of Undergraduate Education.

Presenters: **John Haddock**, Division of Undergraduate Education, NSF

Teri Jo Murphy, Division of Undergraduate Education, NSF

Lee Zia, Division of Undergraduate Education, NSF

MAA Ancillary Workshop

9:00 AM – 4:30 PM **Room 211, Washington State Convention Center**

National research experiences for undergraduates.

Organizer: **Dennis Davenport**, Howard University

MAA Ancillary Workshop

9:00 AM – 4:30 PM **Room 2B, Washington State Convention Center**

Teaching the statistical investigation process with randomization-based inference.

Organizers: **Lorey Burghard**, Pennsylvania State University

Dennis Pearl, Pennsylvania State University

Presenters: **Robin Lock**, St. Lawrence University

Todd Swanson, Hope College

Nathan Tintle, Dordt College

MAA Board of Governors

9:00 AM – 5:00 PM **Metropolitan B, 3rd Floor, Sheraton Seattle Hotel**

AMS Council

1:30 PM – 10:00 PM **Metropolitan A, 3rd Floor, Sheraton Seattle Hotel**

MAA Minicourse #1: Part B

2:00 PM – 3:00 PM **Room 2A, Washington State Convention Center**

Introductory proposal writing for grant applications to the NSF EHR/Division of Undergraduate Education.

Presenters: **John Haddock**, Division of Undergraduate Education, NSF

Teri Jo Murphy, Division of Undergraduate Education, NSF

Lee Zia, Division of Undergraduate Education, NSF

Joint Meetings Registration

3:00 PM – 8:00 PM **Atrium Lobby, 4th Floor, Washington State Convention Center**

Email Center

3:00 PM – 8:00 PM **Atrium Lobby, 4th Floor, Washington State Convention Center**

Wednesday, January 6

MAA Minority Chairs Meeting

7:00 AM – 8:45 AM **Issaquah A, 3rd Floor, Sheraton Seattle Hotel**

Joint Meetings Registration

7:30 AM – 6:00 PM **Atrium Lobby, 4th Floor, Washington State Convention Center**

Email Center

7:30 AM – 10:00 PM **Atrium Lobby, 4th Floor, Washington State Convention Center**

AMS-MAA-SIAM Special Session on Research in Mathematics by Undergraduates and Students in Post-Baccalaureate Programs, I

8:00 AM – 10:50 AM **Tahoma 3, Tahoma Level Three, Washington State Conference Center**

Organizers: **Darren A. Narayan**, Rochester Institute of Technology

Jobby Jacob, Rochester Institute of Technology

Tamas Forgacs, California State University, Fresno

Ugur Abdulla, Florida Institute of Technology

8:00AM ► (1) *On the Fine Classification of Periodic Orbits of Continuous Endomorphisms on the Real Line and Universality in Chaos.* **Ugur G Abdulla**, Florida Institute of Technology, **Rashad U Abdulla***, University of Pennsylvania, **Muhammad U Abdulla**, Florida Institute of Technology, **Alyssa L. Turnquist**, Morningside College, and **Naveed Iqbal**, Florida Institute of Technology (1116-37-85)

8:30AM ► (2) *State Constrained Optimal Control of the Stefan Type Free Boundary Problems.* **Ugur Abdulla**, **Curtis Earl***, Florida Institute of Technology, **Chelsey Hoff**, Florida Atlantic University, **Jim Jones**, **Bruno Poggi**, Florida Institute of Technology, and **Ryan Stees**, James Madison University (1116-35-87)

9:00AM ► (3) *Frechet Differentiability in Optimal Control of Free Boundary Problems for the Second Order Parabolic PDE.* **Dylanger S Pittman***, Williams College, **Jessica Pillow**, Rhodes College, **Ugur Abdulla**, **Jim Jones** and **Jonathan Goldfarb**, Florida Institute of Technology (1116-35-90)

9:30AM (4) *Evolution of Free Boundaries for the Nonlinear Fokker-Planck Equation.* **Ugur G. Abdulla**, Florida Institute of Technology, **Luke Thomas Andrejek**, Indiana University, **Christie M. Campbell***, Michigan State University, **Jian Du**, **Jonathon Goldfarb** and **Adam L. Prinkey**, Florida Institute of Technology (1116-35-101)

10:00AM (5) *Analysis of Interfaces for the Nonlinear Double-Degenerate Reaction-Diffusion Equation.* **Ugur G Abdulla**, **Jian Du**, Florida Institute of Technology, **Chloe L Ondracek**, Minot State University, **Suneil Parimoo***, University of Pennsylvania, and **Adam L Prinkey**, Florida Institute of Technology (1116-35-102)

10:30AM ► (6) *Detecting gene-gene interactions that underlie cancer using the R package algstat.* Preliminary report. **Iliana De La Cruz**, St. Mary's University, **Taylor Spino**, North Central College, **Melissa Stadt***, University of Washington-Seattle, and **Catherine Sullivan**, Siena College (1116-62-108)

AMS-MAA Special Session on Innovative Ideas in Enhancing Success in Mathematics Classes, I

8:00 AM – 10:50 AM **Chelan 2, Chelan Level Two, Washington State Conference Center**

Organizers: **Natali Hritonenko**, Prairie View A&M University
Ellina Grigorieva, Texas Woman's University
Michael A. Radin, Rochester Institute of Technology

8:30AM (7) *Making Problem -Asking the Students to Make up Problem- and its Assessment.* **Noriko Tanaka**, Toyota-nishi High School (1116-97-911)

9:00AM ► (8) *TRAIn Method: A new lab model for training undergraduates in STEM fields.* Preliminary report. **Katherine M. Kinnaird**, Macalester College (1116-97-2499)

9:30AM ► (9) *Building YouTube University Brick by Brick.* **Steven J Miller**, Williams College (1116-97-405)

10:00AM ► (10) *Teaching strategies for a first course in linear algebra.* **Amanda Ellis Francis**, Brigham Young University (1116-97-2895)

10:30AM (11) *Techniques For Teaching Problem Solving Using Mathematics Contests.* **Chris Jeuell**, Microsoft Corporation (1116-00-2957)

AMS Special Session on Analysis and Geometry in Nonsmooth Metric Measure Spaces, I

8:00 AM – 10:50 AM **Room 401, Washington State Convention Center**

Organizers: **Luca Capogna**, Worcester Polytechnic Institute
Jeremy Tyson, University of Illinois at Urbana-Champaign

8:00AM ► (12) *The quasiconformal geometry of continuum trees.* **Mario Bonk**, UCLA (1116-30-1860)

8:30AM (13) *Quasiconformal mappings via iterated function systems.* Preliminary report. **Kevin Wildrick**, Montana State University (1116-30-1270)

9:00AM (14) *Universal Convexity of Balls for QuasiHyperbolic Type Metrics.* Preliminary report. **David A Herron**, University of Cincinnati (1116-53-1490)

9:30AM (15) *Logarithmic Potentials and Quasiconformal Flows on the Heisenberg Group.* Preliminary report. **Alex D Austin**, University of Illinois at Chicago (1116-51-1517)

10:00AM (16) *Quasiconformal non-parametrizability of almost smooth spheres.* **Vyron S Vellis*** and **Pekka Pankka**, University of Jyvaskyla (1116-30-765)

10:30AM ► (17) *Theory and applications of p-modulus of families of walks on networks.* Preliminary report. **Pietro Poggi-Corradini**, Kansas State University (1116-30-1412)

AMS Special Session on Arithmetic Dynamics, I

8:00 AM – 10:50 AM **Room 604, Washington State Convention Center**

Organizers: **Matthew Baker**, Georgia Institute of Technology

Joseph Silverman, Brown University

8:00AM (18) *A nonarchimedean approach to local holomorphic dynamics in dimension two.* **William Gignac**, Georgia Tech (1116-37-2433)

8:30AM (19) *On the distribution of orbits in affine varieties.* **Clayton Petsche**, Oregon State University (1116-37-929)

9:00AM (20) *Arithmetic Coordinates on Dynamical Moduli Space.* Preliminary report. **Robert Rumely**, University of Georgia (1116-37-753)

9:30AM (21) *Questions in higher-dimensional non-archimedean dynamics.* **Alon Levy**, KTH - Royal Institute of Technology (1116-11-754)

10:00AM (22) *Non-archimedean connected Julia sets with branching.* **Robert L Benedetto**, Amherst College (1116-11-917)

10:30AM (23) *Lyapunov Exponents in non-Archimedean Dynamics.* **Kenneth Scott Jacobs**, University of Georgia (1116-37-1171)

AMS Special Session on Integrable Systems, Painlevé Equations, and Random Matrices, I

8:00 AM – 10:50 AM **Skagit 5, Skagit Lower Level, Washington State Conference Center**

Organizers: **Anton Dzhamay**, University of Northern Colorado

Christopher M. Ormerod, California Institute of Technology

Virgil U. Pierce, University of Texas-Pan American

8:00AM (24) *Discrete Painlevé equations.* **Hidetaka Sakai**, Graduate School of Mathematical Sciences, University of Tokyo (1116-39-2305)

8:30AM (25) *Fiber-dependent deautonomisation of integrable 2D mappings.* Preliminary report. **Adrian Stefan Carstea**, National Institute of Physics and Nuclear Engineering, **Anton Dzhamay**, University of Northern Colorado, and **Tomoyuki Takenawa***, Tokyo University of Marine Science and Technology (1116-39-2251)

9:00AM (26) *Lattice supersymmetric Korteweg de Vries equation and super-QRT mappings.* **Adrian Stefan Carstea**, Institute of Physics and Nuclear Engineering, Department of Theoretical Physics, Bucharest, Romania (1116-39-1226)

9:30AM (27) *Hermite-Pade approximation, isomonodromic deformation and hypergeometric integral.* **Teruhisa Tsuda**, Depratment of Economics, Hitotsubashi University, Tokyo, Japan. (1116-39-1484)

10:00AM ► (28) *Singularity confinement 2.0 : an easily implementable and sufficient integrability criterion, at last ?* **Ralph Willox**, The University of Tokyo (1116-39-1214)

10:30AM (29) *Singularity and algebraic entropy analysis of a delay-differential equation.* **Claude M. Viallet**, Centre National de la Recherche Scientifique / Univ Pierre et Marie Curie / Paris (1116-00-1117)

AMS Special Session on Interactions between Noncommutative Algebra, Algebraic Geometry, and Representation Theory, I

8:00 AM – 10:50 AM **Room 602, Washington State Convention Center**

Organizers: **Ellen Kirkman**, Wake Forest University

James Zhang, University of Washington

8:00AM (30) *Classifying connected Hopf algebras of finite GK-dimension via finite Drinfeld quantizations.* **Jesse S Levitt*** and **Milen Yakimov**, Louisiana State University (1116-16-2686)

8:30AM (31) *Evaluations of associative and Lie polynomials on matrices.* Preliminary report. **Louis H Rowen**, Bar-Ilan University (1116-16-72)

9:00AM (32) *The geometry of algebras with zero radical square.* **Frauke M Bleher**, University of Iowa, **Ted Chinburg**, University of Pennsylvania, and **Birge Huisgen-Zimmermann***, University of California at Santa Barbara (1116-16-514)

9:30AM (33) *Tools For Computing Discriminants.* Preliminary report. **W. Frank Moore***, **Jason Gaddis** and **Ellen Kirkman**, Wake Forest University (1116-16-2598)

10:00AM (34) *Values of Frobenius-Schur indicators for Hopf algebras.* **M Susan Montgomery**, University of Southern California (1116-16-1948)

10:30AM (35) *Morita equivalences of Azumaya algebras as sheaves of bimodules.* Preliminary report.
Cris Negron, Louisiana State University (1116-14-2596)

AMS Special Session on Mathematical Information in the Digital Age of Science, I

8:00 AM – 10:50 AM **Room 603, Washington State Convention Center**

Organizers: **Patrick Ion**, University of Michigan, Ann Arbor
Olaf Teschke, zbMATH, Berlin
Stephen Watt, University of Western Ontario

8:00AM ► (36) *How should mathematical knowledge be organized?*
W Timothy Gowers, University of Cambridge, UK (1116-00-1711)

9:00AM ► (37) *The User's Guide Project: giving experiential context to research papers.*
Luke Wolcott, Lawrence University (1116-00-2361)

9:30AM ► (38) *Enhanced Guides to the Mathematical Literature.*
Edward Dunne, AMS / Mathematical Reviews (1116-00-2424)

10:00AM ► (39) *Quantity and quality of mathematical information drawn from the literature: experiences from building and connecting EuDML and zbMATH.*
Olaf Teschke, FIZ Karlsruhe/zbMATH (1116-68-2153)

10:30AM (40) *Evolving Math Web Standards from a Usability Perspective.*
Peter Krautzberger*, MathJax Consortium & American Mathematical Society, **Davide Cervone**, MathJax Consortium & Union College, NY, and **Volker Sorge**, MathJax Consortium & Birmingham University, UK (1116-00-1947)

AMS Special Session on Mathematics and Public Policy

8:00 AM – 10:50 AM **Rooms 307/308, Washington State Convention Center**

Organizer: **Paul Dreyer**, RAND Corporation

8:00AM ► (41) *Mathematics, Public Policy, and High Frequency Trading.*
Paul Dreyer, RAND Corporation (1116-00-2222)

8:30AM ► (42) *Race and policing in Los Angeles.*
Lily S. Khadjavi*, Loyola Marymount University, and **David Greenberg**, New York University (1116-62-2140)

9:00AM ► (43) *Modeling Health Care Reform.*
Carter Claiborne Price, RAND Corporation (1116-91-1568)

9:30AM (44) *Opportunities for academics with the Department of Defense.*
Skip Garibaldi, UCLA Institute for Pure & Applied Mathematics (1116-00-446)

10:00AM ► (45) *Computing Aviation Sparing Policies: Solving a Large Nonlinear Integer Program.*
Igor Mikolic-Torreira*, RAND Corporation, **Ronald H Nickel**, Center for Naval Analyses, and **Jon W Tolle**, Department of Statistics and Operations Research, University of North Carolina, Chapel Hill, NC (1116-90-1353)

10:30AM ► (46) *Joint Mathematics: Lessons from a Marijuana License Lottery.*
Sharif Ibrahim, Washington State University (1116-00-1373)

AMS Special Session on Modular Forms, q-Series, and Mathematics Inspired by Ramanujan

8:00 AM – 10:50 AM **Room 610, Washington State Convention Center**

Organizers: **Chris Jennings-Shaffer**, University of Florida, Gainesville, and Oregon State University, Corvallis
Holly Swisher, Oregon State University, Corvallis

8:00AM (47) *Extending Ramanujan's Dyson rank function identity to all primes greater than 3.* Preliminary report.
F. G. Garvan, University of Florida (1116-11-1298)

8:30AM ► (48) *Hypergeometric functions over finite fields.*
Jenny Fuselier, High Point University, **Ling Long***, Louisiana State University, **Ravi Ramakrishna**, Cornell University, **Holly Swisher**, Oregon State University, and **Fang-Ting Tu**, National Center for Theoretical Sciences, Taiwan (1116-11-921)

9:00AM (49) *Generalized Reciprocal Identities.*
Tim Huber*, University of Texas - Rio Grande Valley, and **Daniel Schultz**, Pennsylvania State University (1116-11-1203)

9:30AM (50) *On p-adic modular forms and the Bloch-Okounkov theorem.*
Michael Griffin, Princeton University, **Marie Jameson***, University of Tennessee, and **Sarah Trebat-Leder**, Emory University (1116-11-1702)

10:00AM (51) *A New Companion to Capparelli's Identities and Some Combinatorial Inequalities.*
Ali Kemal Uncu, University of Florida (1116-05-1908)

10:30AM (52) *Legendre Theorems for Subclasses of Overpartitions.*
George E Andrews, Pennsylvania State University (1116-11-570)

AMS Special Session on Moduli Spaces in Symplectic Geometry

8:00 AM – 10:50 AM **Room 606, Washington State Convention Center**

Organizers: **Nathaniel Bottman**, MIT
Joel Fish, IAS, Princeton, and the University of Massachusetts, Boston
Sheel Ganatra, Stanford University
Katrin Wehrheim, University of California Berkeley

8:00AM (53) *Arnold conjecture via SFT polyfolds.* **Peter Albers**, Mathematisches Institut, WWU Münster, **Benjamin Filippenko***, UC Berkeley, **Joel Fish**, University of Massachusetts Boston, and **Katrin Wehrheim**, UC Berkeley (1116-57-814)

8:30AM (54) *A conjectural formula for counting discs via degeneration.* **Eduardo González***, UMASS Boston, and **Hiroshi Iritani**, Kyoto University, Japan (1116-58-1408)

9:00AM (55) *From SFT to ECH.* Preliminary report. **Michael Hutchings**, University of California, Berkeley (1116-57-836)

9:30AM (56) *Constructing Floer homotopy using polyfolds.* Preliminary report. **Robert Lipshitz**, University of Oregon, and **Ciprian Manolescu***, UCLA (1116-57-522)

10:00AM (57) *Quotient of polyfold and applications to equivariant transversality.* Preliminary report. **Zhengyi Zhou**, UC Berkeley (1116-51-1537)

10:30AM (58) *Embedded contact homology cobordism maps and holomorphic curves.* **Daniel A Cristofaro-Gardiner**, Harvard University (1116-53-2683)

AMS Special Session on Operators, Function Spaces, and Models, I

8:00 AM – 10:50 AM **Room 400, Washington State Convention Center**

Organizers: **Alberto Condori**, Florida Gulf Coast University, Fort Myers
William Ross, University of Richmond

8:00AM (59) *Thin Sequences and Model Spaces.* **Pamela Gorkin***, Bucknell University, and **Brett D. Wick**, Washington University in St. Louis (1116-47-385)

8:30AM (60) *Interpolation and sampling in reproducing kernel Hilbert spaces.* Preliminary report. **Mishko Mitkovski*** and **Aaron Flores Ramirez**, Clemson University (1116-43-1095)

9:00AM ► (61) *An application of finite Blaschke products in operator theory.* **Javad Mashreghi**, Laval University (1116-30-1032)

9:30AM (62) *Compressed Shift Operators on Two-Variable Model Spaces.* **Kelly Bickel***, Bucknell University, and **Constanze Liaw**, Baylor University (1116-47-978)

10:00AM (63) *A spectral area estimate of Toeplitz Operators.* **Cheng Chu***, Washington University in St. Louis, and **Dmitry Khavinson**, University of South Florida (1116-47-51)

10:30AM (64) *Orthogonal polynomials and cyclicity.* **C Beneteau**, **D Khavinson**, University of South Florida, **C Liaw**, Baylor University, **D Seco***, Universitat de Barcelona, and **A A Sola**, University of South Florida (1116-42-470)

AMS Special Session on Origami Methods and Applications, I

8:00 AM – 10:50 AM **Room 4C-3, Washington State Convention Center**

Organizers: **Erik Demaine**, MIT
Thomas C. Hull, Western New England University
Robert J. Lang, Lang Origami

8:00AM ► (65) *Spiral Unfoldings of Convex Polyhedra.* Preliminary report. **Joseph O'Rourke**, Smith College (1116-52-433)

8:30AM ► (66) *Star Unfoldings of Convex Polyhedra.* **Anna Lubiw**, University of Waterloo (1116-52-1146)

9:00AM ► (67) *Kaleidocycles, Rigid Reachability, and Huffman Grids.* Preliminary report. **Denise M Halverson**, Brigham Young University (1116-51-441)

9:30AM ► (68) *On folding compact manifolds without boundary.* **Thomas C. Hull**, Western New England University (1116-57-1092)

10:00AM ► (69) *Overconstrained Rigid Origami Mechanisms.* **Tomohiro Tachi**, The University of Tokyo (1116-51-1660)

10:30AM ► (70) *Nonlinear wave dynamics in origami-based mechanical metamaterials.* **Hiromi Yasuda*** and **Jinkyu Yang**, University of Washington (1116-00-818)

AMS Special Session on Recent Advances in Dynamical Systems and Mathematical Biology, I

8:00 AM – 10:50 AM **Room 4C-1, Washington State Convention Center**

Organizers: **Guihong Fan**, Columbus State University
Jing Li, Califorrnia State University Northridge
Hongying Shu, Tongji University, China

8:00AM ► (71) *A new formulation of a simple epidemic model.*
Fred Brauer, University of British Columbia (1116-92-1053)

8:30AM ► (72) *Dynamics and implications of some clinical data validated prostate cancer growth models.* Preliminary report.
Yang Kuang, Arizona State University (1116-92-775)

9:00AM (73) *Dynamics of epidemic models with asymptomatic infection and seasonal succession.* Preliminary report.
Dongmei Xiao*, Dept. of Math, Shanghai Jiao Tong University, **Yilei Tang**, Dept. of Math.,Shanghai Jiao Tong University, **Weinian Zhang**, Department of Mathematics, Sichuan University, and **Di Zhu**, Dept. of Math., Shanghai Jiao Tong University (1116-34-1266)

9:30AM (74) *Modelling HIV infection in-host: Assumptions and bifurcations.*
Jane M Heffernan, Mathematics & Statistics, Centre for Disease Modelling, York University (1116-92-671)

10:00AM (75) *Bounded global Hopf branches for the Nicholson's blowflies equation.*
Hongying Shu, Department of Mathematics, Tongji University (1116-37-656)

10:30AM (76) *Early Disease Dynamics in an Inhalational Anthrax Infection.*
Buddhi Pantha*, **Judy Day** and **Suzanne Lenhart**, University of Tennessee (1116-37-125)

AMS Special Session on Recent Developments in Dispersive Partial Differential Equations and Harmonic Analysis, I

8:00 AM – 10:50 AM **Skagit 4, Skagit Lower Level, Washington State Conference Center**

Organizers: **William Green**, Rose-Hulman Institute of Technology, Terre Haute
Jennifer Beichman, University of Wisconsin, Madison

8:00AM (77) *New Characterizations of High Order Sobolev Space on Euclidean Spaces.*
Xiaoyue Cui*, University of Cincinnati, and **Guozhen Lu**, Wayne State University (1116-43-268)

8:30AM (78) *Recent progress on radial Fourier multipliers and some generalizations.*
Jongchon Kim, University of Wisconsin-Madison (1116-42-752)

9:00AM (79) *Bochner-Riesz multipliers associated to convex planar domains with rough boundary.*
Laura Cladek, University of Wisconsin-Madison (1116-42-878)

9:30AM (80) *The John–Nirenberg constant of* BMO^p.
Leonid Slavin*, University of Cincinnati, and **Vasily Vasyunin**, Steklov Mathematical Institute, Russian Academy os Sciences (1116-42-1681)

10:00AM (81) *A Proof of Weighted Hardy Space Estimates Using Invariance Properties of* BMO.
Jarod V Hart*, University of Kansas, and **Lucas Oliveira**, Universidade Federal do Rio Grande do Sul, Brazil (1116-44-666)

10:30AM ► (82) *Applications of Random Fourier Series to Non-linear Dynamics.*
Samantha Xu, University of Illinois at Urbana Champaign (1116-35-880)

AMS Special Session on Research from the 2014 and 2015 Rocky Mountain-Great Plains Graduate Research Workshop in Combinatorics, I

8:00 AM – 10:50 AM **Room 204, Washington State Convention Center**

Organizers: **Michael Ferrera**, University of Colorado, Denver
Leslie Hogben, Iowa State University, Ames
Paul Horn, University of Denver
Derrick Stolee, Iowa State University, Ames

8:00AM (83) *The Rocky Mountain - Great Plains Graduate Research Workshop in Combinatorics: An Overview.*
Michael Ferrara, University of Colorado Denver (1116-05-1098)

8:30AM ► (84) *On the unimodality of coefficients of the distance characteristic polynomial of a tree.*
Ghodratollah Aalipour*, University of Colorado Denver and Kharazmi University, **Aida Abiad**, Department of Econometrics and Operations Research, Tilburg University, Tilburg, The Netherlands, **Zhanar Berikkyzy**, Department of Mathematics, Iowa State University, Ames, IA 50011, USA, **Leslie Hogben**, Department of Mathematics, Iowa State University, Ames, IA 50011, USA and American Institute of Mathematics, 600 E. Brok, **Franklin H. J. Kenter**, Department of Computational and Applied Mathematics, Rice University, Houston, TX 77005, USA, **Jephian C.-H. Lin**, Department of Mathematics, Iowa State University, Ames, IA 50011, USA, and **Michael Tait**, Department of Mathematics, University of California San Diego, La Jolla, CA 92037, USA (1116-05-1220)

9:00AM ► (85) *On the distance spectra of graphs.*
Aida Abiad, Maastricht University (The Netherlands) (1116-05-1118)

9:30AM (86) *Zero forcing number on the counterprism of graphs.*
Aida Abiad, Tilburg University, **Phil DeOrsey**, University of Colorado Denver, **Leslie Hogben**, **Kirsten Hogenson***, Iowa State University, **Franklin Kenter**, Rice University, **Jephian C.-H. Lin**, Iowa State University, **Sarah Loeb**, University of Illinois at Urbana-Champaign, **Heather Smith**, University of South Carolina, and **Michael Young**, Iowa State University (1116-05-461)

10:00AM ► (87) *On the Principal Permanent Rank Characteristic Sequences of Graphs.*
Keivan Hassani Monfared*, University of Calgary, **Paul Horn**, University of Denver, **Franklin Kenter**, Rice University, **Kathleen Nowak**, Iowa State University, **John Sinkovic**, University of Waterloo, and **Josh Tobin**, University of California - San Diego (1116-05-638)

10:30AM (88) *Graphs with many strong orientations.*
Sinan G Aksoy*, UC San Diego, and **Paul Horn**, University of Denver (1116-05-1157)

AMS Special Session on Set-Valued Optimization and Variational Problems with Applications, I

8:00 AM – 10:50 AM **Room 310, Washington State Convention Center**

Organizers: **Baasansuren Jadamba**, Rochester Institute of Technology
Akhtar A. Kahn, Rochester Institute of Technology
Mau Nam Nguyen, Portland State University
Miguel Sama, Universidad Nacional de Educacion a Distancia, Spain
Christiane Tammer, Martin Luther University of Halle-Wittenberg

8:00AM (89) *Generalized Directional Derivatives of the Perturbation Map in Parametric Set-Valued Optimization.* Preliminary report.
Doug E. Ward, Miami University (1116-49-2521)

8:30AM (90) *Minimizing Differences of Convex Functions and Applications to Multifacility Location.*
Mau Nam Nguyen* and **Daniel Giles**, Portland State University (1116-49-2751)

9:00AM (91) *On the complexity of the proximal gradient iteration for nonsmooth convex minimization problems in Hilbert spaces.*
J.Y. Bello Cruz*, Federal University of Goias, and **T.T.A. Nghia**, Oakland University (1116-90-1722)

9:30AM (92) *A recursive algorithm for set-valued risk measures and relation to set-valued Bellman's principle.*
Zachary Feinstein*, Washington University in St. Louis, and **Birgit Rudloff**, Vienna University of Economics and Business (1116-90-1232)

10:00AM (93) *A chain rule for spectral functions.* Preliminary report.
Julia Eaton*, University of Washington Tacoma, and **James V Burke**, University of Washington (1116-49-2082)

10:30AM (94) *Efficient second-order methods for an elastography inverse problem.*
Baasansuren Jadamba, Rochester Institute of Technology (1116-49-2777)

AMS Special Session on Tensor Decompositions and Secant Varieties

8:00 AM – 10:50 AM **Skagit 3, Skagit Lower Level, Washington State Conference Center**

Organizer: **Zach Teitler**, Boise State University

8:00AM (95) *Most secant varieties of tangential varieties to Veronese varieties are nondefective.*
Hirotachi Abo*, Department of Mathematics, University of Idaho, and **Nick Vannieuwenhoven**, Department of Computer Science, KU Leuven (1116-14-1469)

8:30AM ► (96) *Normality of Secant Varieties.*
Brooke Susanna Ullery, University of Utah (1116-14-447)

9:00AM (97) *Secants of the Veronese and the Determinant.*
Cameron Farnsworth, Texas A&M University (1116-14-293)

9:30AM ► (98) *Structural tensors of bilinear maps.* Preliminary report.
Ke Ye, University of Chicago (1116-15-1745)

10:00AM (99) *Orthogonal Tensor Decomposition.*
Ada Boralevi, **Jan Draisma**, **Emil Horobet**, TU Eindhoven, and **Elina Robeva***, UC Berkeley (1116-14-1460)

10:30AM (100) *Tensor decompositions and cubic sections of rational surface scrolls.* Preliminary report.
Kristian Ranestad, University of Oslo (1116-14-1525)

AMS Special Session on Topological Representation Theory, I

8:00 AM – 10:50 AM **Room 201, Washington State Convention Center**

Organizers: **Charles Frohman**, University of Iowa, Iowa City

Helen Wong, Carelton College

8:00AM (101) *Representations of the Kauffman bracket skein algebra of a surface.* Preliminary report.
Francis Bonahon, University of Southern California (1116-57-680)

8:30AM (102) *The Localized Skein Algebra as a Frobenius Extension.*
Nel Abdiel* and **Charles Frohman**, University of Iowa (1116-81-2067)

9:00AM (103) *The Homfly skein and elliptic Hall algebras.*
Hugh Morton, University of Liverpool, and **Peter Samuelson***, University of Iowa (1116-57-1008)

9:30AM (104) *On type-preserving representations of the four-punctured sphere group.*
Tian Yang, Stanford University (1116-57-616)

10:00AM (105) *Tangle Functors at Roots of Unity.*
Nathan Druivenga*, **Charles Frohman**, The University of Iowa, and **Sanjay Kumar**, The Unversity of Iowa (1116-57-1399)

10:30AM (106) *Structure of the Kauffman bracket skein algebra of a surface.*
Charles D Frohman, The University of Iowa, and **Joanna Kania-Bartoszynska***, National Science Foundation (1116-57-1358)

AMS Session on Calculus of Variations, Optimal Control, and Optimization

8:00 AM – 9:55 AM **Room 615, Washington State Convention Center**

8:00AM (107) *Sampling from several functions and simultaneous reconstruction.* Preliminary report.
Pando Georgiev*, University of Central Florida, and **Zuhair Nashed**, Department of Mathematics, University of Central Florida (1116-49-2956)

8:15AM (108) *A new difference for compact convex sets.*
Luciano Stefanini, University of Urbino "Carlo Bo", and **Barnabas Bede***, DigiPen Institute of Technology (1116-49-2702)

8:30AM (109) *Existence Theorems for Elliptic and Evolutionary Variational and Quasi-Variational Inequalities.*
Akhtar A. Khan*, Rochester Institute of Technology, and **Dumitru Motreanu**, Université de Perpignan (1116-49-2090)

8:45AM (110) *A study of Mathematical Programming under different types of invexity.* Preliminary report.
Ram N. Mohapatra, University of Central Florida (1116-49-1524)

9:00AM (111) *Optimal control of the perturbed sweeping process over polyhedral controlled set.* Preliminary report.
Tan Hoang Cao, Wayne State University, Detroit, Michigan (1116-49-97)

9:15AM (112) *Invariance properties of time delayed differential inclusion systems.*
Norma Ortiz-Robinson*, Virginia Commonwealth University, and **Vinicio R Rios**, Universidad del Zulia (1116-49-2436)

9:30AM ► (113) *An Improved Modal Interval Algorithm for Unconstrained Continuous Minimax Problems.*
Xin Luo* and **Min Sun**, The University of Alabama (1116-49-1978)

9:45AM (114) *Constraint Handling for Water Resources Application with Filter Particle Swarm Optimization.*
Ahmad R Almomani, Clarkson University (1116-49-1428)

AMS Session on Geometry and Differential Geometry, I

8:00 AM – 10:40 AM **Room 605, Washington State Convention Center**

8:15AM (115) *Deflating hyperbolic surfaces.*
Aaron Fenyes, UT Austin (1116-51-2672)

8:30AM (116) *Can an orbifold be isospectral to a manifold?*
Benjamin Linowitz*, University of Michigan, and **Jefrrey S Meyer**, University of Oklahoma (1116-53-313)

8:45AM (117) *Willmore-type energies and Willmore-type surfaces in space forms.* Preliminary report.
Thanuja Paragoda*, **Giorgio Bornia**, **Bhagya Athukorallage** and **Magdalena Toda**, Texas Tech University (1116-53-980)

9:00AM ► (118) *A Forerunner of Fractals in Financial Markets.*
Jon Fassett, Central Washington University (1116-00-1070)

9:15AM ► (119) *On the inverse problem of systems of second order differential equations.*
Ryad Ghanam, Virginia Commonwealth University in Qatar (1116-53-263)

9:30AM ► (120) *Spiraling geodesics (II) in staircase metric geometries.*
J Mealy* and **Ryan Hood**, Austin College (1116-51-787)

9:45AM (121) *Solutions of Björling Problem for timelike surfaces and the homogeneous wave equation.*
Martha P. Dussan*, Department of Mathematics. Universidade de Sao Paulo. Brazil, and **Martin Magid**, Wellesley College (1116-53-1823)

10:15AM ► (122) *Metrics of Positive Holomorphic Sectional Curvature on Projectivized Vector Bundles.* Preliminary report.
Angelynn Alvarez*, **Ananya Chaturvedi**, **Gordon Heier**, University of Houston, and **Fangyang Zheng**, The Ohio State University (1116-53-649)

10:30AM (123) *Nodal Sets of Random Eigenfunctions of the Harmonic Oscillator.*
Boris Hanin*, MIT, **Steve Zelditch** and **Peng Zhou**, Northwestern (1116-81-1028)

AMS Session on Group Theory and Generalizations, I

8:00 AM – 10:25 AM **Room 616, Washington State Convention Center**

8:00AM (124) *A Review of Thompson's Fixed-Point-Free Automorphism Theorem.*
Marijo Sracic, Kent State University (1116-20-2652)

8:15AM (125) *Induced Characters with Equal Degree Constituents.* Preliminary report.
Corey F Lyons, Kent State University (1116-20-2594)

8:30AM (126) *For what groups would the lattice of closure operators which act on the subgroup lattice also form a subgroup lattice?*
Martha Lee Kilpack*, Brigham Young University, and **Arturo Magidin**, University of Louisiana - Lafayette (1116-20-2413)

8:45AM (127) *The Horofunction Boundary of the Lamplighter Group.*
Keith M Jones*, State University of New York College at Oneonta, and **Gregory Kelsey**, Bellarmine University (1116-20-2037)

9:00AM (128) *Dehn functions of mapping tori of rank-3 right-angled Artin group automorphisms.*
Kristen Pueschel* and **Timothy Riley**, Cornell University (1116-20-576)

9:15AM ► (129) *Infinite Groups and Absolute Extensors.*
Atish J Mitra, Montana Tech (U of Montana) (1116-20-2122)

9:30AM ► (130) *Local Conjugacy in Nilpotent Groups.* Preliminary report.
Bir Kafle*, Purdue University North Central, and **Robert Perlis**, Louisiana State University (1116-20-2055)

9:45AM (131) *Uncountable locally free groups and their group algebras.*
Tsunekazu Nishinaka, University of Hyogo (1116-20-1862)

10:00AM ► (132) *Generalizations of The Futurama Theorem.* Preliminary report.
Jennifer Elder, California State University, Fresno (1116-20-1577)

10:15AM (133) *Involutions of type G_2 over a field of characteristic 2.* Preliminary report.
John Hutchens*, Southern Arkansas University, and **Nathaniel Schwartz**, Washington College (1116-20-1549)

AMS Session on Mechanics and Mathematical Physics

8:00 AM – 10:40 AM **Skagit 1, Skagit Lower Level, Washington State Conference Center**

8:00AM (134) *A Geometric Characterization of Quantum Weak Values.*
Jake Farinholt, U.S. Navy (1116-81-1218)

8:15AM ► (135) *Further Extending the Preons of Harari, Shupe and Seiberg using Transpose(\) with Cispose(/).* Preliminary report.
Michael Dombroski, Los Angeles City College (1116-81-1292)

8:30AM (136) *Complete criterion for convex-Gaussian-state detection.*
Anna Vershynina, Technical University of Munich, Germany (1116-81-719)

8:45AM (137) *An Evolution Equation for Feynman's Operational Calculus in the Combined Continuous/Discrete Setting.* Preliminary report.
Lance Nielsen, Creighton University (1116-44-2506)

9:00AM ► (138) *Complex Matter Space and Relativistic Quantum Mechanics.*
Reza R Ahangar, Texas A & M University in Kingsville (1116-82-2810)

9:15AM ► (139) *The Software Development for a Three Dimensional Gravity Inversion and Application to Study of The Border Ranges Fault System, South-Central Alaska.*
Rolando Cardenas, Valle Verde Early College High School (1116-86-2179)

9:30AM (140) *Modeling and data analysis of large-scale rainfall events and convection in the tropics.*
Reed Ogrosky* and **Samuel Stechmann**, University of Wisconsin-Madison (1116-86-2334)

9:45AM (141) *Where does Kepler's third law hold?*
Corey Shanbrom, California State University, Sacramento (1116-53-2085)

10:00AM (142) *Mathematical modeling of air flow through a coupled cooled-heated wind tunnel.*
Fathi M Allan*, Department of Mathematical Sciences, UAEU, **Mohamed A Hajji** and **Qasem A AL Mdallal**, Department of Mathematical Sceinces, UAEU (1116-76-620)

10:15AM (143) *Continuum Eigenmodes in Some Linear Stellar Models.* Preliminary report.
Chrisopher J Winfield, University of Alaska - Fairbanks, Dept. of Mathematics and Statistics (1116-85-429)

AMS Session on Topology and Knot Theory, II

8:00 AM – 10:25 AM **Chelan 4, Chelan Level Two, Washington State Conference Center**

8:15AM (144) *Understanding character varieties via contact homology.*
Christopher R. Cornwell, CIRGET, UQAM (1116-57-1406)

8:30AM (145) *σ-Adequate Link Diagrams and the Tutte Polynomial.* Preliminary report.
Adam Giambrone, University of Connecticut (1116-57-1454)

8:45AM ► (146) *An Invariant for Virtual Singular Links.*
Kelsey Renee Friesen, California State University, Fresno (1116-57-1456)

9:00AM Discussion

9:00AM (147) *From Tangles to Equivariant Hyperbolic Corks.* Preliminary report.
David Auckly*, Kansas State University, **Hee Jung Kim**, Seoul National University, **Paul Melvin**, Bryn Mawr, and **Daniel Ruberman**, Brandeis University (1116-57-1143)

9:15AM (148) *Gaps in bridge spectra.* Preliminary report.
Nicholas J Owad, University of Nebraska-Lincoln (1116-57-1885)

9:30AM (149) *Operads and the space of string links.*
John Burke, Rhode Island College (1116-57-1622)

9:45AM (150) *Hyperbolic volume and higher genus bridge numbers.* Preliminary report.
Jessica Purcell, Monash University, and **Alexander Zupan***, University of Nebraska-Lincoln (1116-57-1809)

10:00AM (151) *Can two hyperbolic 2-bridge link complements be commensurable?*
Christian R Millichap*, Linfield College, and **William Worden**, Temple University (1116-57-1831)

10:15AM (152) *Tau invariants for balanced spatial graphs and applications to link cobordisms.*
Katherine Vance, Rice University (1116-57-1931)

MAA Session on Assessing Student Learning: Alternative Approaches, I

8:00 AM – 10:55 AM **Room 303, Washington State Convention Center**

Organizers: **David Clark**, Grand Valley State University
Jane Butterfield, University of Victoria
Robert Campbell, College of St. Benedict/St. John's University
Cassie Williams, James Madison University

8:00AM ► (153) *IFF You Already Understand: The roots of elitism and exclusion in mathematical education and what we can do about it.*
Morgan H. Sargent, Camosun College (1116-A5-1986)

8:20AM ► (154) *Assessing Pre-Class Assignments in a Flipped Class.*
Mindy Capaldi, Valparaiso University (1116-A5-163)

8:40AM ► (155) *Oral Assessments in Upper and Lower Level Math Courses.* Preliminary report.
Jessie Hamm, Winthrop University (1116-A5-1132)

9:00AM ► (156) *Presentations, peer reviews, and collegiality points: an attempt to restructure assessment in an abstract algebra course.* Preliminary report.
Jeffery D Sykes, Ouachita Baptist University (1116-A5-1324)

9:20AM ► (157) *Aftermath – after traditional math tests.*
Girija Sarada Nair-Hart, University of Cincinnati Clermont College (1116-A5-2040)

9:40AM ► (158) *Encouraging a Growth-Mindset Approach to Learning through Oral and Mastery Based Testing.*
Amanda Harsy, Lewis University (1116-A5-181)

10:00AM ► (159) *Student Video Problem Presentations as Review Activities in Differential Equations and Multivariable Calculus.* Preliminary report.
Paul E. Seeburger, Monroe Community College (1116-A5-2419)

10:20AM ► (160) *Quantitative Reasoning Learning Outcome Assessment.*
Khairul Islam, Texas A&M University-Kingsville (1116-A5-790)

10:40AM ► (161) *Tests or Projects? The Impact of Summative Assessment in Promoting Quantitative Literacy.*
Samuel Luke Tunstall, Michigan State University (1116-A5-217)

MAA Session on Mathematics and the Arts, I

8:00 AM – 10:55 AM **Room 2B, Washington State Convention Center**

Organizer: **Douglas Norton**, Villanova University

8:00AM ► (162) *Spatially-Developing Fractal Gaskets.*
Robert W Fathauer, Tessellations Company (1116-K5-2532)

8:20AM ► (163) *Quilts & Lace: Unexpected Beauty Hidden in Radin-Conway's Pinwheel Tiling.*
Douglas G. Burkholder, Lenoir-Rhyne University (1116-K6-1827)

8:40AM ► (164) *Drunkard's Path and other quarter circle quilting patterns.*
Mary D. Shepherd, Northwest Missouri State University (1116-K5-2496)

9:00AM ► (165) *Power of Mathematical Quilting.* Preliminary report.
Simei Tong, University of Wisconsin-Eau Claire (1116-K5-377)

9:20AM ► (166) *Finding the Viewpoint at a Museum: A How-To Guide.*
Fumiko Futamura*, Southwestern University, and **Robert Lehr**, Austin, TX (1116-K6-1865)

9:40AM ► (167) *Complex Mazes with Simple Paths: Mathematics within the Art of Classical Labyrinths.*
David Thompson* and **Diana Cheng**, Towson University (1116-K5-1063)

10:00AM ► (168) *Fractals, writing, and applications of Geometry.* Preliminary report.
J. White, Saint Leo University (1116-K5-806)

10:20AM ► (169) *Exploration of Mathematics Teaching and Assessment through Maple-Software Projects of Art Diagram Design as Undergraduate Student Research Projects.* Preliminary report.
Lina Wu, Borough of Manhattan Community College-The City University of New York (1116-K5-881)

10:40AM ► (170) *Children are Mathematicians: Seeing Math in the Art Children Create.* Preliminary report.
Spring Cooke, North Park University (1116-K5-2302)

MAA Session on Proofs and Mathematical Reasoning in the First Two Years of College

8:00 AM – 11:00 AM **Room 304, Washington State Convention Center**

Organizers: **Joanne Peeples**, El Paso Community College
Chris Oehrlein, Oklahoma City Community College
Dean Gooch, Santa Rosa Junior College

8:00AM ► (171) *Proof-writing before Calculus, a Salkehatchie experience.* Preliminary report.
Wei-Kai Lai, University of South Carolina Salkehatchie (1116-P1-2010)

8:20AM ► (172) *Teaching Mathematical Reasoning and Proofs in the Two-Year College Setting.*
B. Dean Gooch, Santa Rosa Junior College (1116-P1-1074)

8:40AM ► (173) *Freshman-Level Discrete Mathematics as an Introduction to Proof.* Preliminary report.
Kathleen M. Shannon, Salisbury University (1116-P1-373)

9:00AM ► (174) *Bridging the Gap – Inserting a Transitions Course between an Introductory Proofs Course and Upper-level Theoretical Courses.*
Karin R Saoub, Roanoke College (1116-P1-909)

9:20AM ► (175) *Addressing Creativity in an Introductory Proof Course.*
Houssein El Turkey*, University of New Haven, **Gail Tang**, University of La Verne, **Milos Savic**, University of Oklahoma, **Gulden Karakok**, **Emilie Naccarato**, University of Northern Colorado, and **David Plaxco**, University of Oklahoma (1116-P1-1619)

9:40AM ► (176) *Transitioning from Lecture to Active Learning in an Introduction to Proofs Course.* Preliminary report.
Ross Sweet* and **Matthew Graham**, Northwestern University (1116-P1-2782)

10:00AM ► (177) *Promoting Out-of-class Student Engagement in an Introduction to Proofs Course.* Preliminary report.
Matthew D. Graham, Northwestern University (1116-P1-2785)

10:20AM ► (178) *Proof Frameworks – A Way to Get Started on Writing Proofs.*
Ahmed A Benkhalti*, **John Selden** and **Annie Selden**, New Mexico State University (1116-P1-1286)

10:40AM Discussion

10:40AM ► (179) *Using Videocases to Focus Student Thinking (Inside and) Outside of Class.*
James Sandefur*, Georgetown University, and **Kay Somers**, Moravian College (1116-P1-1323)

MAA Session on the Scholarship of Teaching and Learning in Collegiate Mathematics, I

8:00 AM – 10:55 AM **Room 2A, Washington State Convention Center**

Organizers: **Jacqueline Dewar**, Loyola Marymount University
Thomas Banchoff, Brown University
Curtis Bennett, Loyola Marymount University
Pam Crawford, Jacksonville University
Edwin Herman, University of Wisconsin-Stevens Point

8:20AM ► (180) *Using Games to Teach Freshmen to Handle Mathematical and Professional Complications.* Preliminary report. **Victor I Piercey*** and **Andrew Peterson**, Ferris State University (1116-R5-367)

8:40AM ► (181) *College Graduates and Marketable Learning Outcomes.* Preliminary report. **Annela R Kelly**, Bridgewater State University (1116-R5-2042)

9:00AM ► (182) *Students' Inclination to Incorporate Sketches During Problem Solving.* Preliminary report. **Milé Krajcevski**, University of South Florida (1116-R5-2131)

9:20AM ► (183) *Mathematics Attitudes and Perceptions Survey: Assessing Students' Expert-like Conceptions of Mathematics.* **Warren J. Code***, University of British Columbia, **Joseph Lo**, British Columbia Institute of Technology, **Wes Maciejewski**, University of Auckland, **Sandra Merchant**, University of British Columbia, and **Matthew Thomas**, Ithaca College (1116-R5-2215)

9:40AM ► (184) *Bridging the Gap: What Non-Cognitive Strategies are Effective in a a College Algebra Course?* Preliminary report. **Cinnamon Hillyard***, **Emily Gismervig**, **Alex Musselman** and **Robin Angotti**, University of Washington Bothell (1116-R5-2528)

10:00AM ► (185) *Hybridized Learning in an Online Bridge Program.* Preliminary report. **James S Rolf***, **John Hall**, **Sara Epperson**, **Jennifer Frederick**, **James Kim**, **Edward O'Neill** and **Frank Robinson**, Yale University (1116-R5-2567)

10:20AM ► (186) *Anxiety Levels of Students in a Developmental Mathematics Program.* **Edgar Fuller**, West Virginia University (1116-R5-2811)

10:40AM ► (187) *Students as partners in curricular design: Creation of student-generated calculus projects and their implementation.* **Steve Cohen**, Roosevelt University, **Barbara Gonzalez**, Hofstra University, and **Melanie Pivarski***, Roosevelt University (1116-R5-2937)

MAA General Contributed Paper Session on Geometry, I

8:00 AM – 10:10 AM **Room 213, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

8:00AM ► (188) *Minimizing Utopia.* Preliminary report. **Andrew Simoson**, King University (1116-VE-479)

8:15AM ► (189) *Special Configurations of Triangle Centers.* **Hyun Jin Kim*** and **Hyun Sun Kim**, Hofstra University (1116-VE-121)

8:30AM ► (190) *Canonical Involution on Double Jet Bundles.* Preliminary report. **Hulya Kadioglu**, Yildiz Technical University, Istanbul, Turkey (1116-VE-1538)

8:45AM ► (191) *Geometric Group Theory and Untangling Ear-Phones.* **Neha Gupta**, University of Illinois Urbana-Champaign (1116-VE-1771)

9:00AM (192) *Adams Operations on the Virtual K-Theory of* $\mathbb{P}(1,n)$. **Ross Sweet***, Northwestern University, and **Takashi Kimura**, Boston University (1116-VE-1856)

9:15AM ► (193) *Packing Three Equal Circles Onto a Flat Klein Bottle.* **Samantha Moore***, University of Northern Colorado, and **Robert Dickens**, University of Maryland, Baltimore County (1116-VE-1979)

9:30AM ► (194) *Numerical Ranges over Finite Fields.* **Douglas D Knowles**, State University of New York at Geneseo (1116-VE-2341)

9:45AM (195) *Asymptotic Analysis of Non-Compact Inverse Mean Curvature Flow in Hyperbolic Space.* **Brian Allen**, University of Tennessee (1116-VE-240)

10:00AM (196) *Symplectic capacities, group actions, and integrable systems.* **Alessio Figalli**, ETH Zurich, **Joseph Palmer*** and **Álvaro Pelayo**, University of California, San Diego (1116-VE-2406)

MAA General Contributed Paper Session on Graph Theory, I

8:00 AM – 10:55 AM **Room 212, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University

Bem Cayco, San Jose State University

Timothy Comar, Benedictine University

T. James Reid, University of Mississippi

8:15AM ► (197) *Interval edge-colorings of Cayley graphs.* Preliminary report. **Stephen H Dong*** and **Erik E Westlund**, Kennesaw State University (1116-VF-1021)

8:30AM ► (198) *Hypergraphs in Ecological Network Analysis.* **Antonio J Golubski**, Kennesaw State University, **John H Vandermeer**, University of Michigan, and **Erik E Westlund***, Kennesaw State University (1116-VF-1022)

8:45AM (199) *An algorithm for the independence number of incidence graphs.* **Sarah E. Vigliotta**, Wesleyan University (1116-VF-1046)

9:00AM ► (200) *Bicycle Routes and Euler Double-paths.* **C. Ray Rosentrater**, Westmont College (1116-VF-631)

9:00AM ► (201) *Smith and Critical Groups of the Rook's Graph and its Complement.* **Noah James Watson*** and **Jonathan M. Gerhard**, James Madison University (1116-VF-1211)

9:30AM (202) *Structure of self-complementary graphs.* Preliminary report. **Peter Maceli**, Wesleyan University (1116-VF-1262)

9:45AM (203) *Non-Local Games on Graphs: An Operator Algebraic Approach.* Preliminary report. **Carlos M Ortiz***, University of Houston, and **Vern I Paulsen**, University of Waterloo (1116-VF-1377)

10:00AM ► (204) *Predicting neural sequences from network structure.* Preliminary report. **Caitlyn Parmelee***, University of Nebraska-Lincoln, and **Carina Curto**, The Pennsylvania State Univerisity (1116-VF-1482)

10:15AM (205) *Extremal Numbers for Forestable Graphs.* **Neal Owen Bushaw***, Arizona State University, and **Nathan Kettle**, IMPA (1116-VF-1494)

10:30AM ► (206) *Topics in game f-matching.* Preliminary report. **Jennifer Irene Wise***, University of Illinois, Urbana-Champaign, and **Douglas B West**, Zhejiang Normal University and University of Illinois (1116-VF-1503)

10:45AM ► (207) *Zero forcing and the power domination problem in graphs.* Preliminary report. **Daniela Ferrero**, Texas State University (1116-VF-530)

MAA General Contributed Paper Session on Mentoring

8:00 AM – 9:10 AM **Room 618, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University

Bem Cayco, San Jose State University

Timothy Comar, Benedictine University

T. James Reid, University of Mississippi

8:15AM ► (208) *How to Get into Graduate School in Mathematics: What Graduate Schools Are Looking for.* **Paul R. Bialek**, Trinity International University (1116-VL-1915)

8:30AM ► (209) *Mixed peer and graduate student mentoring of undergraduate students in mathematics.* **Julia P Clark*** and **Eric Roberts**, University of California, Merced (1116-VL-2203)

8:45AM ► (210) *Mentoring Mathematical Programming in Undergraduate Research.* **Jeffrey W. Clark**, Elon University (1116-VL-230)

9:00AM ► (211) *Tips for Running an REU Program at a Primarily Undergraduate Institution.* **Zachary J. Abernathy**, Winthrop University (1116-VL-2881)

MAA General Contributed Paper Session on Modeling and Applications, I

8:00 AM – 10:55 AM **Room 214, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University

Bem Cayco, San Jose State University

Timothy Comar, Benedictine University

T. James Reid, University of Mississippi

8:00AM ► (212) *A comparison of methods to calculate the basic reproductive number for periodic systems.* **Christopher David Mitchell**, University of Texas at Arlington (1116-VM-1890)

8:15AM ► (213) *Global Parameter Sensitivity Analysis on a Dynamic Model of Gene Regulation.* **Jacqueline M Dresch***, **Robert A Drewell**, Clark University, and **Gregory D McCarthy**, Hampshire College (1116-VM-2399)

8:30AM ► (214) *Compartmental Competition Model with Cancer Stem Cells in a Colon Crypt.* Preliminary report.
Amber N. Lee*, Salem College, **Anna Steinfeld**, St. Mary's College of Maryland, and **Zachary Abernathy**, Winthrop University (1116-VM-105)

8:45AM ► (215) *A model of Johne's disease with the disease transmission through the environment.* Preliminary report.
Kokum R. De Silva*, **Shigetoshi Eda** and **Suzanne Lenhart**, University of Tennessee, Knoxville (1116-VM-1072)

9:00AM (216) *Coexistence and Extinction of Competing Species in the Time-Periodic Volterra-Lotka type Systems with Nonlocal Dispersal.*
Nar Rawal*, Hampton University, Hampton, VA 23668, and **Arun Verma**, Hampton University (1116-VM-1077)

9:15AM ► (217) *Exploring Transcranial Stimulation in a Cognitive Learning Model.* Preliminary report.
Taylor M. Posey*, University of Washington, and **Kelsey Kalmbach**, Colorado School of Mines (1116-VM-1094)

9:30AM (218) *Preemptive vaccination strategies for disease outbreaks in community networks.* Preliminary report.
Michael R Kelly* and **Joseph H Tien**, The Ohio State University (1116-VM-2389)

9:45AM ► (219) *A Mathematical Model of Cancer Stem Cell Driven Tumor Growth with Radiation and Chemotherapy Treatment.* Preliminary report.
Zachary Abernathy, Winthrop University, **Savannah V. Bates***, Jacksonville University, and **Rebecca Santorella**, The College of New Jersey (1116-VM-118)

10:00AM (220) *Overview of Multi-Component Surface-Volume Reactions.*
Ryan M Evans* and **David A Edwards**, University of Delaware (1116-VM-1415)

10:15AM (221) *Synchronization of tubular pressure oscillations by vascular and hemodynamic coupling in interacting nephrons.*
Hwayeon Ryu*, Department of Mathematics, Statistics, and Computer Science, St. Olaf College, and **Anita T. Layton**, Department of Mathematics, Duke University (1116-VM-1586)

10:30AM (222) *A Deeper Study of a Mathematical Model Using Torain's Equations.*
David S Torain, II, Hampton University (1116-VM-1590)

10:45AM (223) *An Infinite Time Horizon Portfolio Optimization Model with Delays.*
Tao Pang and **Azmat Hussain***, North Carolina State University Raleigh NC (1116-VM-2479)

MAA General Contributed Paper Session on the History or Philosophy of Mathematics

8:00 AM – 9:55 AM **Yakima 2, Yakima Level One, Washington State Conference Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

8:00AM ► (224) *John Playfair and His Misnamed Axiom.*
Amy Ackerberg-Hastings, University of Maryland University College (1116-VG-106)

8:15AM (225) *The Fluid Dynamics and the Heat Theory by Poisson.* Preliminary report.
Shigeru Masuda, Ex. Long-Term Researcher of RIMS, Kyoto University (1116-VG-1621)

8:30AM ► (226) *van der Pol's Tablecloth: Highlights from the Balthasar van der Pol Collection at Museum Boerhaave.*
John F. Bukowski, Juniata College (1116-VG-1826)

8:45AM ► (227) *Olinde Rodrigues: banker, activist and mathematician.* Preliminary report.
Johannes C. Familton, Borough of Manhattan Community College (1116-VG-2011)

9:00AM ► (228) *A Triune Philosophy of Mathematics.*
Dusty W. Wilson, Highline College (1116-VG-2086)

9:15AM ► (229) *A 2016 Calendar of Math in Berlin: Twelve Historical Moments That Influence Us Today.*
Meredith L. Greer, Bates College (1116-VG-2182)

9:30AM ► (230) *Using Debates To Study the History of Mathematics.*
Steve Leonhardi, Winona State University, Winona, MN (1116-VG-2293)

9:45AM ► (231) *A model for public documentation and sharing of the long-term achievements of graduates of mathematics programs in both regional and institutional contexts.* Preliminary report.
Colm Mulcahy, Spelman College (1116-VG-946)

SIAM Minisymposium on Optimization

8:00 AM – 10:55 AM **Room 3A, Washington State Convention Center**

Organizer: **Juan Meza**, University of California, Merced

8:00AM (232) *Optimal value function methods for numerical optimization.*
Aleksandr Y Aravkin, **James V Burke***, **Dmitriy Drusvyatskiy**, University of Washington, **Michael P Friedlander**, University of California, Davis, and **Scott Roy**, University of Washington (1116-90-2892)

8:30AM ► (233) *A fast primal-dual method for the obstacle problem.*
Dominique Zosso*, UCLA Department of Mathematics, **Braxton Osting**, University of Utah, Department of Mathematics, **Mengqi Xia**, UCLA Department of Mathematics, and **Stanley J. Osher**, UCLA, Department of Mathematics (1116-35-1558)

9:00AM Discussion: Maria Cristina Villalobos, University of Texas-Pan American

9:30AM (234) *Scalable optimization of complex energy systems under uncertainty using high-performance computers.*
Cosmin G Petra, Argonne National Laboratory (1116-90-2657)

10:00AM (235) *A Data-Driven Approach to PDE-Constrained Optimization Under Uncertainty.* Preliminary report.
Drew P Kouri, Sandia National Laboratories (1116-49-2902)

10:30AM (236) *A Fast and Scalable Method for A-Optimal Design of Experiments for Infinite-dimensional Bayesian Nonlinear Inverse Problems with Application to Porous Medium Flow.*
Noemi Petra, University of California, Merced (1116-49-2634)

Project NExT Workshop

8:00 AM – 6:00 PM **Room 4C-2, Washington State Convention Center**

MAA/NCTM Joint Committee on Mutual Concerns/ College Board Panel Discussion

8:00 AM – 9:20 AM **Room 612, Washington State Convention Center**

Creating a meaningful calculus I experience for students entering with high school calculus.

Organizer: **Alison Reddy**, University of Illinois

Panelists: **Michael Boardman**, Pacific University

David Bressoud, Macalester College

Robin Permantle, University of Pennsylvania

Uri Treisman, University of Texas

MAA Committee on Professional Development Session: NSF Funding Opportunities for the Learning and Teaching of the Mathematical Sciences, Part I

8:00 AM – 9:15 AM **Room 609, Washington State Convention Center**

Undergraduate/graduate education, department of mathematics infrastructure, and human resource development.(DUE/DGE/DMS/HRD)

Organizers: **John Haddock**, Division of Undergraduate Education, National Science Foundation

Lee Zia, Division of Undergraduate Education, National Science Foundation

Karen King, Division of Research on Learning, National Science Foundation

Tasha Inniss, Division of Human Resource Development, National Science Foundation

Jennifer Slimowitz Pearl, Division of Mathematical Sciences, National Science Foundation

Employment Center

8:00 AM – 5:30 PM **Hall 4B, 4th Floor, Washington State Convention Center**

MAA Minicourse #12: Part A

9:00 AM – 11:00 AM **Tahoma 5, Tahoma Level Three, Washington State Conference Center**

Humanistic mathematics.

Presenters: **Gizem Karaali**, Pomona College

Eric Marland, Appalachian State University

MAA Minicourse #11: Part A

9:00 AM – 11:00 AM **Metropolitan B, 3rd Floor, Sheraton Seattle Hotel**

Implementing inquiry-oriented curricula for linear algebra, differential equations, and abstract algebra.

Presenters: **Estrella Johnson**, Virginia Polytechnic Institute

Karen Keene, North Carolina State University

MAA Minicourse #5: Part A

9:00 AM – 11:00 AM **Metropolitan A, 3rd Floor, Sheraton Seattle Hotel**

Teaching introductory statistics for instructors new to teaching statistics.

Presenter: **Carolyn Cuff**, Westminster College

Student Hospitality/Information Center

9:00 AM – 5:00 PM **Skybridge, 4th Floor, Washington State Convention Center**

MAA General Contributed Paper Session on Outreach

9:30 AM – 10:25 AM **Room 618, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University

Bem Cayco, San Jose State University

Timothy Comar, Benedictine University

T. James Reid, University of Mississippi

9:30AM ► (237) *Beyond Grades: Motivation in a Not-For-Credit Online Bridge Program.* Preliminary report. **John Hall***, **James S Rolf**, **Sara Epperson**, **Jennifer Frederick**, **James Kim**, **Edward O'Neill** and **Frank Robinson**, Yale University (1116-VO-2571)

9:45AM ► (238) *Girls Exploring Mathematics: A female-centric outreach program.* Preliminary report. **Meghan M De Witt**, St. Thomas Aquinas College (1116-VO-1872)

10:00AM ► (239) *Combining sports and STEM in activity-based lessons for middle school students.* **Jerry F. Dwyer***, George Washington University, and **Aimee M. Cloutier**, Texas Tech University (1116-VO-2158)

10:15AM ► (240) *Cougar Math Advanced Project (C-MAP) Summer Camp: A Hands-On-Approach to Mathematical and Critical Thinking for High School Students.* **Sofia Agrest*** and **Debby Jeter**, College of Charleston, Charleston, SC (1116-VO-2754)

MAA Committee on Professional Development: NSF Funding Opportunities for the Learning and Teaching of the Mathematical Sciences, Part II

9:30 AM – 10:30 AM **Room 609, Washington State Convention Center**

The K-16 continuum-learning science and research and pre- and in-service teachers. (DUE/DRL)

Organizers: **John Haddock**, Division of Undergraduate Education, National Science Foundation

Lee Zia, Division of Undergraduate Education, National Science Foundation

Karen King, Division of Research on Learning, National Science Foundation

Tasha Inniss, Division of Human Resource Development, National Science Foundation

Jennifer Slimowitz Pearl, Division of Mathematical Sciences, National Science Foundation

MAA Panel Discussion

9:35 AM – 10:55 AM **Room 612, Washington State Convention Center**

Advanced placement calculus today: Opportunities and challenges.

Organizer: **Ben Hedrick**, College Board

Panelists: **Don King**, Northeastern University

Dan Teague, North Carolina School of Science and Mathematics

Gail Burrill, Michigan State University

Stephen Davis, Davidson University

AMS Invited Address

10:05 AM – 10:55 AM **Ballroom 6BC, Washington State Convention Center**

(241) *Prestrained elasticity: curvature constraints and differential geometry with low regularity.* **Marta Lewicka**, University of Pittsburgh (1116-35-70)

MAA Session on Experiences and Innovations in Teaching Probability Theory, I

10:20 AM – 11:55 AM **Room 617, Washington State Convention Center**

Organizers: **Jonathon Peterson**, Purdue University

Nathaniel Eldredge, University of Northern Colorado

10:20AM ► (242) *Using dice games to teach probability.* Preliminary report. **Jeremiah D Bartz**, Franis Marion University (1116-E5-24)

10:40AM (243) *Teaching to the Actuarial Exams: One of the Few Times Teaching to an Exam is Okay.* Preliminary report. **Jesse W Johnson**, Westfield State University (1116-E5-2764)

11:00AM ► (244) *Guessing your way through a probability test.* **Edward Early**, St. Edward's University (1116-E5-1370)

11:20AM ► (245) *Statistical Simulations of Lottery Tickets.* **Paul R. Bouthellier**, University of Pittsburgh-Titusville (1116-E5-47)

11:40AM ► (246) *Improving the pyrenees probability tutor to enable comparison of pedagogical interventions.* **Gerardo Emmanuele Serrano**, Universidad Metropolitana (Recinto Cupey) (1116-E5-100)

AMS-MAA Invited Address

11:10 AM – NOON **Ballroom 6BC, Washington State Convention Center**

► (247) *Statistical paradises and paradoxes in big data.* **Xiao-Li Meng**, Harvard University (1116-62-1317)

Exhibits and Book Sales

12:15 PM – 5:30 PM **Hall 4A, 4th Floor, Washington State Convention Center**

AMS Colloquium Lectures: Lecture I

1:00 PM – 2:00 PM **Ballroom 6BC, Washington State Convention Center**

► (248) *Quasirandom sets, quasirandom graphs, and applications.* **W Timothy Gowers**, University of Cambridge, UK (1116-05-1512)

MAA Invited Address

2:15 PM – 3:05 PM **Ballroom 6BC, Washington State Convention Center**

(249) *Singing along with math: The mathematical work of the opera singer Jerome Hines.* **T. Christine Stevens**, American Mathematical Society (1116-A0-19)

AMS-MAA Special Session on Innovative Ideas in Enhancing Success in Mathematics Classes, II

2:15 PM – 6:05 PM **Chelan 2, Chelan Level Two, Washington State Conference Center**

Organizers: **Natali Hritonenko**, Prairie View A&M University
Ellina Grigorieva, Texas Woman's University
Michael A. Radin, Rochester Institute of Technology

2:15PM ► (250) *Etudes of Questions: A New Approach for Writing Mathematics.* **Thomas Garrity**, Williams (1116-97-551)

2:45PM ► (251) *Integrating Calculus I for Deeper Conceptual Understanding.* Preliminary report. **J. Alfredo Jimenez**, Penn State Hazleton (1116-97-1212)

3:15PM (252) *Geometric approach to solving algebraic problems.* **Ellina Grigorieva**, Texas Woman's University (1116-97-292)

3:45PM ► (253) *Team Base Learning in a Large Lecture Calculus I Class.* Preliminary report. **Elgin Johnston***, **Heather Bolles** and **Travis Peters**, Iowa State University (1116-97-1189)

4:15PM ► (254) *How to Write Proofs in Analysis.* Preliminary report. **Jonathan Kane**, University of Wisconsin - Madison (1116-97-1596)

4:45PM ► (255) *Course Management of Engineering Statistics for Student Learning and Instructor Survival.* **Paul B. Deignan**, University of Texas at Dallas (1116-62-497)

5:15PM ► (256) *Engagement, Capacity, and Continuity Theory: What is it and how can I use it?* Preliminary report. **James R. Valles, Jr.**, Prairie View A&M University (1116-97-2157)

5:45PM ► (257) *Puzzles, warm-ups, and games in teaching Calculus.* **Natali Hritonenko**, Prairie View A&M University (1116-97-383)

AMS-MAA Special Session on The History of Mathematics, I

2:15 PM – 6:05 PM **Tahoma 3, Tahoma Level Three, Washington State Conference Center**

Organizers: **Patti Hunter**, Westmont College
Adrian Rice, Randolph-Macon College
Sloan Despeaux, Western Carolina University
Deborah Kent, Drake University

2:15PM (258) *Geometry's Indisputability: From Hero to Hobbes.*
Jacqueline Feke, University of Waterloo (1116-01-1341)

2:45PM ► (259) *The Vis Viva Controversy: a Tercentenary Celebration.* Preliminary report.
Lawrence A. D'Antonio, Ramapo College of New Jersey (1116-01-1100)

3:15PM ► (260) *Some Aspects of the History of the Cycloid.* Preliminary report.
Maria Zack, Point Loma Nazarene University (1116-01-831)

3:45PM ► (261) *75 Years of Apology: G.H. Hardy's A Mathematician's Apology.*
Daniel S Silver, University of South Alabama (1116-01-688)

4:15PM ► (262) *Wetzel's problem, Paul Erdős, and the continuum hypothesis: a mathematical mystery.*
Stephan Ramon Garcia, Pomona College (1116-01-223)

4:45PM ► (263) *Programming Before Computers.* Preliminary report.
Thomas Drucker, University of Wisconsin–Whitewater (1116-01-1688)

5:15PM ► (264) *Visualizing a constructive cubic solution: Omar Khayyam meets Oliver Byrne.*
Deborah Kent, Drake University (1116-01-1659)

5:45PM ► (265) *The Long Birth of Modern Algebra for Undergraduates.*
Walter J. Meyer, Adelphi U. (1116-01-1919)

AMS Special Session on Analysis and Geometry in Nonsmooth Metric Measure Spaces, II

2:15 PM – 6:05 PM **Room 401, Washington State Convention Center**

Organizers: **Luca Capogna**, Worcester Polytechnic Institute
Jeremy Tyson, University of Illinois at Urbana-Champaign

2:15PM (266) *Stochastic analysis on sub-Riemannian manifolds.*
Fabrice Baudoin, Purdue University (1116-58-1254)

2:45PM (267) *Hypoelliptic heat kernels on nilpotent Lie groups.*
Maria Gordina, University of Connecticut (1116-43-887)

3:15PM (268) *Densities and uniformly distributed measures in the Heisenberg group.*
Vasileios Chousionis, University of Connecticut (1116-28-1588)

3:45PM (269) *Carnot vs Siegel: Diophantine approximation in the Heisenberg group.*
Anton Lukyanenko*, University of Michigan, and **Joseph Vandehey**, University of Georgia (1116-20-1981)

4:15PM (270) *A Measure Zero Universal Differentiability Set in the Heisenberg Group.*
Gareth Speight, University of Cincinnati (1116-46-484)

4:45PM (271) *The Whitney Extension Theorem for C^1, horizontal curves in $\mathbb{H}^n$.*
Scott Zimmerman, University of Pittsburgh (1116-58-472)

5:15PM (272) *Unrectifiability of metric spaces and mappings of bounded length distortion.*
Piotr Hajlasz* and **Soheil Malekzadeh**, University of Pittsburgh (1116-49-891)

5:45PM (273) *Projection theorem in infinite dimensional spaces.*
Marianna Csornyei, University of Chicago (1116-28-2425)

AMS Special Session on Big Demand for Big Data: How Do We Create the Big Supply?, I

2:15 PM – 5:55 PM **Room 610, Washington State Convention Center**

Organizers: **Rick Cleary**, Babson College
Xiao-Li Meng, Harvard University

2:15PM (274) *Big Network Data.*
Patrick J Wolfe, University College London (1116-62-2468)

3:15PM Discussion.

4:15PM ► (275) *Statistical Fusion Learning: Combining Inferences from Multiple Sources for More Powerful Findings.*
Regina Y Liu, Department of Statistics, Rutgers University, New Brunswick, New Jersey (1116-62-2646)

5:15PM (276) *The potential and perils of preprocessing: Building new foundations.*
Alex Blocker, Google Life Sciences, and **Xiao-Li Meng***, Department of Statistics, Harvard University (1116-60-2887)

AMS Special Session on Integrable Systems, Painlevé Equations, and Random Matrices, II

2:15 PM – 6:05 PM **Skagit 5, Skagit Lower Level, Washington State Conference Center**

Organizers: **Anton Dzhamay**, University of Northern Colorado
Christopher M. Ormerod, California Institute of Technology
Virgil U. Pierce, University of Texas-Pan American

2:15PM (277) *Inverse Moment Problem for Non-Abelian Coxeter Double Bruhat Cells.*
Michael Gekhtman, Notre Dame (1116-58-1026)

2:45PM (278) *Quantum Gravity and Quantum Groups.*
Nicholas M Ercolani*, University of Arizona, and **Patrick Waters**, Temple University (1116-05-2774)

3:15PM (279) *Combinatorial Hamiltonian Dynamics.* Preliminary report.
Tova Brown, University of Arizona (1116-37-2404)

3:45PM (280) *Universality of operator limits at the Laguerre hard edge.* Preliminary report.
Brian Rider and **Patrick Thomas Waters***, Temple University (1116-60-1616)

4:15PM ► (281) *From gap probabilities in random matrix theory to eigenvalue expansions.*
Thomas Joachim Bothner, University of Michigan (1116-82-1129)

4:45PM (282) *Forward scattering for the semiclassical three wave equation.*
Robert Buckingham*, University of Cincinnati, **Robert Jenkins**, University of Arizona, and **Peter Miller**, University of Michigan (1116-35-736)

5:15PM (283) *A numerical study of line-soliton interactions of the Davey-Stewartson II system.*
Ken-ichi Maruno* and **Arata Nagahara**, Waseda University (1116-35-2655)

5:45PM (284) *Confluence of generalized hypergeometric functions and integrable hydrodynamic type equations.* Preliminary report.
Yuji Kodama, The Ohio State University (1116-30-1542)

AMS Special Session on Interactions between Noncommutative Algebra, Algebraic Geometry, and Representation Theory, II

2:15 PM – 6:05 PM **Room 602, Washington State Convention Center**

Organizers: **Ellen Kirkman**, Wake Forest University
James Zhang, University of Washington

2:15PM (285) *Affine PI Algebras, Representability and the Hopfian Property.*
Lance W. Small, University of California, San Diego (1116-16-1289)

2:45PM (286) *Finite dimensional Hopf actions on Weyl algebras.*
Chelsea Walton, Temple University (1116-16-734)

3:15PM (287) *On Frobenius-Schur indicators for nonsemisimple Hopf algebras.*
Siu-Hung Ng, Louisiana State University (1116-16-1604)

3:45PM (288) *Hopf algebra domains of Gelfand-Kirillov dimension two.* Preliminary report.
Kenneth R Goodearl, University of California at Santa Barbara (1116-16-511)

4:15PM (289) *BGG Category $\mathcal{O}$ over generalized Weyl algebras.*
Apoorva Khare*, Stanford University, and **Akaki Tikaradze**, University of Toledo (1116-16-890)

4:45PM (290) *Modular derivations for Poisson algebras.*
Quanshui Wu, School of Mathematical Sciences, Fudan University (1116-16-1475)

5:15PM (291) *Positive entropy automorphisms and free subalgebras.*
S. Paul Smith, University of Washington (1116-16-882)

5:45PM (292) *General noncommutative blowing up.* Preliminary report.
Daniel Rogalski, UC San Diego (1116-16-2213)

AMS Special Session on Mathematical Information in the Digital Age of Science, II

2:15 PM – 6:05 PM **Room 603, Washington State Convention Center**

Organizers: **Patrick Ion**, University of Michigan, Ann Arbor
Olaf Teschke, zbMATH, Berlin
Stephen Watt, University of Western Ontario

2:15PM ► (293) *Embracing the dislocations as well as the gifts of the internet.*
David Mumford, Brown University (1116-00-1751)

3:15PM ► (294) *Ensuring access and reproducibility: where do we go from here?* Preliminary report.
Henry Cohn, Microsoft Research New England (1116-00-1867)

3:45PM ► (295) *A publishers view on various aspects of handling digital scientific information.*
Mario Aigner, Springer International Publishing (1116-00-2256)

4:15PM ► (296) *Linked Data, Annotations and the Future of Mathematics Libraries.*
Timothy W. Cole, University of Illinois at Urbana-Champaign (1116-00-1884)

4:45PM ► (297) *Mathematics publishing in an academic library context.*
David Ruddy, Cornell University (1116-00-1626)

5:15PM ► (298) *The Search for Convex Pentagons that Tile the Plane: Challenges in Computation and Dissemination.* Preliminary report.
Casey Mann*, **Jennifer McLoud-Mann** and **David Von Derau**, University of Washington Bothell (1116-52-2200)

5:45PM ► (299) *Non-textual information infrastructure for mathematics at the German National Library of Science and Technology.* Preliminary report.
Elena Demidova, Forschungszentrum L3S, **Peter Löwe**, **Margret Plank** and **Mila Runnwerth***, German National Library of Science and Technology (1116-00-2385)

AMS Special Session on Metrical and Topological Fixed Point Theory with Applications

2:15 PM – 5:35 PM **Skagit 3, Skagit Lower Level, Washington State Conference Center**

Organizers: **Clement Boateng Ampadu**, Boston, MA
Talat Nazir, Mälardalen University, Sweden
Hudson Akewe, University of Lagos, Nigeria

2:15PM (300) *Coincidence Point of Sequence of Multivalued Maps using Graphic Contraction.* Preliminary report.
Muhammad Nouman Aslam Khan, SCME, National University of Sciences and Technology, Islamabad, Pakistan (1116-46-126)

2:45PM (301) *Coincidence points of crisp and L-fuzzy mappings.*
Akbar Azam, Department of Mathematics, COMSATS Institute of Information Technology, Chak Shahzad, Islamabad - 44000, Pakistan (1116-46-130)

3:15PM (302) *Nielsen fixed point theory on infra-solvmanifolds of* Sol.
Jang Hyun Jo and **Jong Bum Lee***, Sogang University (1116-55-280)

3:45PM (303) *Hybrid iterative sequences of Jungck-type and common fixed point theorems.*
Hudson Akewe, University of Lagos (1116-46-412)

4:15PM (304) *Fixed point theory of geometric 3-manifolds.* Preliminary report.
Peter N Wong, Bates College (1116-55-525)

4:45PM (305) *Fixed point theorems for single and multi-valued dominating mappings in dualistic partial metric space.*
Muhammad Arshad Zia, International Islamic University, Islamabad, Pakistan. (1116-46-355)

5:15PM (306) *L*-operators and fixed-point theorems.* Preliminary report.
W. Kulpa, Department of Mathematics, UKSW, **A. Szymanski***, Department of Mathematics, Slippery Rock University, **M. Turzanski** and **D. Zagrodny**, Department of Mathematics, UKSW (1116-54-1048)

AMS Special Session on Operators, Function Spaces, and Models, II

2:15 PM – 5:35 PM **Room 400, Washington State Convention Center**

Organizers: **Alberto Condori**, Florida Gulf Coast University, Fort Myers
William Ross, University of Richmond

2:15PM (307) *The classification problem for arclength null-quadrature domains.*
Alexandre Eremenko, Purdue University, and **Erik Lundberg***, Florida Atlantic University (1116-30-2159)

2:45PM ► (308) *Two remarks on similarity.*
Stephan Ramon Garcia, Pomona College (1116-47-351)

3:15PM (309) *The 3x3 von Neumann inequality.*
Greg Knese, Washington University in St. Louis (1116-47-1061)

3:45PM (310) *Two-Weight Inequalities for Commutators with Calderón-Zygmund Operators.*
Irina Holmes*, **Michael T. Lacey**, Georgia Institute of Technology, and **Brett D. Wick**, Washington University in St. Louis (1116-44-453)

4:15PM (311) *Sub-Jordan Operator Tuples.*
Benjamin Peter Russo, University of Florida (1116-47-826)

4:45PM (312) *Iterated Rank-One Perturbations.*
Dale Frymark*, **Constanze Liaw**, Baylor University, and **Alexei Poltoratski**, Texas A&M University (1116-46-728)

5:15PM (313) *Non-commutative Function Theory for Operators.*
John E McCarthy*, Washington University in St. Louis, and **Jim Agler**, U.C. San Diego (1116-47-692)

AMS Special Session on Origami Methods and Applications, II

2:15 PM – 6:05 PM **Room 4C-3, Washington State Convention Center**

Organizers: **Erik Demaine**, MIT
Thomas C. Hull, Western New England University
Robert J. Lang, Lang Origami

2:15PM ► (314) *Computational Origami is Hard.*
Erik D. Demaine, Massachusetts Institute of Technology (1116-68-2254)

2:45PM ► (315) *Who Needs Crossings? Hardness of Plane Graph Rigidity.* Preliminary report.
Zachary Abel*, MIT Department of Mathematics, **Erik D. Demaine**, **Martin L. Demaine**, **Sarah Eisenstat**, **Jason Lynch** and **Tao B. Schardl**, MIT Computer Science and Artificial Intelligence Laboratory (1116-52-2006)

3:15PM ► (316) *Box Pleating is Hard.*
H. A. Akitaya*, Tufts University, **K. C. Cheung**, NASA, **E. D. Demaine**, MIT, **T. Horiyama**, Saitama University, **T. C. Hull**, Western New England University, **J. S. Ku**, MIT, **T. Tachi**, The University of Tokyo, and **R. Uehara**, JAIST (1116-68-1125)

3:45PM ► (317) *Verification of flat-foldability of crease patterns on the 45 degree grid system.* Preliminary report.
Yoshihisa Matsukawa and **Jun Mitani***, University of Tsukuba (1116-05-652)

4:15PM ► (318) *Recent results on common developments of tetramonohedron and other solids.* **Ryuhei Uehara**, Japan Advanced Institute of Science and Technology (1116-51-641)

4:45PM ► (319) *Generating Crease Patterns from Prescribed Boundary Foldings.* **Jason S Ku**, Massachusetts Institute of Technology (1116-68-1565)

5:15PM ► (320) *Geodesic Universal Molecules.* **John Christopher Bowers***, James Madison University, and **Ileana Streinu**, Smith College (1116-52-768)

5:45PM ► (321) *Counterrotating Twist Tessellations and Brocard Polygons.* **Robert J Lang***, Robert J. Lang Origami, and **Roger Alperin**, San Jose State University (1116-51-439)

AMS Special Session on Parabolic Geometries, Twistor Theory, and the AdS/CFT Correspondence, I

2:15 PM – 4:55 PM **Room 4C-4, Washington State Convention Center**

Organizers: **Jonathan Holland**, University of Pittsburgh
George Sparling, University of Pittsburgh
Daniela Mihai, Carnegie Mellon University

2:15PM (322) *Hyperholomorphic line bundles.* **Eric O. Korman**, University of Texas at Austin (1116-53-152)

3:15PM (323) *New results on the structure of quantum Teichmüller space.* **Dylan G.L. Allegretti**, Yale University (1116-51-859)

4:15PM (324) *Higher-dimensional Willmore energies via minimal submanifold asymptotics.* Preliminary report. **C. Robin Graham*** and **Nicholas Reichert**, University of Washington (1116-53-2052)

AMS Special Session on Problems in Geometry and Design of Materials, I

2:15 PM – 5:55 PM **Room 604, Washington State Convention Center**

Organizers: **Marta Lewicka**, University of Pittsburgh
Petronela Radu, University of Nebraska

2:15PM (325) *The energy of a Möbius band.* **Roberto Paroni**, Università di Sassari (1116-49-1750)

3:15PM (326) *Isometric Immersions and Self Similar Buckling in Non-Euclidean Elastic Sheets.* **John Gemmer***, Brown University, **Shankar Venkataramani**, University of Arizona, and **Eran Sharon**, Hebrew University of Jeruslaem (1116-35-1583)

3:45PM (327) *Characterization of perfectly ordered mathematical quasicrystals.* **Alan Haynes***, **Henna Koivusalo** and **James Walton**, University of York, UK (1116-52-1013)

4:15PM ► (328) *Compatibility conditions as a measure of rigidity of discrete structures.* Preliminary report. **Andrej Cherkaev***, University of Utah, Department of Mathematics, **Predrag Krtolica** and **Andrejs E. Treibergs***, Department of Mathematics, University of Utah (1116-35-954)

4:45PM (329) *Dynamic Analysis of Chevron Structures in Liquid Crystal Cells.* **Lidia Mrad*** and **Daniel Phillips**, Purdue University (1116-35-1769)

5:15PM ► (330) *Finite Element Approximations of Bilayer Plates.* **Soeren Bartels**, University of Freiburg, Germany, **Andrea Bonito***, Texas A&M University, College Station, USA, and **Ricardo H Nochetto**, University of Maryland, USA (1116-65-1275)

AMS Special Session on Pseudorandomness and Its Applications, I

2:15 PM – 6:05 PM **Room 606, Washington State Convention Center**

Organizers: **Timothy Gowers**, University of Cambridge
Jozsef Solymosi, University of British Columbia

2:15PM (331) *A characterization of functions with vanishing averages over products of disjoint sets.* **Hamed Hatami***, McGill University, **Pooya Hatami**, University of Chicago, and **Yaqiao Li**, McGill Univeristy (1116-05-523)

2:45PM (332) *Pseudorandomness & Higher-Dimensional Topological Expansion.* Preliminary report. **Uli Wagner**, IST Austria (1116-05-1691)

3:15PM (333) *Recent developments in explicit constructions of randomness extractors.* **Xin Li**, Johns Hopkins University (1116-68-1572)

3:45PM (334) *On some problems in Geometric Ramsey Theory.* Preliminary report. **Neil Lyall*** and **Akos Magyar**, University of Georgia (1116-42-1998)

4:15PM (335) *Arithmetic progressions in sparse pseudorandom subsets of the real numbers.* **Marc Carnovale**, The Ohio State University (1116-42-2108)

4:45PM (336) *On problems of Cameron and Erdos.* **Jozsef Balog***, University of Illinois at Urbana-Champaign, **Hong Liu**, **Maryam Sharifzadeh**, UIUC, and **Andrew Treglown**, Birmingham U., UK (1116-05-516)

5:15PM *Algebraic constructions of Turán graphs.*
► (337) **Boris Bukh**, Carnegie Mellon University (1116-05-342)

5:45PM *Additive Diophantine equations in dense*
(338) *variables.*
Kevin Henriot, University of British Columbia (1116-11-872)

AMS Special Session on Recent Advances in Dynamical Systems and Mathematical Biology, II

2:15 PM – 6:05 PM **Room 4C-1, Washington State Convention Center**

Organizers: **Guihong Fan**, Columbus State University
Jing Li, Californnia State University Northridge
Hongying Shu, Tongji University, China

2:15PM *A theory of optimal antibiotic resistance*
► (339) *management.* Preliminary report.
Timothy C Reluga, Penn State University (1116-92-1185)

2:45PM *Interaction of water and biomass: rich*
► (340) *dynamics in a simple model.*
Junping Shi*, College of William and Mary, **Xiaoli Wang** and **Guohong Zhang**, Southwest University (1116-92-1489)

3:15PM *Modeling and the dynamics of the Spread*
(341) *and Control of Dengue with L= imited Public Health Resources.*
Huaiping Zhu, York University (1116-00-2977)

3:45PM *Residual viremia in treated HIV+*
(342) *patients: simple model insights.*
Jessica M Conway*, Pennsylvania State University, and **Alan S Perelson**, Los Alamos National Laboratory (1116-92-1264)

4:15PM *Modeling HIV treatment and slow*
► (343) *depletion of target cells.*
Libin Rong, Oakland University (1116-92-2449)

4:45PM *Infectious diseases can eradicate host*
(344) *species.*
Alex P Farrell* and **H Thieme**, Arizona State University (1116-34-1457)

5:15PM *Leading indicators of bifurcations in*
► (345) *epidemiological systems.*
John M. Drake, University of Georgia, and **Suzanne M. O'Regan***, National Institute for Mathematical and Biological Synthesis (NIMBioS) (1116-92-589)

5:45PM *Data Assimilation in Mathematical*
► (346) *Models of Cancer Growth and Treatment.* Preliminary report.
Eric J Kostelich*, **Yang Kuang** and **Javier Baez**, Arizona State University (1116-92-2168)

AMS Special Session on Recent Developments in Dispersive Partial Differential Equations and Harmonic Analysis, II

2:15 PM – 6:05 PM **Skagit 4, Skagit Lower Level, Washington State Conference Center**

Organizers: **William Green**, Rose-Hulman Institute of Technology, Terre Haute
Jennifer Beichman, University of Wisconsin, Madison

2:15PM *A Weigthed estimate for two dimensional*
► (347) *Schrödinger, matrix Schrödinger, and wave equations with resonance of the first kind at zero.* Preliminary report.
Ebru Toprak, University of Illinois (1116-35-857)

2:45PM *L^p Bounds for Wave Operators for the*
(348) *Schrödinger Equation with a Threshold Eigenvalue.*
Michael Goldberg*, University of Cincinnati, and **William Green**, Rose-Hulman Institute of Technology (1116-35-678)

3:15PM *Global Well-Posedness of 2D Nonlinear*
(349) *Schrödinger Equations of Indefinite Signature.*
Nathan Totz, University of Massachusetts Amherst (1116-35-1142)

3:45PM *Global behavior and non-squeezing for*
(350) *the NLKG.*
Dana Mendelson, MSRI (1116-35-1508)

4:15PM *Wave maps with large data.*
(351) **Andrew Lawrie**, UC Berkeley (1116-35-428)

4:45PM *Periodic traveling waves of the short*
(352) *pulse equation: existence and stability.*
Milena Stanislavova, University of Kansas (1116-35-1055)

5:15PM *Negative energy blowup for the focusing*
(353) *Hartree hierarchy via identities of virial and localized virial type.*
Aynur Bulut, University of Michigan and MSRI (1116-35-1863)

5:45PM *Strichartz Estimate for the Cauchy*
(354) *Problem of Dispersive Equations on α-Modulation Space.* Preliminary report.
Justin Trulen, University of Wisconsin - Milwaukee (1116-35-259)

AMS Special Session on Research from the 2014 and 2015 Rocky Mountain-Great Plains Graduate Research Workshop in Combinatorics, II

2:15 PM – 6:05 PM **Room 204, Washington State Convention Center**

Organizers: **Michael Ferrera**, University of Colorado, Denver
Leslie Hogben, Iowa State University, Ames

Paul Horn, University of Denver

Derrick Stolee, Iowa State University, Ames

2:15PM ► (355) *How to Make the Perfect Fireworks Display: Two Strategies for Hanabi.*
Christopher Cox, Carnegie Mellon University, **Jessica De Silva***, University of Nebraska-Lincoln, **Philip DeOrsey**, Emory & Henry College, **Franklin H.J. Kenter**, Rice University, **Troy Retter**, Emory University, and **Josh Tobin**, University of California, San Diego (1116-91-1204)

2:45PM (356) *Antimagic Labelings of Weighted and Oriented Graphs.*
Zhanar Berikkyzy, Iowa State University, **Axel Brandt***, **Sogol Jahanbekam**, University of Colorado Denver, **Victor Larsen**, Kennesaw State University, and **Danny Rorabaugh**, Queens University (1116-05-1480)

3:15PM ► (357) *On the Strong Chromatic Index of Sparse Graphs.*
Sogol Jahanbekam, Department of Mathematical and Statistical Sciences, University of Colorado Denver, Denver (1116-05-1164)

3:45PM ► (358) *Fast percolation on the hexagonal lattice.*
Charles Tomlinson*, University of Nebraska-Lincoln, and **Philip DeOrsey**, Emory & Henry College (1116-05-2148)

4:15PM (359) *Chvátal-type results for degree sequence Ramsey numbers.*
Christopher Cox, Carnegie Mellon University, **Michael Ferrara**, University of Colorado Denver, **Ryan R Martin**, Iowa State University, and **Benjamin Reiniger***, Ryerson University (1116-05-1154)

4:45PM ► (360) *Graph Builds.* Preliminary report.
Jay Cummings, UC San Diego (1116-05-2018)

5:15PM (361) *I, F-partitions of sparse graphs.*
Axel Brandt, **Michael Ferrara**, University of Colorado Denver, **Mohit Kumbhat**, Iowa State University, **Sarah Loeb***, University of Illinois at Urbana–Champaign, **Derrick Stolee**, Iowa State University, and **Matthew Yancey**, Institute for Defense Analyses / Center for Computing Sciences (1116-05-2160)

5:45PM ► (362) *Increasing paths in edge-ordered graphs.*
Jessica De Silva, UNL, **Theodore Molla**, UIUC, **Florian Pfender**, UC Denver, **Troy Retter**, Emory, and **Michael Tait***, UCSD (1116-05-1257)

AMS Special Session on Set-Valued Optimization and Variational Problems with Applications, II

2:15 PM – 6:05 PM **Room 310, Washington State Convention Center**

Organizers: **Baasansuren Jadamba**, Rochester Institute of Technology
Akhtar A. Kahn, Rochester Institute of Technology
Mau Nam Nguyen, Portland State University
Miguel Sama, Universidad Nacional de Educacion a Distancia, Spain
Chirstiane Tammer, Martin Luther University of Halle-Wittenberg

2:15PM (363) *Existence of equilibria and fixed points of set-valued mappings on Epi-Lipschitz sets with weak tangential conditions.*
Messaoud Bounekhel, King Saud University, College of Science, Department of Mathematics, Riyadh, KSA (1116-49-326)

2:45PM (364) *A generalized multi-directional mean value inequality.*
Robert J Kipka*, Queen's University, and **Yuri S. Ledyaev**, Western Michigan University (1116-49-1892)

3:15PM (365) *Geometric Approach to Convex Analysis in Locally Convex Topological Vector Spaces.*
R. Blake Rector* and **Nguyen Mau Nam**, Portland State University (1116-49-738)

3:45PM ► (366) *Optimization and Numerical Analysis of Set-Valued or Fuzzy-Valued functions - A Unified Approach and Applications.*
Vira Babenko, The University of Utah (1116-65-648)

4:15PM (367) *On the Douglas-Rachford algorithm: inconsistency and finite convergence.*
Minh Ngoc Dao, University of British Columbia Okanagan and Hanoi National University of Education (1116-49-195)

4:45PM (368) *Stability analysis of composite optimization problems with applications to critical multipliers.*
Ebrahim Sarabi, Wayne state university (1116-49-427)

5:15PM (369) *A new topological degree theory for pseudomonotone perturbations of the sum of two maximal monotone operators and applications.*
Teffera M. Asfaw, Virginia Polytechnic Institute and State University (1116-46-1354)

5:45PM (370) *Runge-Kutta Approximation and Optimization of Differential Inclusions.*
Yuan Tian*, Miami University - Oxford, and **Boris Mordukhovich**, Wayne State University (1116-49-403)

AMS Special Session on Topological Representation Theory, II

2:15 PM – 6:05 PM **Room 201, Washington State Convention Center**

Organizers: **Charles Frohman**, University of Iowa, Iowa City

Helen Wong, Carelton College

2:15PM (371) *Bernstein-Gelfand-Gelfand reciprocity property and categorification of the polynomial ring.* Preliminary report. **Radmila Sazdanovic***, North Carolina State University, and **Mikhail Khovanov**, Columbia University (1116-18-1282)

2:45PM (372) *Stabilization of the Khovanov Homotopy Type of Torus Links.* **Michael S Willis**, University of Virginia (1116-55-1277)

3:15PM (373) *Diagonalization of the full twist.* Preliminary report. **Matthew Hogancamp***, Indiana University, Bloomington, and **Benjamin Elias**, University of Oregon, Eugene (1116-55-1398)

3:45PM (374) *Stable homology of torus links via categorified one-column Young symmetrizers.* **Michael A Abel***, Duke University, and **Matt Hogancamp**, Indiana University (1116-57-1260)

4:15PM (375) *On formal contact categories.* **Ben Cooper**, University of Iowa (1116-18-1036)

4:45PM (376) *Link homologies from Bar-Natan skein modules.* **Christine Ruey Shan Lee**, University of Texas at Austin (1116-57-889)

5:15PM (377) *Howe dualities and link invariants.* **David E. V. Rose**, University of Southern California (1116-81-1367)

5:45PM (378) *Topology in the degree of the Colored Jones Polynomial.* **Effie Kalfagianni***, Michigan State University, Michigan State University, and **Ahn T. Tran**, The University of Texas at Dallas (1116-57-931)

AMS Special Session on What's New in Group Theory?, I

2:15 PM – 6:05 PM **Rooms 307/308, Washington State Convention Center**

Organizers: **Arturo Magidin**, University of Louisiana at Lafayette

Elizabeth Wilcox, Oswego State University of New York

2:15PM (379) *What's new about finite p-groups.* **George Glauberman**, University of Chicago (1116-20-632)

2:45PM (380) *Standard form problems for 2-fusion systems.* **Justin Lynd**, University of Montana (1116-20-1355)

3:15PM (381) *Finiteness properties of infinite groups, and examples in pure braid groups.* **Matthew Zaremsky**, Binghamton University (1116-20-558)

3:45PM ► (382) *Automorphism groups of extremal codes.* **Paul E Becker**, Penn State Erie, The Behrend College (1116-20-943)

4:15PM (383) *Graphical Frobenius Representations with even complements.* Preliminary report. **Thomas W Tucker***, Colgate University, **Marston D.E. Conder**, University of Auckland, NZ, and **Mark E Watkins**, Syracuse University, NY (1116-20-1920)

4:45PM (384) *Asymptotic density of test elements in free groups and surface groups.* **Ilir Snopce**, Universidade Federal do Rio de Janeiro (1116-20-626)

5:15PM (385) *The congruence subgroup problem for branch groups.* **Rachel K. Skipper**, Binghamton University (1116-20-959)

5:45PM ► (386) *On autocommutators in infinite abelian groups.* Preliminary report. **Luise-Charlotte Kappe***, Binghamton University, **Patrizia Longobardi** and **Mercede Maj**, University of Salerno (1116-20-496)

MAA Minicourse #8: Part A

2:15 PM – 4:15 PM **Tahoma 5, Tahoma Level Three, Washington State Conference Center**

Algebraic geometry: A problem-based course.

Presenters: **Thomas Garrity**, Williams College

Ryan Brown, Georgia College

MAA Minicourse #9: Part A

2:15 PM – 4:15 PM **Metropolitan A, 3rd Floor, Sheraton Seattle Hotel**

Increasing student engagement and understanding through active learning strategies in calculus.

Presenters: **Debbie Gochenaur**, Shippensburg University

Larissa Schroeder, University of Hartford

Matt Boelkins, Grand Valley State University

Annie Hodge, University of Nebraska Omaha

Dana Ernst, Northern Arizona University

MAA Minicourse #4: Part A

2:15 PM – 4:15 PM **Metropolitan B, 3rd Floor, Sheraton Seattle Hotel**

Teaching mathematics with sports applications.

Presenter: **Rick Cleary**, Babson College

AMS Session on Functional Analysis and Operator Theory, I

2:15 PM – 5:40 PM **Room 615, Washington State Convention Center**

2:15PM (387) *Two approaches to the notions of real locally C*- and locally JB-algebras.* **Oleg Friedman**, Lander College for Men-Touro College, NY, USA/UNISA, RSA (1116-46-2351)

2:30PM (388) *Estimates of the modular-type operator norm of an integral operator over spherical cones.* **Chang-Pao Chen**, Hsuan Chuang University (1116-47-490)

2:45PM ► (389) *Positive cones, positive linear functionals and classification of algebras of operators on Pontryagin Π_1 space.* Preliminary report. **Sofya S Masharipova*** and **Shukhrat M Usmanov**, Ashford University (1116-46-901)

3:00PM (390) *Moment Representations of the Exceptional X_1-Laguerre Orthogonal Polynomials.* **Constanze Liaw** and **John M. Osborn***, Baylor University (1116-46-2235)

3:15PM (391) *Compact Composition Operators on Weighted Hilbert Spaces.* **Waleed Al-Rawashdeh**, Montana Tech (1116-47-974)

3:30PM (392) *Fixed point theorem for hypergroups with application to showing the existence of a Haar measure.* **Benjamin Willson**, Western Illinois University (1116-43-2938)

3:45PM (393) *Weak compactness is not equivalent to the fixed point property in c.* **Torrey Gallagher**, **Chris Lennard** and **Roxana Popescu***, University of Pittsburgh (1116-00-1571)

4:00PM (394) *Frames generated by compact group actions.* **Joseph W. Iverson**, University of Oregon (1116-43-2667)

4:15PM (395) *Nonlinear operators satisfying order theoretic properties on vector-valued functions.* Preliminary report. **William A. Feldman**, University of Arkansas, Department of Mathematical Sciences (1116-46-2212)

4:30PM (396) *A Noncommutative Borsuk-Ulam Theorem.* **Benjamin W Passer**, Washington University in St. Louis (1116-47-482)

4:45PM (397) *Classifying Functions in the Kernel of the Adjoint of a Composition Operator on the Hardy Space.* Preliminary report. **Brittney R. Miller**, Purdue University (1116-47-1599)

5:00PM ► (398) *Zero Inclusion for the Numerical Range of a Composition Operator.* Preliminary report. **Christopher R. Felder**, Butler University (1116-47-2069)

5:15PM (399) *Motives of noncommutative tori.* **Y Shen**, Department of Mathematics, the Florida state University (1116-47-2098)

5:30PM ► (400) *Mean isometries are isometries.* Preliminary report. **Torrey M Gallagher**, University of Pittsburgh (1116-46-1646)

AMS Session on Geometry and Differential Geometry, II

2:15 PM – 4:40 PM **Room 605, Washington State Convention Center**

2:15PM (401) *Non-triviality of the Fundamental Group of Symplectic Embeddings of 2 Ellipsoids.* Preliminary report. **Edward William Burkard**, University of Notre Dame (1116-53-1105)

2:30PM (402) *The convexity radius of a Riemannian manifold.* **James Dibble**, Western Illinois University (1116-53-2120)

2:45PM (403) *On hearing the length spectrum of lens spaces.* Preliminary report. **Donato R. Cianci**, Dartmouth College (1116-53-2330)

3:00PM (404) *Extending the* $\log(2k-1)$*-Theorem.* **Rosemary K Guzman**, University of Illinois at Urbana-Champaign (1116-57-2971)

3:15PM (405) *New Results in Conformal Ricci Flow and the Conformally Reduced Einstein Evolution Equations.* **Arthur E. Fischer**, University of California, Santa Cruz (1116-53-2964)

3:30PM (406) *Classifying Monotone Lagrangian Tori in $S^2 \times S^2$ up to Hamiltonian Isotopy.* **Sahana Vasudevan**, Harvard University (1116-53-2582)

3:45PM ► (407) *Sobolev Homeomorphism on a Sphere Containing An Arbitrary Cantor Set in the image.* **Piotr Hajlasz** and **Xiaodan Zhou***, University of Pittsburgh (1116-00-1049)

4:00PM ► (408) *A Finite Generating Set For Muller's Arc Algebra - Part 1.* **Julian R Skotheim***, Carleton College, **Matt Sikkink Johnson**, University of Minnesota, **Crystal Lai**, Berlin Mathematical School, and **Helen Wong**, Carleton College (1116-57-1315)

4:15PM ► (409) *A Finite Generating Set for Muller's Arc Algebra, Part 2.*
Matthew L. Sikkink Johnson*, University of Minnesota, **Julian R. Skotheim**, **Helen Wong**, Carleton College, and **Crystal Lai**, Berlin Mathematical School (1116-57-1314)

4:30PM (410) *Spinning Almost Normal Surfaces.* Preliminary report.
Katherine Paullin*, University of Kentucky, **David Letscher** and **Erin Wolf Chambers**, Saint Louis University (1116-57-2593)

AMS Session on Group Theory and Generalizations, II

2:15 PM – 4:55 PM **Room 616, Washington State Convention Center**

2:15PM (411) *Periodicity phenomena in the modular representation theory of symmetric and general linear groups.*
Nate Harman, Massachusetts Institute of Technology (1116-20-2126)

2:30PM (412) *Specht modules in the principal block of* $F\Sigma_{3p}$.
Michael A Rosas, SUNY at Buffalo (1116-20-964)

2:45PM (413) *Symmetric Generating Sets for* D_n *and Word Length Perturbations.* Preliminary report.
Michael P. Allocca*, Muhlenberg College, **Jason M. Graham**, University of Scranton, **Candice R. Price**, Sam Houston State University, **Shannon N. Talbott**, Moravian College, and **Jennifer F. Vasquez**, University of Scranton (1116-20-1394)

3:00PM (414) *Linear group actions on related algebras.* Preliminary report.
Stephen M Gagola, Jr, Kent State University (1116-20-1837)

3:15PM (415) *Abelian groups with partial decomposition bases.* Preliminary report.
Peter Loth, Sacred Heart University (1116-20-840)

3:30PM (416) *Generators for Decompositions of Tensor Products of Modules associated with standard Jordan partitions.*
Michael JJ Barry, Allegheny College, Meadville, PA 16335 (1116-20-689)

3:45PM (417) *The Bruhat order, the lookup conjecture and spiral Schubert Varieties of type* $\tilde{A}_2$.
William Graham, University of Georgia, and **Wenjing Li***, Simpson University (1116-22-2948)

4:00PM (418) *Classification of Seven-Dimensional Lie Algebras with* $H \oplus \mathbb{R}^3$ *Niradical.* Preliminary report.
Firas Y Hindeleh* and **Christopher Mattoon**, Grand Valley State University (1116-22-1624)

4:15PM ► (419) *Nilpotent Orbits for Borel Subgroups of Modality Zero.* Preliminary report.
Madeleine Burkhart, University of Washington, and **David C. Vella***, Skidmore College (1116-20-2480)

4:30PM (420) *Sets with few differences in abelian groups.*
Mitchell M Lee, Massachusetts Institute of Technology (1116-05-270)

4:45PM (421) *Isomorphy Classes of Finite Order Automorphisms of SL(2,k).*
Robert W. Benim*, Pacific University, **Mark Hunnell**, Winston-Salem State University, and **Amanda K. Sutherland**, Shenandoah University (1116-22-743)

AMS Session on Mathematical Biology and Related Fields, I

2:15 PM – 5:55 PM **Skagit 1, Skagit Lower Level, Washington State Conference Center**

2:15PM (422) *Sensitivity Analysis of Mathematical Model for Dengue fever Transmission.*
Tarig Mohamed Ali, Universiti Sains malaysia, **Mohamed Faisal Abd Karim** and **Anton Abdulbasah Kamil***, Universiti Sains Malaysia (1116-92-116)

2:30PM ► (423) *Cyclophosphamide induced loss in the murine olfactory systems.*
Andrea Vazquez Quiles, Universidad Metropolitana (UMET) (1116-92-128)

2:45PM ► (424) *A Topological Analysis of Targeted In-111 Uptake in SPECT Images of Murine Tumors.*
David B Damiano, College of the Holy Cross, and **Melissa R McGuirl***, Brown University (1116-92-419)

3:00PM ► (425) *Evolutionary dynamics in finite structured populations.*
Jan Rychtar, University of North Carolina at Greensboro (1116-92-952)

3:15PM (426) *Dynamics of phytoplankton-zooplankton interactions with toxin producing phytoplankton and mutual interference of zooplankton.*
T.Mihiri M. De silva*, Graduate student, Texas Tech university, and **Sophia R.J. Jang**, Professor, Texas Tech University (1116-34-622)

3:30PM (427) *Insect Drift Movement Modeling and Parameter Estimations via Boundary Characteristics.*
Xiuquan Wang*, Tougaloo College, **John D. Reeve**, **Mingqing Xiao**, **Dashun Xu**, Southern Illinois University Carbondale, and **James T. Cronin**, Louisiana State University (1116-92-761)

3:45PM ► (428) *Topological Data Analysis of Biological Aggregation Models.*
Lori Beth Ziegelmeier*, **Chad M. Topaz** and **Tom Halverson**, Macalester College (1116-92-883)

4:00PM ► (429) *Bird-Driven Dispersal of Trees: Multi-Scale Modeling and Analysis.* **Ram C Neupane**, Utah State University, Logan, Utah (1116-92-1337)

4:15PM ► (430) *Comparative Analysis of Transcriptomic Data Accounting for Variation in Gene Flexibility.* Preliminary report. **Rachel A Schomaker***, Florida Southern College, and **MaLyn Lawhorn**, Winthrop University (1116-92-1555)

4:30PM ► (431) *Modeling of Extinction of Inhomogeneous Population.* Preliminary report. **Georgiy P Karev***, National Center for Biotechnological Information, National Institute of Health, Bethesda, USA, and **Irina P Kareva**, Tuft University, Boston MA (1116-92-1629)

4:45PM ► (432) *Local spatial entanglement of protein structures.* Preliminary report. **Kenneth C Millett**, University of California, Santa Barbara (1116-57-2314)

5:00PM (433) *Reductions in dynamic uncertainty for a B cell antigen receptor signaling model using a MINE criterion.* **Reginald L. McGee***, Mathematical Biosciences Institute, **Ann E. Rundell** and **Gregery T. Buzzard**, Purdue University (1116-92-2503)

5:15PM (434) *A mathematical model of human papillomavirus (HPV) in African American Men and Women populations.* **Najat Ziyadi,** Morgan State University (1116-92-1642)

5:30PM ► (435) *Modeling the effects of co-occurring nutrient and contaminant stressors in aquatic systems.* **Angela Peace**, Texas Tech University (1116-92-1783)

5:45PM ► (436) *Optimal Insecticide Treated Bed-net Coverage and Malaria Treatment in a Malaria-HIV Co-infection Model.* **Eric Numfor***, Georgia Regents University, and **Jemal Mohammed-Awel**, Valdosta State University (1116-92-1950)

AMS Session on Number Theory, I

2:15 PM – 5:40 PM Chelan 5, Chelan Level Two, Washington State Conference Center

2:15PM (437) *Groups of order 16 as Galois groups over the 2-adic numbers.* **Chad Awtrey**, Elon University (1116-12-2226)

2:30PM (438) *On On_p.* **Joseph Michael DiMuro**, Biola University (1116-12-2663)

2:45PM (439) *On the number of Special Numbers.* **Kevser Aktas**, Gazi University, Ankara, Turkey (1116-11-2684)

3:00PM (440) *Elliptic curves of bounded Faltings height.* **Ruthi Hortsch**, Massachusetts Institute of Technology (1116-11-746)

3:15PM (441) *Generalized Gauss sums: congruences and p-adic properties.* **Sandi Xhumari**, University of Connecticut (1116-11-2919)

3:30PM ► (442) *Leading digit laws on Linear Lie Groups.* **Corey M Manack***, Franklin & Marshall College, and **Steven J Miller**, Williams College (1116-11-2718)

3:45PM (443) *Some Arithmetic Properties of Partitions and Quadratic Forms.* Preliminary report. **Zhu Cao***, Department of Mathematics, Kennesaw State University, and **Shichao Chen**, Department of Mathematics, Henan University, P. R. China (1116-11-2849)

4:00PM (444) *Stickelberger Elements for $\mathbb{Q}(\zeta_{p^{n+1}})^+$ and p-adic L-functions.* **Timothy James All**, Wabash College (1116-11-2966)

4:15PM (445) *Triply imprimitive representations of GL(2).* **Ralf Schmidt**, University of Oklahoma, and **Salam Turki***, University of New Haven (1116-11-2118)

4:30PM ► (446) *A generalization of continued fractions.* Preliminary report. **John R Greene*** and **Jesse Schmeig**, University of Minnesota Duluth (1116-11-919)

4:45PM (447) *Siegel modular forms: Representations, computing spaces, and abelian varieties.* **Jeffery E. Breeding-Allison**, Fordham University (1116-11-798)

5:00PM ► (448) *Fast exponentiation methods using the generalized continued fractions.* **Tall Aadou***, AIMS-senegal, African Institute for Mathematical Sciences, and **Sanghare Yacin Aly**, Université Cheikh Anta Diop de Dakar (1116-11-2124)

5:15PM (449) *On relations of Koike and Somos for the Rogers-Ramanujan functions.* Preliminary report. **Chadwick Arthur Gugg**, Georgia Southwestern State University (1116-11-138)

5:30PM (450) *Solutions of Diagonal Congruences with Variables Restricted to Small Intervals.* **Misty Ostergaard***, **Todd Cochrane** and **Craig Spencer**, Kansas State University (1116-11-2500)

AMS Session on Topology and Knot Theory, I

2:15 PM – 5:40 PM Chelan 4, Chelan Level Two, Washington State Conference Center

2:15PM (451) *The untwisting number of a knot.* **Kenan Ince**, Rice University (1116-54-851)

2:30PM (452) *The Kauffman Polynomial of Periodic Links.* **Kyle Istvan***, Louisiana State University, **Khaled Qazaqzeh** and **Ayman Abouzaid**, Kuwait University (1116-54-2445)

2:45PM ► (453) *An ergodic algorithm for generating random knots of a prescribed thickness.* **Kyle Leland Chapman**, University of California: Santa Barbara (1116-54-2558)

3:00PM (454) *Quantifying entanglement for collections of chains in periodic boundary conditions models.* **Eleni Panagiotou***, University of California Santa Barbara, and **Ken Millett**, University of California, Santa Barbara (1116-54-2642)

3:15PM ► (455) *A Study of Bouquet Pseudograph Diagrams.* Preliminary report. **Elaina K Aceves**, California State University Fresno (1116-57-1380)

3:30PM (456) *Turaev Genus and Alternating Decompositions.* **Cody W. Armond***, University of South Alabama, and **Adam M. Lowrance**, Vassar College (1116-57-2440)

3:45PM (457) *Tangle surgeries and hyperbolic augmented links.* Preliminary report. **Rolland Trapp***, Cal State University San Bernardino, and **John Harnois**, James Madison University (1116-57-2462)

4:00PM (458) *Nearrings of endomorphisms of group objects in the category of quandles.* Preliminary report. **Nathan A Smith**, The University of Texas at Tyler (1116-57-2725)

4:15PM (459) *Asymmetric knots with two cyclic surgeries.* **Neil R Hoffman***, University of Melbourne, **Nathan M Dunfield**, University of Illinois - Urbana-Champaign, and **Joan E Licata**, Australia National University (1116-57-2809)

4:30PM ► (460) *Examples of virtual knots with vanishing n-writhes.* **Sumiko Horiuchi**, **Yoshiyuki Ohyama**, Tokyo Woman's Christian University, and **Migiwa Sakurai***, National Institute of Technology, Ibaraki College (1116-57-2171)

4:45PM (461) *Shake slice and shake concordant knots.* **Tim D Cochran**, Rice University, and **Arunima Ray***, Brandeis University (1116-57-684)

5:00PM (462) *The cosmetic crossing conjecture and symmetric unions.* **Allison H Moore***, Rice University, and **Tye Lidman**, Institute for Advanced Study (1116-57-677)

5:15PM ► (463) *Folded knots in the plane.* Preliminary report. **Elizabeth Denne**, Washington & Lee University (1116-57-873)

5:30PM (464) *Braided cobordisms and the braid rank of a knot.* **Mark Hughes**, Brigham Young University (1116-57-896)

MAA Session on Assessing Student Learning: Alternative Approaches, II

2:15 PM – 5:10 PM **Room 303, Washington State Convention Center**

Organizers: **David Clark**, Grand Valley State University
Jane Butterfield, University of Victoria
Robert Campbell, College of St. Benedict/St. John's University
Cassie Williams, James Madison University

2:35PM ► (465) *Encouraging Careful Questioning Through Two-Color Problem Sets.* Preliminary report. **Vicky W Klima**, Appalachian State University (1116-A5-1917)

2:55PM ► (466) *A minimalist assessment method which maximizes student learning and participation.* **Maarten McKubre-Jordens**, University of Canterbury, Christchurch, New Zealand. (1116-A5-1196)

3:15PM ► (467) *Assessing Student Participation and Presentation of Material.* Preliminary report. **Edwin P Herman**, University of Wisconsin-Stevens Point (1116-A5-2221)

3:35PM ► (468) *Innovations in Calculus Assessment.* **Vincent J. Matsko**, University of San Francisco (1116-A5-1767)

3:55PM ► (469) *Assessment and Rubrics for a Survey Project in an Elementary Statistics Course.* Preliminary report. **Richard P Spindler**, University of Wisconsin - Eau Claire (1116-A5-289)

4:15PM (470) *Measuring Student Learning Outcomes under Interval and Fuzzy Uncertainty.* Preliminary report. **Jalalidin Jaenbai**, Zayed University, UAE (1116-A5-1435)

4:35PM ► (471) *E-assessment and learning: the relationship between take-home and proctored assessment.* **Filippo Posta*** and **Jonah Beaumont**, Grand Canyon University (1116-A5-282)

4:55PM (472) *No tests. No, really.* **Emlee Nicholson**, Millsaps College (1116-A5-1913)

MAA Session on Experiences and Innovations in Teaching Probability Theory, II

2:15 PM – 4:10 PM **Room 617, Washington State Convention Center**

Organizers: **Jonathon Peterson**, Purdue University
Nathaniel Eldredge, University of Northern Colorado

2:15PM ► (473) *Using cultural references and flipped classrooms in teaching undergraduate probability.*
Joe P. Chen* and **Thomas W. Roby**, Department of Mathematics, University of Connecticut (1116-E5-1510)

2:35PM ► (474) *Probability in an Active Learning Environment.*
Mark Daniel Ward, Purdue University, Department of Statistics (1116-E5-2511)

2:55PM ► (475) *Using R Simulation to Encourage Creativity in an Introductory Probability Course.*
Matt Roscoe and **David Patterson***, University of Montana (1116-E5-2625)

3:15PM ► (476) *A Study in Using Computer Programming to Simulate Classic Probability Problems.* Preliminary report.
David P Ely, The Ohio State University (1116-E5-2738)

3:35PM ► (477) *Probability projects with multiple motives.*
Ryan Gantner, Saint John Fisher College (1116-E5-992)

3:55PM (478) *Developing an undergraduate stochastic processes course.*
Jonathon Peterson, Purdue University (1116-E5-2512)

MAA Session on Innovative Targeted Solutions in Teaching Introductory Statistics, I

2:15 PM – 5:50 PM **Yakima 1, Yakima Level One, Washington State Conference Center**

Organizers: **Patti Frazer Lock**, St. Lawrence University
Randall Pruim, Calvin College
Sue Schou, Idaho State University

2:15PM ► (479) *Data-free Visualizations: A Project in the First Week of Introductory Statistics?* Preliminary report.
K. Scott Alberts, Truman State University (1116-H5-1188)

2:35PM ► (480) *Lies, Popcorn, Barbie, and the Spelling Bee: Bringing Life into the Statistics Classroom.*
Samuel Luke Tunstall, Michigan State University (1116-H5-218)

2:55PM (481) *Investigating Students' misconceptions about confidence intervals.*
Kumer Pial Das*, **Jasdeep Pannu** and **PJ Couch**, Lamar University (1116-H5-2996)

3:15PM ► (482) *Tailoring Introductory Statistics Assignments to Students' Interests.* Preliminary report.
Sarah L. Marsh, Oklahoma Baptist University (1116-H5-2455)

3:35PM ► (483) *Using a Shared Experiment to Bind the Class Together.*
Amy Wangsness Wehe, Fitchburg State University (1116-H5-1825)

3:55PM ► (484) *SAT and MCAT Data – An Introductory Statistics Research Project for Students in non-STEM fields.*
Bruce Liby and **Kathryn Weld***, Manhattan College (1116-H5-1849)

4:15PM ► (485) *Student Heights and Prediction Intervals.* Preliminary report.
Eleanor S. Farrington, Massachusetts Maritime Academy (1116-H5-2297)

4:35PM (486) *Facebook Consulting: A Semester-Long Project for Introductory Statistics.*
Adam F Childers, Roanoke College (1116-H5-2289)

4:55PM ► (487) *The Misuse of Statistics in Political Campaigns.* Preliminary report.
Tonya S Adkins, Johnson & Wales University - Charlotte (1116-H5-2484)

5:15PM ► (488) *The Mathematical Analysis of Cancer Risk in a Statistics Class.*
Alexander G. Atwood* and **Vera Hu-Hyneman**, SUNY Suffolk County Community College (1116-H5-2628)

5:35PM ► (489) *Flipping Coins to Normal Distribution.* Preliminary report.
Annela R Kelly, Bridgewater State University (1116-H5-2603)

MAA Session on Mathematics and the Arts, II

2:15 PM – 5:50 PM **Room 2B, Washington State Convention Center**

Organizer: **Douglas Norton**, Villanova University

2:15PM ► (490) *On the Artistic Aspects of Magic Squares.* Preliminary report.
Hossein Behforooz, Mathematics Department, Utica College, Utica, New York (1116-K6-1182)

2:35PM ► (491) *Dante the Mathematician.*
Seth I Zimmerman, Bellingham, WA (1116-K6-73)

2:55PM ► (492) *Nevermore: Mathematics of 'The Raven'.*
Randall E Cone, Salisbury University (1116-K5-564)

3:15PM ► (493) *Hypernom.*
Vi Hart, **Andrea Hawksley**, Communications Design Group, SAP Labs, **Henry Segerman***, Department of Mathematics, Oklahoma State University, and **Marc ten Bosch**, MTB Design Works, Inc. (1116-K5-986)

3:35PM ► (494) *Polyhedral Painting in WebGL with Group Averaging.*
Frank A Farris* and **Ryan Tsao**, Santa Clara University (1116-K6-1960)

3:55PM ► (495) *Catalan Connections.* Preliminary report.
Margaret Kepner, Washington, DC (1116-K5-1580)

4:15PM ► (496) *Application of Doily Design to Hyperbolic Crochet.* Preliminary report.
Heidi Burgiel, Bridgewater State University (1116-K5-1916)

4:35PM ► (497) *Phylogenetic Analysis of the Ancient Greek Paeonic Rhythmic Forms.* Preliminary report.
Godfried T. Toussaint, Department of Computer Science, New York University Abu Dhabi (1116-K5-334)

4:55PM ► (498) *Change Ringing, Dance and Memory: An Embodied Learning Approach to Abstract Algebra.*
Gareth E Roberts, College of the Holy Cross (1116-K5-2541)

5:15PM ► (499) *Using art to present mathematics in a freshman general education math course for non-STEM majors.*
John W Watson, Arkansas Tech University (1116-K5-94)

5:35PM (500) *Pythagorean Women, Symphony of Science.*
Rosanna Iembo*, University of Calabria, Italy, and **Irene Iaccarino**, High School of Music, Crotone, Italy (1116-K6-685)

MAA Session on Professional Development for Mathematicians: A Session for MAA PREP Organizers and Participants

2:15 PM – 5:10 PM **Room 620, Washington State Convention Center**

Organizers: **Jon Scott**, Montgomery College
Barbara Edwards, Oregon State University
Nancy Hastings, Dickinson College
Stan Yoshinobu, Cal Poly San Luis Obispo

3:15PM (501) *A MAA PREP workshop on Preparing Departmental Reviewers.*
Betsy G Yanik, Emporia State University (1116-N5-547)

3:35PM ► (502) *A Tale of Two Workshops.*
Tevian Dray*, Oregon State University, and **Corinne A. Manogue**, Oregon State University (Physics) (1116-N5-1443)

3:55PM (503) *You should try running an online workshop!*
John Travis*, Mississippi College, and **Karl-Dieter Crisman**, Gordon College (1116-N5-1743)

4:15PM (504) *Setting a Pace for Success in Faculty Development.*
Karen Bliss* and **Jessica Libertini**, Virginia Military Institute (1116-N5-2493)

4:35PM ► (505) *Using the MAA PREP Program to Enhance Teaching and Research.*
Qiang Shi, Emporia State University (1116-N5-1499)

4:55PM ► (506) *The Inquiry-Based Learning Workshop Model for Professional Development.*
Stan Yoshinobu*, Cal Poly San Luis Obispo, and **Matthew G Jones**, Cal State Dominguez Hills (1116-N5-2813)

MAA Session on Quantitative Literacy in the K–16 Curriculum

2:15 PM – 4:50 PM **Room 619, Washington State Convention Center**

Organizers: **Aaron Montgomery**, Central Washington University
Gary Franchy, Southwestern Michigan College
Gizem Karaali, Pomona College
Andrew Miller, Belmont University
Victor Piercey, Ferris State University

2:15PM (507) *Statistical Visualization Applets for the Collegiate QL Course.*
Lindsay Orlando*, **Mary Parker**, Austin Community College, and **Hunter Ellinger**, Austin, TX (1116-P5-1937)

2:35PM ► (508) *From quantitative literacy to basic modeling in a summer bridge program.*
Ksenija Simic-Muller, Pacific Lutheran University (1116-P5-795)

2:55PM ► (509) *Personal Finance as a Practical Approach to Mathematical Literacy in College.*
Thomas E. Leathrum, Jacksonville State Univ. (1116-P5-1178)

3:15PM (510) *From the Algebra Project to the Common Core: Quantitative Literacy and Social Justice.*
Kira Hylton Hamman, Penn State Mont Alto (1116-P5-1150)

3:35PM ► (511) *Enhancing Students' Quantitative Literacy and Reasoning Skills in Statistical Thinking by Projects.* Preliminary report.
Lina Wu*, Borough of Manhattan Community College-The City University of New York, and **Wenyi Lu**, CUNY Graduate Center (1116-P5-1104)

3:55PM (512) *The Development of Quantitative Literacy (QL) in College Students.*
Olaseni T. Fadipe, Central Michigan University (1116-P5-485)

MAA Session on Topics and Techniques for Teaching Real Analysis

2:15 PM – 5:10 PM **Room 618, Washington State Convention Center**

Organizers: **Erik Talvila**, University of the Fraser Valley
Paul Musial, Chicago State University
Robert Vallin, Lamar University
James Peterson, Alma College

2:15PM ► (513) *A bounded derivative that is not Riemann integrable.*
Russell A. Gordon, Whitman College (1116-S5-119)

2:35PM ► (514) *An Alternative Path Towards Delta-Epsilon Proofs.*
Suzanne M. Seager, Mount Saint Vincent University (1116-S5-966)

2:55PM ► (515) *Integration and local maximal functions.*
Peter A. Loeb, Dept. of Math, University of Illinois, Champaign-Urbana (1116-S5-1045)

3:15PM ► (516) *Further variations on the theme of completeness.* Preliminary report.
Robert Kantrowitz*, Hamilton College, and **Michael M. Neumann**, Mississippi State University (1116-S5-1340)

3:35PM ► (517) *Assessment of Student Learning in the Age of the Internet.*
Paul Martin Musial, Chicago State University (1116-S5-2519)

3:55PM (518) *Differentiating a cross-listed introductory Real Analysis course.*
Antonia E. Cardwell, Millersville University of Pennsylvania (1116-S5-1487)

4:15PM ► (519) *Pósaâ\s Discovery method in Real Analysis.*
Judit Kardos, The College of New Jersey (1116-S5-1527)

4:35PM ► (520) *The Lebesgue Integral for Undergraduates.*
William W. Johnston, Butler University (1116-S5-1728)

4:55PM ► (521) *Continuous functions in the extended real plane.* Preliminary report.
Erik Talvila, University of the Fraser Valley (1116-S5-1464)

MAA Session on the Scholarship of Teaching and Learning in Collegiate Mathematics, II

2:15 PM – 5:50 PM **Room 2A, Washington State Convention Center**

Organizers: **Jacqueline Dewar**, Loyola Marymount University
Thomas Banchoff, Brown University
Curtis Bennett, Loyola Marymount University
Pam Crawford, Jacksonville University
Edwin Herman, University of Wisconsin-Stevens Point

2:15PM ► (522) *Flipping the Discrete Mathematics Classroom with Interactive e-Textbooks.* Preliminary report.
Pangyen B Weng, Metropolitan State University (1116-R5-36)

2:35PM (523) *Engaged Learning Through Writing: A Faculty Development Project.*
Hilary T Freeman* and **Mary E Pilgrim**, Colorado State University (1116-R5-161)

2:55PM ► (524) *Investigating Student Learning Gains from Guided-Inquiry Activities in a Flipped Calculus I Course.* Preliminary report.
Cassie Williams* and **John (Zig) Siegfried**, James Madison University (1116-R5-1858)

3:15PM ► (525) *Increasing Student Engagement in Learning Calculus Through PBL, Oral Assessments, and Writing.*
Jessica Gehrtz* and **Mary E. Pilgrim**, Colorado State University (1116-R5-370)

3:35PM ► (526) *Calculus activities to enhance student understanding.* Preliminary report.
Janet Sharp and **Jennifer D. Wagner***, Washburn University (1116-R5-502)

3:55PM ► (527) *Do students learn from their mistakes?*
Ioannis Souldatos, University of Detroit Mercy (1116-R5-625)

4:15PM ► (528) *Flipped learning in college algebra increases student learning but decreases student satisfaction.*
Jenna R. Van Sickle, Cleveland State University (1116-R5-660)

4:35PM ► (529) *Assessing a summer preparatory workshop for mathematics transfer students.* Preliminary report.
Julie Bergner, University of California, Riverside (1116-R5-981)

4:55PM ► (530) *Assessment of Mathematical Reasoning Outcomes in a Mathematics Course for Liberal Arts Students.* Preliminary report.
Vesna Kilibarda, Indiana University Northwest (1116-R5-1029)

5:15PM (531) *How Harry Potter and The Walking Dead Changed Student's Performance in Calculus.* Preliminary report.
Janine E. Janoski*, King's College, and **Whitney George**, University of Wisconsin-La Crosse (1116-R5-1200)

5:35PM ► (532) *Direct Embodiment in Differential Calculus.* Preliminary report.
Andrea Young* and **Kathryn Bruhns**, Ripon College (1116-R5-1730)

MAA General Contributed Paper Session on Applied Mathematics, I

2:15 PM – 5:10 PM **Room 214, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

2:00PM (533) *Application of Wasserstein distance to biological systems.*
Shane Lubold, Arizona State University (1116-VC-2972)

2:15PM ► (534) *Advanced study of wave propagation in dynamic materials.* Preliminary report. **Mihhail Berezovski**, Embry-Riddle Aeronautical University (1116-VC-2530)

2:30PM (535) *Applications of Adaptive Guaranteed Cubatures.* **Lluis Antoni Jimenez Rugama**, Illinois Institute of Technology (1116-VC-1033)

2:45PM ► (536) *Conditions for positive solutions to the general elliptic model.* **Timothy E Robertson**, Andrews University (1116-VC-1159)

3:00PM (537) *Applications of the Pfaffain technique to (3+1)-dimensional soliton equations of KP type.* **Alrazi M Abdeljabbar**, The Petroleum Institute (1116-VC-1290)

3:15PM ► (538) *Obstructions to Convexity in Neural Codes.* **Caitlin R. Lienkaemper**, Harvey Mudd College (1116-VC-1466)

3:30PM ► (539) *Analyzing Multistationarity in Chemical Reaction Networks using the Determinant Optimization Method.* **Zev Woodstock***, James Madison University, **Bryan Félix**, University of Texas at Austin, and **Anne Shiu**, Texas A&M University (1116-VC-1772)

3:45PM ► (540) *Mathematics and Compressed Sensing.* Preliminary report. **Ghanshyam Bhatt**, Tennessee State University (1116-VC-1564)

4:00PM ► (541) *Sperm pairing and measures of efficiency in planar swimming models.* **Owen Michael Richfield***, **Paul Cripe**, Tulane University, and **Julie Simons**, California Maritime Academy (1116-VC-1579)

4:15PM ► (542) *Pseudo 3D Color Barcode based on Pseudo Quantum Signal in M-band Wavelet Domain.* **Hieu Q Nguyen*** and **Xiaodi Wang**, Western Connecticut State University (1116-VC-1598)

4:30PM ► (543) *Better Initial Conditions for Homogeneous Self-Assembly Problems.* **Jason Karl Davis*** and **Suzanne S Sindi**, University of California, Merced (1116-VC-1600)

4:45PM ► (544) *A Modified Energy Based Swing-up Controller for an Inverted Pendulum on a Cart.* **Emese Kennedy**, Muhlenberg College (1116-VC-1657)

5:00PM ► (545) *Multiplicative Modelling of Four-Phase Microbial Growth.* **Maria Jesus Munoz Lopez***, Trinity College Dublin, **Maureen P Edwards**, University of Wollongong, **Ulrike Schuman**, CSIRO Plant Industry, and **Robert S Anderssen**, CSIRO Digital Productivity (1116-VC-1734)

MAA General Contributed Paper Session on Interdisciplinary Topics in Mathematics, I

2:15 PM – 5:25 PM **Room 304, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University

Bem Cayco, San Jose State University

Timothy Comar, Benedictine University

T. James Reid, University of Mississippi

2:15PM ► (546) *The social benefits of private infectious disease-risk mitigation.* **Benjamin Morin***, **Charles Perrings**, **Ann Kinzig**, Arizona State University, and **Simon Levin**, Princeton University (1116-VH-169)

2:30PM ► (547) *A numerical method to explain how colors are categorized.* Preliminary report. **Nicole A. Fider*** and **Natalia Komarova**, University of California, Irvine (1116-VH-1090)

2:45PM ► (548) *Cake cutting, cartography, and flows along barriers.* **Arnold Yim**, Purdue University (1116-VH-1753)

3:00PM ► (549) *Towards developing intercultural competence with interdisciplinary topics in mathematics.* **Kyle Evans***, University of Connecticut, **Christopher R Bennet**, Sacred Heart University, **Megan E Brunner**, SUNY Geneseo, and **Fabiana Cardetti**, University of Connecticut (1116-VH-1828)

3:15PM ► (550) *Math and Study Abroad: Two Examples from a London Semester Program.* **Alison M. Marr*** and **Fumiko Futamura**, Southwestern University (1116-VH-1844)

3:30PM ► (551) *Removing ocular artifact from electroencephalogram data utilizing eye-tracking technology.* Preliminary report. **Christopher J Hanson**, **Matthew R Hayden** and **Rachel G Kaale***, Simpson College (1116-VH-1941)

3:45PM ► (552) *Mobius Transformations: The Orbits of Various Mobius Mappings.* Preliminary report. **Carter G. Murray**, Northern Michigan University (1116-VH-2327)

4:00PM ► (553) *A Mathematical Model for Alzheimer Disease and its Treatment Based on the anti-aggregation inhibitors drugs.* Preliminary report. **Shantia Yarahmadian***, **Leonard Richard Young**, Mississippi State University, and **Meisam Sharify**, Isfahan University of Technology (1116-VH-2410)

4:15PM ► (554) *Wave Propagation through a Fractal Medium.*
Lee Fisher*, Appalachian State University, **Edith Aromando**, University of New Hampshire, **Loren Anderson**, North Dakota State University, and **Ulysses A Andrews**, University of Connecticut (1116-VH-2412)

4:30PM ► (555) *Mobius Photoshop: Transformations through Pictures.* Preliminary report.
Joseph D. Paulson* and **Josh Thompson**, Northern Michigan University (1116-VH-2441)

4:45PM ► (556) *Grandma Sells Granola?*
Howsikan Kugathasan* and **Qingxia Li**, Fisk University (1116-VH-2467)

5:00PM (557) *Swimming Speeds of Filaments in Viscous Fluids with Resistance.*
Nguyenho Ho* and **Sarah Olson**, Worcester Polytechnic Institute (1116-VH-2504)

5:15PM ► (558) *Fuzzy systems as mathematical models for detective reasoning.* Preliminary report.
Barnabas Bede, DigiPen Institute of Technology (1116-VH-2589)

MAA General Contributed Paper Session on Number Theory, I

2:15 PM – 5:40 PM **Room 212, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

2:15PM ► (559) *Counting Artin representations with bounded conductor.*
Joshua Zelinsky, University of Maine (1116-VN-1410)

2:30PM ► (560) *Special Numbers in the Ring $\mathbb{Z}_n$.*
Samuel Gross, Noblis, Inc., and **Joshua Harrington***, Cedar Crest College (1116-VN-1421)

2:45PM ► (561) *Subgroups of Cyclic Groups and Values of the Riemann Zeta Function.*
Dominic Lanphier* and **Mahannah El-Farrah**, Western Kentucky University (1116-VN-1591)

3:00PM ► (562) *Predicting the Sequence of Non-Truncated Tetrahedron Numbers.*
Jeremy Newton, Lee University (1116-VN-1647)

3:15PM ► (563) *Conjugacy classes in $\mathrm{GSp}_6(\mathbb{F}_q)$ and an application to abelian varieties.* Preliminary report.
Jonathan Gerhard, James Madison University (1116-VN-1873)

3:30PM (564) *Enumerating the Partitions of the Göllnitz–Gordon Theorem.* Preliminary report.
Nicolas Allen Smoot, Georgia Southern University (1116-VN-1875)

3:45PM ► (565) *A Notorious Problem in Silverman's A Friendly Introduction to Number Theory*. Preliminary report.
Mits Kobayashi, Cal Poly Pomona (1116-VN-1930)

4:00PM (566) *Elliptic curves with maximally disjoint division fields.*
Harris B. Daniels, Amherst College, **Jeffrey Hatley**, Union College, and **James Ricci***, Daemen College (1116-VN-1965)

4:15PM ► (567) *Quadratic Prime-Generating Polynomials Over $\mathbb{Z}[i]$.*
Frank Fuentes, Seattle University, and **Monta Meirose***, Morningside College (1116-VN-2002)

4:30PM (568) *Iwasawa λ-invariants of p-adic product measures.* Preliminary report.
Scott Zinzer, West Virginia Wesleyan College (1116-VN-2028)

4:45PM ► (569) *On the distribution of discriminants over a finite field.*
Jonathan Douglas Chan*, **Soonho Kwon**, Princeton University, and **Michael Seaman**, California Institute of Technology (1116-VN-2053)

5:00PM (570) *A function-field analogue of Conway's topograph.*
Michael Wijaya, Loomis Chaffee School (1116-VN-2190)

5:15PM ► (571) *Maximizing the Number of Lattice Points on a Strictly Convex Curve.*
Brandon Rafal Epstein, MIT at Research Science Institute (RSI) (1116-VN-2214)

5:30PM (572) *Certain number fields with an explicit integral basis.* Preliminary report.
Qingquan Wu, Texas A&M International University (1116-VN-996)

MAA General Contributed Paper Session on Probability and Statistics, I

2:15 PM – 5:40 PM **Room 213, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

2:30PM ► (573) *Generating Various Integral Representations of Beta and Gamma Functions and Their Individual Products.* **Khairul Islam**, Texas A&M University-Kingsville, and **Mian Arif Shams Adnan***, Ball State University (1116-VP-2711)

2:45PM ► (574) *Using Poker to Motivate Conditional Probability.* **Ashley S Johnson**, University of North Alabama (1116-VP-2514)

3:00PM ► (575) *Tossing a Coin and Characteristics Assessment in R.* **Khairul Islam**, Texas A&M University-Kingsville (1116-VP-793)

3:15PM ► (576) *Survival Analysis Dimension Reduction Techniques: A Comparison of Select Methods.* **Ivan Rodriguez***, The University of Arizona, and **Claressa L. Ullmayer**, The University of Alaska, Fairbanks (1116-VP-714)

3:30PM (577) *Bayesian Nonparametric Multivariate EWMA Control Chart for Process Changepoint Detection.* **Mingwei Sun***, **Yuhui Chen**, University of Alabama, and **Timothy Hanson**, University of South Carolina (1116-VP-1002)

3:45PM (578) *Rosner's Mathematical Model of Ovarian Cancer and it Generalization.* Preliminary report. **Mehdi Razzaghi**, Bloomsburg University (1116-VP-1027)

4:00PM (579) *A Bayesian Test of Independence in a Two-way Contingency Table with Covariates under Cluster Sampling.* **Dilli Bhatta***, University of South Carolina Upstate, and **Balgobin Nandram**, Worcester Polytechnic Institute (1116-VP-1097)

4:15PM (580) *Rank Based Group Variable Selection.* **Brice Merlin Nguelifack***, United Stated Naval Academy, and **Guy-Vanie Miakonkana**, Travelers (1116-VP-1180)

4:30PM (581) *Attention Deficit Hyperactivity Disorder (ADHD) – a statistical analysis of incidence in Texas and other states.* **Miguel A Cerna**, The University of Texas Rio Grande Valley (1116-VP-1325)

4:45PM ► (582) *Using Minitab to Demonstrate the Central Limit Theorem (CLT).* **Howard Troughton**, Babson College (1116-VP-1360)

5:00PM ► (583) *Intrinsic Volumes of Random Cubical Complexes.* **Matthew L Wright**, St. Olaf College (1116-VP-1425)

5:15PM ► (584) *Bayesian age-stratified joinpoint regression model: an application to lung and brain cancer mortality.* **Netra Khanal**, The University of Tampa (1116-VP-1706)

5:30PM ► (585) *A Few Game Examples from Win, Lose, or Draw an Analytic Reasoning Course.* **Karen M Holmes**, Butler University (1116-VP-524)

MAA General Contributed Paper Session on Teaching and Learning Calculus, I

2:15 PM – 5:40 PM **Yakima 2, Yakima Level One, Washington State Conference Center**

Organizers: **Bem Cayco**, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

Moderator: **Jennifer E. Beineke**, Western New England University

2:15PM ► (586) *Enhancing the Instruction of Multivariable Calculus using Dynamic Visualizations.* Preliminary report. **Richard G Chandler**, University of Texas at Arlington (1116-VR-1393)

2:30PM ► (587) *Teaching Calculus Through "Astronomical" Mistakes.* Preliminary report. **Jesse W Johnson**, Westfield State University (1116-VR-2758)

2:45PM ► (588) *Innovative and Alternate Methods to Chain Rules.* Preliminary report. **Ram Verma**, International Publications (1116-VR-34)

3:00PM (589) *Calculus and structures.* **Jay M. Kappraff**, New Jersey Institute of Technology (1116-VR-310)

3:15PM ► (590) *Mathematics and art meet at a beautiful bridge - a calculus problem derived.* **Jian He***, Northeastern University, China, and **Aihua Li**, Montclair State University (1116-VR-2962)

3:30PM (591) *Inquiry-based learning activities in multivariable calculus.* **Younggon Bae**, Michigan State University (1116-VR-1815)

4:00PM ► (592) *The Unsung Heroes of Calculus: Mathematicians Before and After Newton and Leibniz.* **Paul Sisson*** and **Tibor Szarvas**, Louisiana State University in Shreveport (1116-VR-1263)

4:15PM ► (593) *Teaching Calculus in the 21st Century.* Preliminary report. **J.C. Price**, Georgia Gwinnett College (1116-VR-1710)

4:30PM ► (594) *Not ready for calculus? What we've tried....* Preliminary report. **Ian Pierce**, United States Air Force Academy (1116-VR-1996)

4:45PM ► (595) *Calculus Instructors' Reported Use of Technology to Teach Approximation Concepts in First-Year Calculus Courses.* **Nicholas Gorgievski***, Nichols College, **Kimberly S. Sofronas**, Emmanuel College, **Thomas C. DeFranco**, **Hariharan Swaminathan**, **Charles I. Vinsonhaler**, University of Connecticut, and **Samantha A. MacMillan**, Nichols College (1116-VR-2369)

5:00PM ► (596) *An application of 3D printing in Calculus 3.* **Matthew J Haines**, Augsburg College (1116-VR-2396)

5:15PM ► (597) *The impact of Calculus students' understanding of quotient on their understanding of rate of change functions.* **Cameron O'Neill Byerley**, Arizona State University (1116-VR-2402)

5:30PM ► (598) *On a misconception about alternative definition of the logarithmic function in Calculus.* **Alexander Y. Vaninsky**, City University of New York/Hostos Community College (1116-VR-74)

SIAM Minisymposium on Inverse Problems and Applications, I

2:15 PM – 6:00 PM **Room 3A, Washington State Convention Center**

Organizer: **Gunther Uhlmann**, University of Washington

2:15PM ► (599) *Recovering a quantum network from input-output amplitude measurements.* Preliminary report. **F Alberto Grunbaum**, Math Dept UC Berkeley (1116-81-763)

2:45PM (600) *Distribution of phase shifts in semi-classical potential scattering.* **Jesse Gell-Redman**, Johns Hopkins University, **Andrew Hassell**, ANU, Canberra, Australia, and **Steve Zelditch***, Northwestern University (1116-35-860)

3:15PM (601) *On Uniqueness of an Inverse problem for the Time-Harmonic Maxwell Equations.* **Ting Zhou**, Department of Mathematics, Northeastern University (1116-35-1506)

3:45PM (602) *Array Imaging with Sparsity Promoting Optimization Methods.* **ilker Kocyigit*** and **Liliana Borcea**, University of Michigan (1116-00-2620)

4:15PM (603) *Thermoacoustic Tomography in Bounded Domains.* **Yang Yang**, Purdue University (1116-35-1411)

4:45PM (604) *Increasing stability in inverse problems.* **Ru-Yu Lai**, School of Mathematics, University of Minnesota (1116-35-1739)

5:15PM (605) *Super-resolution in Imaging High Contrast Targets from the Perspective of Scattering Coefficients.* **Yat Tin Chow**, Department of Mathematics, University of California, Los Angeles (1116-35-1224)

5:45PM (606) *The Scattering Relation on Asymptotically Hyperbolic Manifolds.* **Antônio Sá Barreto**, Department of Mathematics, Purdue University, and **Yiran Wang***, Jockey Club Institute for Advanced Study, The Hong Kong University of Science and Technology (1116-58-1707)

Project NExT-Young Mathematicians' Network- Poster Session

2:15 PM – 4:15 PM **Hall 4F, 4th Floor, Washington State Convention Center**

Organizers: **Thomas Wakefield**, Youngstown State University
Jonathan Needleman, LeMoyne College

MAA Panel Discussion

2:15 PM – 3:35 PM **Room 609, Washington State Convention Center**

Developing the MAA Pedagogy Guide.

Organizer: **Martha Abell**, Georgia Southern University

Panelists: **Jacqueline Dewar**, Loyola Marymount University
Gavin LaRose, University of Michigan
Carol Schumacher, Kenyon College
Lew Ludwig, Denison University
Diana White, University of Colorado Denver

MAA Workshop

2:15 PM – 3:35 PM **Room 612, Washington State Convention Center**

The enjoyment of employment: finding the right organizational culture.

Organizer: **Douglas Kalish**, University of California Berkeley

Association for Women in Mathematics Panel Discussion

2:15 PM – 3:40 PM **Room 611, Washington State Convention Center**

Research collaboration conferences for women: who, what, where, when, why, and how?

Organizer: **Michelle Manes**, University of Hawaii at Manoa

Moderator: **Michelle Manes**, University of Hawaii at Manoa

Panelists: **Maria Basterra**, University of New Hampshire

Susanne Brenner, Louisiana State University

Ellen Eischen, University of Oregon

Kristin Lauter, Microsoft Research

Kathryn Leonard, Channel Islands

Ami Radunskaya, Pomona College

MAA Invited Address

3:20 PM – 4:10 PM **Ballroom 6BC, Washington State Convention Center**

(607) *Mathematics and policy: Strategies for effective advocacy.*
Katherine D. Crowley, Washington and Lee University (1116-A0-18)

Project NExT Session

3:30 PM – 4:45 PM **Room 4C-2, Washington State Convention Center**

Broadening assessment of student learning.

AWM Business Meeting

3:45 PM – 4:15 PM **Room 611, Washington State Convention Center**

MAA Young Mathematicians' Network Panel Discussion

3:50 PM – 5:10 PM **Room 609, Washington State Convention Center**

Finding a thesis topic and advisor.

Organizers: **Nicholas Scoville**, Ursinus College

Emily Cilli-Turner, Salve Regina University

Panelists: **Allison Henrich**, Seattle University

Brooke Shipley, University of Illinois at Chicago

MAA Committee on Professional Development Panel Discussion

3:50 PM – 5:10 PM **Room 612, Washington State Convention Center**

Improving the preparation of graduate students to teach mathematics: An NSF-funded project.

Organizer: **Jessica Deshler**, West Virginia University

Panelists: **Jack Bookman**, Duke University

Robin Gottlieb, Harvard University

Shandy Hauk, WestEd

Sarah Schott, Duke University

Natasha Speer, University of Maine

MAA Section Officers

4:00 PM – 5:00 PM **Willow, 2nd Floor, Sheraton Seattle Hotel**

Chair: **Betty Mayfield**, Hood College

AMS Committee on the Profession Panel Discussion

4:30 PM – 6:00 PM **Room 3B, Washington State Convention Center**

Promoting mathematics to policy makers and the public.

Organizers: **Allan Greenleaf**, University of Rochester

Hal Sadofsky, University of Oregon

Suzanne L. Weekes, Worcester Polytechnic Institute

Panelists: **Jordan Ellenberg**, University of Wisconsin

Kristin Lauter, Microsoft Research

William Massey, Princeton University

Sam Rankin, American Mathematical Society

Reception for Undergraduate Students

4:30 PM – 5:30 PM **Skybridge, 4th Floor, Washington State Convention Center**

MAA Minicourse #3: Part A

4:45 PM – 6:45 PM **Metropolitan B, 3rd Floor, Sheraton Seattle Hotel**

Designing and implementing a problem-based mathematics course.

Presenters: **Gail Burrill**, Michigan State University

Bowen Kerins, Educational Development Center

Darryl Young, Harvey Mudd College

MAA Minicourse #16: Part A

4:45 PM – 6:45 PM **Metropolitan A, 3rd Floor, Sheraton Seattle Hotel**

Mobile mathematics—interactive apps for teaching and learning.

Presenters: **Lila Roberts**, Clayton State University
Andrew G. Bennett, Kansas State University

MAA Minicourse #2: Part A

4:45 PM – 6:45 PM **Tahoma 5, Tahoma Level Three, Washington State Conference Center**

Visual topics in undergraduate complex analysis.

Presenters: **Michael Brilleslyper**, U.S. Air Force Academy
Michael Dorff, Brigham Young University

Radical Dash Kickoff Meeting

5:15 PM – 6:00 PM **Room 608, Washington State Convention Center**

A daily scavenger hunt filled with math challenges and creativity for teams of undergraduates. Individuals are welcome and encouraged to participate;they will be formed into teams.

SIGMAA on the History of Mathematics(HOM SIGMAA)Business Meeting and Reception

5:30 PM – 6:20 PM **Room 607, Washington State Convention Center**

Reception for Graduate Students and First-Time Participants

5:30 PM – 6:30 PM **Grand Ballroom AB, 2nd Floor, Sheraton Seattle Hotel**

SIGMAA on the History of Mathematics (HOM SIGMAA)Guest Lecture

6:30 PM – 7:20 PM **Room 607, Washington State Convention Center**

6:30PM ► (608) *The Antikythera Mechanism: A Masterpiece of Ancient Astronomy, Mechanics, and Mathematical Modeling.*
James Evans, University of Puget Sound (1116-01-1999)

AMS-MAA Special Film Presentation

6:30 PM – 7:50 PM **Ballroom 6BC, Washington State Convention Center**

Navajo Math Circles, produced by MSRI

AMS Josiah Willard Gibbs Lecture

8:30 PM – 9:30 PM **Ballroom 6BC, Washington State Convention Center**

► (609) *Graphs, vectors, and matrices.*
Daniel Alan Spielman, Yale University (1116-15-848)

Thursday, January 7

Joint Meetings Registration

7:30 AM – 4:00 PM **Atrium Lobby, 4th Floor, Washington State Convention Center**

Email Center

7:30 AM – 10:00 PM **Atrium Lobby, 4th Floor, Washington State Convention Center**

AMS-MAA Special Session on the History of Mathematics, II

8:00 AM – 11:20 AM **Tahoma 3, Tahoma Level Three, Washington State Conference Center**

Organizers: **Patti Hunter**, Westmont College
Adrian Rice, Randolph-Macon College
Sloan Despeaux, Western Carolina University
Deborah Kent, Drake University

8:00AM (610) *The Construction of Edmond Halley's 1701 Map of Magnetic Declination.*
David R Bellhouse* and **Lori L Murray**, University of Western Ontario (1116-01-314)

8:30AM ► (611) *The inner imagination without sensory media: Jakob Steiner and the figure in geometry.*
Jemma Lorenat, Pitzer College (1116-01-349)

9:00AM ► (612) *Cauchy's Work on Complex Analysis in the 1820s.* Preliminary report.
Craig Fraser, University of Toronto (1116-01-1145)

9:30AM ► (613) *Riemann's Model of Nobili's Rings.*
Tom Archibald, Dept. of Mathematics, Simon Fraser University (1116-01-257)

10:00AM (614) *Quadratic forms, Fermat's Last Theorem and Bernoulli numbers from Cauchy to Kummer (1830-1850).*
Jenny Boucard, Centre François Viète, Université de Nantes (1116-01-720)

10:30AM ► (615) *Determining the Discriminant.* Preliminary report.
Fernando Q Gouvêa*, Colby College, and **Jonathan Webster**, Butler University (1116-01-1128)

11:00AM ► (616) *Some remarks on Dedekind and Weber's edition of Riemann's Gesammelte Werke.* **Emmylou Haffner**, Archives Henri Poincare, Universite de Lorraine (1116-01-599)

AMS Special Session on Advances in Free Analysis: the Theory and Applications of Noncommutative Functions, Inequalities, and Domains, I

8:00 AM – 11:50 AM **Room 400, Washington State Convention Center**

Organizers: **Joseph A. Ball**, Virginia Polytechnic Institute
Paul S. Muhly, University of Iowa, Iowa City

8:00AM (617) *Displacement Theory and W^*-correspondences.* **Rachael M. Norton**, University of Iowa (1116-47-1280)

8:30AM (618) *Morita Equivalence and Hardy Algebras.* **Rene Ardila**, University of Iowa (1116-47-1362)

9:00AM (619) *Monotonicity in free analysis.* **J E Pascoe**, Washington University in St. Louis (1116-47-1661)

10:00AM (620) *Convexity and free analytic functions.* **Ryan K. Tully-Doyle**, Hampton University (1116-46-2795)

11:00AM (621) *B-valued Free Convolution for Unbounded Operators.* **John D. Williams**, Saarland University (1116-47-1672)

AMS Special Session on Analysis, Geometry, and Data

8:00 AM – 11:50 AM **Room 401, Washington State Convention Center**

Organizers: **Kevin R. Vixie**, Washington State University, Pullman
Bala Krishnamoorthy, Washington State University, Vancouver

8:00AM ► (622) *The multi-scale flat norm and applications: an introduction.* **Enrique Alvarado**, Washington State University/Pullman (1116-49-1309)

8:30AM (623) *Flat norm decomposition of integral currents.* **Sharif Ibrahim***, **Bala Krishnamoorthy** and **Kevin R. Vixie**, Washington State University (1116-53-1376)

9:00AM ► (624) *Median shapes and minimal varifolds.* Preliminary report. **Yunfeng Hu***, Washington State University - Pullman, **Bala Krishnamoorthy**, Washington State University - Vancouver, **Altansuren Tumurbaatar** and **Kevin R. Vixie**, Washington State University - Pullman (1116-49-1348)

9:30AM (625) *Local Set Approximation, Psuedo.* **Stephen Lewis**, Seattle, WA (1116-51-2578)

10:00AM (626) *Local Scales.* **Triet M Le**, NGA (1116-35-1389)

10:30AM (627) *Learning Structured Data Representations using Approximation.* **Chinmay Hegde**, Iowa State University (1116-68-1207)

11:00AM ► (628) *Delay-coordinate Mapping in the Presence of Noise: A Stable Takens' Theorem.* **Hanlun Yap**, DSO National Laboratories, **Armin Eftekhari***, **Michael B Wakin**, Colorado School of Mines, and **Christopher J Rozell**, Georgia Institute of Technology (1116-37-1255)

11:30AM (629) *L^∞-Transport and Data-Driven Partitions.* Preliminary report. **Joshua Kaminski**, Dept, of Mathematics, Washington State University, **Alexander Panchenko*** and **Kevin Vixie**, Dept. of Mathematics, Washington State University (1116-28-1350)

AMS Special Session on Big Demand for Big Data: How Do We Create the Big Supply?, II

8:00 AM – 11:50 AM **Room 610, Washington State Convention Center**

Organizers: **Rick Cleary**, Babson College
Xiao-Li Meng, Harvard University

8:00AM ► (630) *Preparing Mathematicians for Big Data Careers: An Industry's Point of View.* **Paul Raff**, Microsoft (1116-62-1663)

9:00AM ► (631) *Show me the data: Using data-enhanced classroom experiences to engage student learning.* **Talithia D. Williams**, Harvey Mudd College (1116-62-1449)

10:00AM (632) *Data Analytics for Non-STEM Majors (in the Age of Big Data).* **Davit Khachatryan***, Assistant Professor of Statistics & Analytics, Babson College, and **Nathan Karst**, Assistant Professor, Babson College (1116-62-850)

11:00AM ► (633) *Statistical Thinking in a Data Science Course.* **Deborah Nolan**, University of California, Berkeley (1116-62-2183)

AMS Special Session on Combinatorial Design Theory, I

8:00 AM – 11:50 AM **Room 310, Washington State Convention Center**

Organizer: **Esther R. Lamken**, San Francisco

8:00AM (634) *The asymptotic existence of $DR(v, k, k-1)$-BIBDs.* **Esther R Lamken**, San Francisco, CA (1116-05-1896)

8:30AM (635) *Design Theory and Extremal Combinatorics.*
Richard Anstee, Mathematics, UBC, Vancouver, BC, Canada (1116-05-2453)

9:00AM (636) *A New Infinite Family of Group Divisible t-Designs with Strength $t \geq 2$ and index λ.*
Hedvig Mohacsy, Arizona State University (1116-05-1544)

9:30AM ► (637) *The Construction and Uses of Heffter Arrays.*
Jeffrey H. Dinitz, Univ. of Vermont (1116-05-944)

10:00AM ► (638) *Designs and dimension.*
Peter J Dukes, University of Victoria (1116-05-1928)

10:30AM (639) *Thickly-Resolvable Block Designs.*
Peter J. Dukes, University of Victoria, **Alan C.H. Ling**, University of Vermont, and **Amanda Malloch***, University of Victoria (1116-05-2516)

11:00AM (640) *Characterisations of Optimal Algebraic Manipulation Detection Codes.*
Douglas R Stinson*, University of Waterloo, and **Maura B Paterson**, Birkbeck, University of London (1116-05-1313)

11:30AM ► (641) *On the rank of matrices with few off-diagonal entries, and combinatorial applications.* Preliminary report.
Richard M Wilson, Caltech (1116-05-2861)

AMS Special Session on Commutative Algebra, I (a Mathematics Research Communities Session)

8:00 AM – 11:50 AM **Skagit 3, Skagit Lower Level, Washington State Conference Center**

Organizers: **Linquan Ma**, University of Utah
Sarah Mayes-Tang, Quest University
Jonathan Montaño, University of Kansas

8:00AM (642) *The Hurwitz form of a projective variety.*
Bernd Sturmfels, UC Berkeley (1116-14-486)

8:30AM (643) *Betti splittings and syzygies of Veronese embeddings of the projective plane.*
Thanh Q Vu, University of Nebraska-Lincoln (1116-13-1301)

9:00AM (644) *Tensor Product surfaces and linear syzygies.*
Eliana M Duarte*, University of Illinois Urbana-Champaign, and **Hal Schenck**, University of Illinois Urbana - Champaign (1116-13-2313)

9:30AM (645) *On the relationship between depth and cohomological dimension.*
Hailong Dao, University of Kansas (1116-13-2627)

10:00AM (646) *Stable local cohomology.*
Peder Thompson, University of Nebraska-Lincoln (1116-13-1430)

10:30AM (647) *Explicit descriptions of F-thresholds.*
Daniel J Hernández*, University of Michigan / University of Kansas, and **Emily E Witt**, University of Kansas (1116-13-2319)

11:00AM (648) *On the bimodule structure of bounded cohomology.*
Luigi Ferraro, University of Nebraska-Lincoln (1116-13-1199)

11:30AM (649) *The geometry of the F-different.*
Omprokash Das, Tata Institute of Fundamental Research, and **Karl Schwede***, University of Utah (1116-13-556)

AMS Special Session on Differential Equations, Probability and Sea Ice, I (a Mathematics Research Communities Session)

8:00 AM – 11:50 AM **Skagit 5, Skagit Lower Level, Washington State Conference Center**

Organizers: **B.Cael Barry**, MIT and Woods Hole Oceanographic Institution
Kaitlin Hill, Northwestern University
Ross Lieb-Lappen, Dartmouth College
Christian Sampson, University of Utah
Alexandria Volkening, Brown University

8:00AM ► (650) *Mathematics of Sea Ice.*
Kenneth M. Golden, Department of Mathematics, University of Utah (1116-35-2340)

9:00AM (651) *Convection in Mushy Sea Ice: Nonlinear Dynamics and Asymptotic Structure.*
Andrew J Wells*, **Joseph R. Hitchen**, Atmospheric, Oceanic & Planetary Physics, University of Oxford, **John S. Wettlaufer**, Dept. of Geology and Geophysics, Yale University, and **Steven A. Orszag**, (Deceased) (1116-76-1761)

9:30AM (652) *From sea ice to water: on the thermodynamic boundary conditions of a solidifying mushy layer with outflow.*
David W Rees Jones*, University of Oxford, and **Grae Worster**, University of Cambridge (1116-76-1898)

10:00AM (653) *Spectral analysis of transport in sea ice.*
N Benjamin Murphy, University of California, Irvine (1116-86-2670)

10:30AM (654) *Spatial scaling of sea ice deformation.*
Jennifer K Hutchings*, Oregon State University, **Andrew Roberts**, Naval Postgraduate School, **Cathleen A Geiger**, University of Delaware, and **Jacqueline Richter-Menge**, Cold Regions Research and Engineering Laboratory (1116-86-1087)

11:00AM (655) *Sea ice dispersion and anomalous diffusion: patterns and paradigms.* **J V Lukovich***, University of Manitoba, Centre for Earth Observation Science, **J K Hutchings**, Oregon State University, College of Earth, Atmospheric and Oceanic Sciences, **K M Golden**, University of Utah, Department of Mathematics, **N B Murphy**, University of California, Irvine, Department of Mathematics, **H Dinh** and **E Fang**, University of Utah, Department of Mathematics (1116-86-1269)

11:30AM ► (656) *The leading mode in an ice-covered ocean wave guide.* Preliminary report. **John V Matthews***, **Boris P Belinskiy**, Department of Mathematics, University of Tennessee at Chattanooga, and **Don B Hinton**, Department of Mathematics, University of Tennessee (1116-49-1940)

AMS Special Session on Financial Mathematics, I (a Mathematics Research Communities Session)

8:00 AM – 11:20 AM **Skagit 4, Skagit Lower Level, Washington State Conference Center**

Organizers: **Triet Pham**, Rutgers University
Wilber A Ventura, University of Texas at Arlington
Kim Weston, Carnegie Mellon University

8:00AM (657) *Robust Dynkin games.* **Song Yao**, University of Pittsburgh (1116-60-758)

8:30AM (658) *Impact of the Carbon Market on Production Emissions.* **Arash Fahim***, Florida State University, and **Nizar Touzi**, Ecole Polytechnique (1116-91-494)

9:00AM ► (659) *Markov Projection of a Stochastic Process.* **Steven E Shreve**, Carnegie Mellon University (1116-60-1426)

10:00AM (660) *A class of approximate Greek weights: high-order schemes and extrapolation techniques.* **Ivo Mihaylov**, Imperial College London (1116-60-1541)

10:30AM (661) *An α-Stable Limit Theorem Under Sublinear Expectation.* **Erhan Bayraktar** and **Alexander Munk***, University of Michigan (1116-60-1513)

11:00AM (662) *On the existence of shadow price processes.* **Junjian Yang**, University of Vienna (1116-91-1551)

AMS Special Session on Fractal Geometry and Dynamical Systems, I

8:00 AM – 11:50 AM **Room 4C-1, Washington State Convention Center**

Organizers: **John Rock**, Cal Poly Pomona
Machiel van Frankenhuijesen, Utah Valley University
Michel L. Lapidus, University of California, Riverside

8:00AM (663) *Extremality and measures from conformal dynamical systems.* **Tushar Das**, University of Wisconsin - La Crosse (1116-11-534)

8:30AM ► (664) *The Box Counting Zeta Functions and Complex Dimensions of Self-Similar Sets Under Certain Separation Conditions.* **Christina G Knox**, University of California, Riverside (1116-00-2606)

9:00AM (665) *Hypergeometric Multifractal Zeta Functions.* Preliminary report. **Essouabri**, Universite Jean Monnet, Saint-Etienne, **Lapidus**, **Scott Roby***, University of California, Riverside, and **Rock**, California State Polytechnic University, Pomona (1116-00-2195)

9:30AM ► (666) *A fractal perturbation of a nanowire.* **Robert G Niemeyer**, University of Maine (1116-37-2073)

10:00AM (667) *Fractal tube formulas for relative fractal drums in arbitrary Euclidean spaces via Lapidus zeta functions.* **Michel L. Lapidus**, University of California, Riverside, **Goran Radunović*** and **Darko Žubrinić**, University of Zagreb, Croatia (1116-28-1235)

10:30AM (668) *Current large deviations in the boundary-driven symmetric simple exclusion process on the Sierpinski gasket.* **Joe P. Chen*** and **Alexander Teplyaev**, Department of Mathematics, University of Connecticut (1116-60-1587)

11:00AM (669) *Time change of Brownian motion: Poincare inequality, heat kernel estimate and protodistance.* **Jun Kigami**, Kyoto University (1116-60-617)

11:30AM (670) *Mandelpinski Structures in the Parameter Planes of Rational Maps.* **Robert L. Devaney**, Boston University (1116-37-301)

AMS Special Session on Graduate Mathematics Courses and Programs for Secondary Mathematics Teachers

8:00 AM – 11:50 AM **Chelan 2, Chelan Level Two, Washington State Conference Center**

Organizers: **James J. Madden**, Louisiana State University, Baton Rouge
James A. Mendoza Epperson, University of Texas, Arlington

8:00AM ► (671) *Loyola Marymount University's Masters of Arts in Teaching Mathematics Program.*
Christina Eubanks-Turner* and **Anna Bargagliotti**, Loyola Marymount University (1116-97-821)

8:30AM ► (672) *Stephen F. Austin State University's Graduate Programs for Secondary Teachers.*
Lesa L Beverly, Stephen F. Austin State University (1116-97-2310)

9:00AM ► (673) *University of Utah Master of Science in Mathematics (Teaching).* Preliminary report.
Emina Alibegovic and **Hugo Rossi***, Mathematics, University of Utah (1116-97-457)

9:30AM (674) *Mathematical knowledge for teaching at the University of Nebraska-Lincoln.* Preliminary report.
Yvonne Lai*, **W. James Lewis** and **Allan Donsig**, University of Nebraska-Lincoln (1116-97-1723)

10:00AM (675) *Graduate Courses in Mathematics for Teachers: The University of Texas at Arlington Master of Arts in Mathematics Program for Secondary Mathematics Teachers.*
James A. Mendoza Epperson* and **Kathryn Rhoads**, The University of Texas at Arlington (1116-97-2858)

10:30AM ► (676) *Portland State University's Masters of Science in Mathematics for Teachers Program.*
Jeanette R Palmiter, Portland State University (1116-97-1141)

11:00AM (677) *Training Teachers of Mathematics in Idaho and Beyond.* Preliminary report.
Jennifer Johnson-Leung*, **Mark Nielsen** and **David Yopp**, University of Idaho (1116-97-2265)

11:30AM ► (678) *The Master of Mathematics program for in-service teachers at Texas Tech University.*
George Brock Williams*, Texas Tech University, and **Jerry F. Dwyer**, George Washington University (1116-97-2675)

AMS Special Session on Knots in Washington (State), I

8:00 AM – 11:50 AM **Room 201, Washington State Convention Center**

Organizers: **Allison Henrich**, Seattle University
Sam Nelson, Claremont McKenna College
Jozef Przytycki, George Washington University
Radmila Sazdanovic, North Carolina State University, Raleigh

8:00AM (679) *On the sl(n) homology theory.* Preliminary report.
Carmen L Caprau, California State University, Fresno (1116-57-1562)

8:30AM (680) *Homological operations on different versions of Khovanov homology.* Preliminary report.
Krzysztof K. Putyra, ETH Zurich, Switzerland, and **Alexander N. Shumakovitch***, The George Washington University (1116-57-2880)

9:00AM (681) *Foams and homology.* Preliminary report.
J. Scott Carter, University of South Alabama (1116-57-1883)

9:30AM ► (682) *Tensor products of quandles and classification of 1-handles.*
Seiichi Kamada, Osaka City University (1116-57-235)

10:00AM (683) *Sequences of quandle extensions and cocycle knot invariants.*
W. Edwin Clark and **Masahico Saito***, University of South Florida (1116-57-1429)

10:30AM ► (684) *Twisted quandles and matrix invariants for oriented links.*
Kanako Oshiro, Sophia University (1116-57-1229)

11:00AM ► (685) *On a coloring function and the necessity of Reidemeister move of type II.*
Kanako Oshiro, Sophia University, **Ayaka Shimizu*** and **Yoshiro Yaguchi**, Gunma National College of Technology (1116-57-1383)

11:30AM (686) *Unital Shelves.* Preliminary report.
Alissa S. Crans, Loyola Marymount University (1116-54-2722)

AMS Special Session on Mathematical Information in the Digital Age of Science, III

8:00 AM – 11:50 AM **Room 603, Washington State Convention Center**

Organizers: **Patrick Ion**, University of Michigan, Ann Arbor
Olaf Teschke, zbMATH, Berlin
Stephen Watt, University of Western Ontario

8:00AM ► (687) *Formal Proof.*
Thomas C Hales, University of Pittsburgh (1116-03-2373)

9:00AM ► (688) *Theorema: A Tool for Formalizing Mathematics.*
Wolfgang Windsteiger* and **Bruno Buchberger**, Research Institute for Symbolic Computation, Johannes Kepler University, A-4040 Linz, Austria (1116-68-2342)

9:30AM (689) *From the nLab to the HoTT Book.*
Michael Shulman, University of San Diego (1116-00-1673)

10:00AM (690) *30 Years of Digitizing Mathematical Knowledge with Maple.*
Edgardo Cheb-Terrab* and **Laurent Bernardin**, Maplesoft (1116-00-2335)

10:30AM ► (691) *Orthogonal Polynomial Seeding for the Digital Repository of Mathematical Formulae.*
Howard S. Cohl*, Applied and Computational Mathematics Division, National National Institute of Standards and Technology, **Moritz Schubotz**, Database Systems and Information Management Group, Technische Universität, **Marjorie A. McClain**, **Bonita V. Saunders**, Applied and Computational Mathematics Division, National Institute of Standards and Technology, **Cherry Y. Zou** and **Azeem S. Mohammed**, Poolesville High School (1116-68-1495)

11:00AM ► (692) *Recent developments in computable mathematical data: Special functions, function spaces, and the semantic representation of mathematics using Mathematica and Wolfram| Alpha.*
Eric W Weisstein* and **Michael Trott**, Wolfram—Alpha (1116-68-1176)

11:30AM (693) *Assembling the World's Mathematical Knowledge.*
Stephen M. Watt, University of Waterloo (1116-68-2021)

AMS Special Session on Parabolic Geometries, Twistor Theory, and the AdS/CFT Correspondence, II

8:00 AM – 11:40 AM **Room 4C-4, Washington State Convention Center**

Organizers: **Jonathan Holland**, University of Pittsburgh
George Sparling, University of Pittsburgh
Daniela Mihai, Carnegie Mellon University

9:00AM (694) *Scalar-flat Kahler ALE metrics on minimal resolutions.*
Michael T. Lock, The University of Texas at Austin (1116-53-183)

10:00AM (695) *Analysis on asymptotically hyperbolic and de Sitter spaces.*
Andras Vasy, Department of Mathematics, Stanford University (1116-35-2671)

11:00AM Discussion.

AMS Special Session on Problems in Geometry and Design of Materials, II

8:00 AM – 11:50 AM **Room 604, Washington State Convention Center**

Organizers: **Marta Lewicka**, University of Pittsburgh
Petronela Radu, University of Nebraska

8:00AM (696) *On ill-posed hyperbolic systems of Euler type.*
Agnieszka Swierczewska-Gwiazda, University of Warsaw (1116-35-1559)

9:00AM (697) *A Massively Parallel Scalable Implicit SPH Solver.*
Nathaniel Trask, **Martin Maxey**, Brown University, **Kyungjoo Kim**, **Mauro Perego**, **Michael L Parks***, Sandia National Laboratories, **Kai Yang**, **Jinchao Xu**, Pennsylvania State University, **Wenxiao Pan** and **Alex Tartakovsky**, Pacific Northwest National Laboratory (1116-35-1665)

9:30AM ► (698) *Dendritic Growth Shapes in Bond-Counting Models.*
Tim Ryan Krumwiede* and **Tim P Schulze**, University of Tennessee (1116-70-1024)

10:00AM ► (699) *The materials science of chemically driven elastic incompatibility: A multi-physics study of lithium ion battery electrode Li1+xT2O4.*
Michael L. Falk*, **Tonghu Jiang**, Johns Hopkins University, **Shiva Rudraraju** and **Krishna Garikipati**, University of Michigan (1116-74-744)

11:00AM (700) *High contrast periodic media: Bloch waves and band gaps.*
Robert P Lipton* and **Robert Viator**, Louisiana State University (1116-78-1413)

11:30AM ► (701) *Diffusion phenomenon and decay rates for nonlocal wave equations with damping.*
Petronela Radu*, University of Nebraska-Lincoln, **Grozdena Todorova**, University of Tennessee-Knoxville, and **Boris Yordanov**, Institute of Mathematics and Informatics, Bulgaria (1116-35-735)

AMS Special Session on Pseudorandomness and Its Applications, II

8:00 AM – 11:40 AM **Room 606, Washington State Convention Center**

Organizers: **Timothy Gowers**, University of Cambridge
Jozsef Solymosi, University of British Columbia

8:00AM (702) *The regularity method and blow-up lemmas for sparse graphs.*
Yoshiharu Kohayakawa, University of Sao Paulo (1116-05-2290)

9:00AM (703) *Directed paths: from Ramsey to Ruzsa and Szemerédi.*
Po-Shen Loh, Carnegie Mellon University (1116-05-2242)

9:30AM (704) *Point configurations in sparse sets.*
Malabika Pramanik, University of British Columbia, Vancouver (1116-42-915)

10:00AM ► (705) *Low-distortion embeddings of graphs with large girth.*
Mikhail I. Ostrovskii, St. John's University (1116-05-939)

11:00AM (706) *Pseudorandom Generators and Derandomization.*
Luca Trevisan, U.C. Berkeley (1116-68-2189)

AMS Special Session on Quantum Walks, Quantum Markov Chains, Quantum Computation and Related Topics, I

8:00 AM – 11:50 AM **Room 602, Washington State Convention Center**

Organizers: **Chaobin Liu**, Bowie State University
Takyua Machida, Japan Sociey for the Promotion of Science
Salvador E. Venegas-Andraca, Technológico de Monterrey, Mexico
Nelson Petulante, Bowie State University

8:00AM (707) *Generalized Gibbs states in Quantum Markov Processes.*
Jaroslav Novotny*, CTU in Prague, Czech Republic, **Gernot Alber**, TU Darmstadt, Germany, and **Igor Jex**, CTU in Prague, Czech Republic (1116-81-1034)

8:30AM ► (708) *Quantum State Transfer in Corona Products.*
Ethan Ackelsberg, Bard College at Simon's Rock, **Zachary Brehm**, SUNY Potsdam, **Ada Chan**, York University, **Joshua Mundinger**, Swarthmore College, and **Christino Tamon***, Clarkson University (1116-05-926)

9:00AM ► (709) *On Nonlinear Quantum Walk.* Preliminary report.
Yutaka Shikano, Institute for Molecular Science, National Institutes of Natural Sciences, Japan (1116-81-86)

9:30AM (710) *Bulk-edge correspondence of one dimensional quantum walks.*
F Alberto Grunbaum, Math Dept UC Berkeley (1116-81-1419)

10:00AM (711) *Hitting times for open quantum random walks.* Preliminary report.
Carlos F. Lardizabal, Federal University of Rio Grande do Sul (1116-81-1485)

10:30AM (712) *Open quantum walk based bias removal algorithms.* Preliminary report.
Radhakrishnan Balu, US Army Resaerch Lab, MD (1116-03-160)

11:00AM (713) *Quantum walks in terms of density operators.* Preliminary report.
Chaobin Liu, Bowie State University (1116-81-2020)

11:30AM Discussion.

AMS Special Session on Research by Postdocs of the Alliance for Diversity in Mathematics, I

8:00 AM – 11:55 AM **Room 4C-3, Washington State Convention Center**

Organizers: **Aloysius Helminck**, North Carolina State University, Raleigh
Michael Young, Iowa State University, Ames

9:00AM (714) *Special subgroups of hyperbolic 3-manifold groups.*
Rosemary K Guzman, University of Illinois at Urbana-Champaign (1116-57-2963)

9:30AM ► (715) *Computing Galois groups for functional equations.*
Carlos E Arreche, North Carolina State University (1116-12-1477)

10:00AM (716) *Schrödinger groups: An application in nonrelativistic quantum squeezing.*
Jose M Vega-Guzman, Howard University (1116-81-910)

10:30AM (717) *Instantons on Taub-NUT Spaces.*
Andres Larrain-Hubach, University of Arizona (1116-58-789)

11:00AM ► (718) *Improving the accuracy of convexity splitting methods for gradient flow equations.*
Saulo Orizaga*, The University of Arizona, and **K. Glasner**, University of Arizona (1116-35-1842)

11:30AM (719) *Hopf automorphisms and twisted extensions.*
Susan Montgomery, University of Southern California, **Maria D. Vega***, United States Military Academy, and **Sarah Witherspoon**, Texas A&M University (1116-16-1912)

AMS Special Session on Topological Graph Theory: Structure and Symmetry, I

8:00 AM – 11:50 AM **Room 204, Washington State Convention Center**

Organizers: **Jonathan L. Gross**, Columbia University
Thomas W. Tucker, Colgate University

8:00AM (720) *Characterizing Almost-planar Graphs.* Preliminary report.
Guoli Ding, **Joshua Fallon** and **Emily Marshall***, Louisiana State University (1116-05-1901)

8:30AM (721) *Quadrilateral embeddings of cartesian products.*
Mark Ellingham*, Vanderbilt University, **Wenzhong Liu**, Nanjing University of Aeronautics and Astronautics, China, **Dong Ye** and **Xiaoya Zha**, Middle Tennessee State University (1116-05-2362)

9:00AM (722) *Dualities and Trialities from Ribbon Group Stabilizers.*
Lowell Abrams*, The George Washington University, and **Jo Ellis-Monaghan**, Saint Michael's College (1116-05-2127)

9:30AM ► (723) *An elementary construction of tessellated Riemann surfaces using finite groups.*
J. Pakianathan*, **M. Herman**, University of Rochester, and **E. Yalcin**, Bilkent University, Turkey. (1116-57-256)

10:00AM (724) *Branched coverings and harmonic automorphisms of graphs.* Preliminary report.
Alexander Mednykh, Sobolev Institute of Mathematics, Novosibirsk State University, Russia (1116-55-379)

10:30AM (725) *Operations on oriented maps.* Preliminary report.
Tomaz Pisanski, University of Primorska, Slovenia (1116-05-2318)

11:00AM (726) *Symmetry breaking in graphs.*
Wilfried Imrich*, Montanuniversitaet Leoben, Austria, **Florian Lehner**, University of Hamburg, Germany, and **Simon Mark Smith**, City University of New York, New York, NY (1116-05-1144)

11:30AM (727) *Infinite Graphical Frobenius Representations.*
Mark E. Watkins, Syracuse University (1116-05-1043)

AMS Special Session on What's New in Group Theory?, II

8:00 AM – 11:50 AM **Rooms 307/308, Washington State Convention Center**

Organizers: **Arturo Magidin**, University of Louisiana at Lafayette

Elizabeth Wilcox, Oswego State University of New York

8:00AM (728) *Real classes of finite special unitary groups.*
Amanda A. Schaeffer Fry*, Metropolitan State University of Denver, and **C. Ryan Vinroot**, College of William and Mary (1116-20-382)

8:30AM ► (729) *Some computational complexity results for right-angled Artin groups.*
David M. Carroll*, **Benjamin Francisco** and **Zoran Sunic**, Texas A&M University (1116-20-629)

9:00AM (730) *Affine Automorphisms of Rooted Trees.* Preliminary report.
Dmytro M Savchuk*, University of South Florida, and **Said N Sidki**, Universidade de Brasilia (1116-20-713)

9:30AM ► (731) *Gyrogroup actions: A generalization of group actions.*
Teerapong Suksumran, North Dakota State University (1116-20-201)

10:00AM (732) *Specht modules, simple modules, and a kernel intersection theorem for centralizer algebras of the symmetric group.* Preliminary report.
Harald Ellers* and **Craig J. Dodge**, Allegheny College (1116-20-1052)

10:30AM (733) *On the number of elements that are not k-th powers in a group.*
William L. Cocke*, Univ of Wisconsin, Madison, **I. Marty Isaacs**, University of Wisconsin, and **D. Skabelund**, University of Illinois (1116-20-328)

11:00AM (734) *Constructions from Groups to Loops.*
Mark Greer and **Lee Raney***, University of North Alabama (1116-20-845)

11:30AM ► (735) *Partition Numbers of Finite Groups.*
Tuval Foguel, Adelphi University (1116-20-173)

AMS Session on Functional Analysis and Operator Theory, II

8:00 AM – 11:25 AM **Room 615, Washington State Convention Center**

8:15AM (736) *Amenability and uniqueness for groupoids associated with inverse semigroups.* Preliminary report.
David Milan* and **Scott LaLonde**, The University of Texas at Tyler (1116-47-2306)

8:30AM (737) *Fixed and common fixed point results of generalized cyclic contraction mappings.*
Urooj Malik, Department of Mathematics, COMSATS Institute of Information Technology, Pakistan (1116-46-1115)

8:45AM (738) *On Noncommutative Levi-Civita Connections.*
Mira A. Peterka, Philadelphia, Pennsylvania, and **Albert Jeu-Liang Sheu***, University of Kansas (1116-46-700)

9:00AM (739) *Infinitely divisible weighted shifts.* Preliminary report.
Chafiq Benhida, University of Lille, **Raul Curto**, University of Iowa, and **George R. Exner***, Bucknell University (1116-47-640)

9:15AM (740) *Fixed and common fixed point results in multiplicative partial metric spaces.*
Qasim Mahmood, Riphah International University, Islamabad, Pakistan (1116-46-1169)

9:30AM (741) *Recent developments in fixed point and Banach space theory.*
Jared Burns, Seton Hill University, **Chris Lennard***, University of Pittsburgh, and **Jeromy Sivek**, Temple University (1116-46-1436)

9:45AM (742) *Bases in the space of regular multilinear operators on Banach lattices.* Preliminary report.
Khazhak Navoyan, University of Mississippi (1116-46-1791)

10:00AM (743) *Expanders and K-theory for group C* algebras.*
Paul Frank Baum, Penn State (1116-19-769)

10:15AM (744) *On locally order unit spaces and characterizations of locally JB-algebras.*
Alexander A Katz, St. John's University, NY (1116-46-1718)

10:30AM (745) *Classification of Crossed Products Arising From Actions on $C(X, A)$.* Preliminary report.
Julian M Buck, Francis Marion University (1116-46-2474)

10:45AM (746) *Uniqueness property of semigroup C^*-algebras.*
Sun Young Jang, Department of Mathematics, University of Ulsan, (1116-46-580)

11:00AM (747) *Application of Functional Operators with Shift to the Study of Equilibrium State of Systems with Two Renewable Resources Taking into Account Their Interactions.*
Oleksandr Karelin*, **Manuel Gonzalez Hernandez**, **Norberto Hernandez Romero** and **Juan Carlos Seck-Tuoh Mora**, Hidalgo State University, Institute of Basic Sciences and Engineering (1116-45-813)

11:15AM (748) *Numerical solution of multilayer multiple acoustic wave scattering by time domain boundary integral equation.*
Tianyu Qiu, University of Delaware (1116-45-2908)

AMS Session on Mathematical Biology and Related Fields, II

8:00 AM – 11:55 AM **Skagit 1, Skagit Lower Level, Washington State Conference Center**

8:00AM (749) *Wave propagation in noisy systems near saddle node on limit cycle bifurcation.* Preliminary report.
M M Rahman, University of North Florida (1116-92-2533)

8:15AM ► (750) *Modeling the impact of coinfection on persistence and infectivity of malaria.*
Lauren M Childs* and **Caroline Buckee**, Harvard T. H. Chan School of Public Health (1116-92-2119)

8:30AM ► (751) *Obtaining Qualitative Properties of Chemical Reaction Networks from Simplified Models.*
Michael Marcondes de Freitas*, **Elisenda Feliu** and **Carsten Wiuf**, Department of Mathematical Sciences, University of Copenhagen (1116-92-2257)

8:45AM ► (752) *A Model of Proton Therapy using Discrete Diffusion.*
Erin N. Bodine*, Rhodes College, and **K. Lars Monia**, Naval Nuclear Power Training Command, U.S. Navy, Charleston, SC (1116-92-1065)

9:00AM ► (753) *Pattern recognition to improve diagnostic process for late-diagnosed late onset MADD patients.*
Beyza Aslan*, University of North Florida, and **Anthony Perszyk**, University of Florida (1116-92-2275)

9:15AM ► (754) *New Results in a Boolean Model of Gene Regulatory Networks.* Preliminary report.
Simon Joyce, Binghamton University (1116-92-2380)

9:30AM ► (755) *Mean field modeling of neural population interactions.*
Caitlin A Kennedy, SUNY New Paltz (1116-92-2471)

9:45AM (756) *Modeling synaptic control of obsessive compulsive behavior.*
Joanna R Herron, SUNY New Paltz (1116-92-2476)

10:00AM (757) *Mathematical Modeling of Androgen Deprivation Therapy for Advanced Prostate Cancer.* Preliminary report.
John G Alford*, **Edward Swim** and **Alacia Voth**, Sam Houston State University (1116-92-2526)

10:15AM ► (758) *Population dynamics for stray cats.*
Jeff Sharpe, University of Central Florida (1116-92-2699)

10:30AM ► (759) *General mathematical models for ecological drivers of poverty.*
Calistus N. Ngonghala*, Harvard Medical School, **Giuleo de Leo**, Stanford University, **Mercedes Pascual**, University of Chicago, **Donald C. Keenan**, Universite de Cergy-Pontoise et THEMA, **Andrew Dobson**, Princeton University, and **Matthew H. Bonds**, Harvard Medical School (1116-34-2927)

10:45AM ► (760) *Will transient spatial dynamics help or hinder species responding to climate change?*
Austin J Phillips, University of Washington, Seattle (1116-92-1911)

11:00AM ► (761) *Analysis of fMRI data using methods from network theory and persistent homology (Preliminary Report).* Preliminary report.
Bernadette J Stolz*, **Heather A Harrington** and **Mason A Porter**, University of Oxford (1116-92-2714)

11:15AM ► (762) *Experimental and Numerical Results for Glioblastoma Multiforme in Murine Brains.* Preliminary report.
Erica M Rutter*, **Tracy L Stepien**, **Barrett A Anderies**, **Eric J Kostelich** and **Yang Kuang**, Arizona State University (1116-92-2794)

11:30AM ► (763) *A stochastic process model for fish migration.*
Sheldon H Lee, Viterbo University (1116-92-2829)

11:45AM (764) *The multi-facet of a data science project to answer: how are organs = formed?*
Bin Yu, UC Berkeley (1116-00-2976)

AMS Session on Number Theory, II

8:00 AM – 11:40 AM **Chelan 5, Chelan Level Two, Washington State Conference Center**

8:00AM (765) *On the degrees of divisors of $x^n - 1$.* **Lola Thompson**, Oberlin College (1116-11-1570)

8:15AM (766) *Deeply Ramified Iterated Extensions.* **Spencer Hamblen***, McDaniel College, and **Rafe Jones**, Carleton College (1116-11-1668)

8:30AM ► (767) *Primefree Shifted Lucas Sequences of the Second Kind.* Preliminary report. **Lenny Jones** and **Tristan Phillips***, Shippensburg University (1116-11-1835)

8:45AM ► (768) *The Fibonacci Quilt Sequence: A Generalization of Zeckendorf Decompositions with Non-Uniqueness.* **Dawn C. Nelson***, Saint Peter's University, **M. Catral**, Xavier University, **P. Ford**, Bethany College, **P. Harris**, United States Military Academy, West Point, and **S. J. Miller**, Williams College (1116-11-2109)

9:00AM (769) *Hypergeometric Point Counts for Dwork K3-Surfaces.* **Heidi E Goodson**, University of Minnesota (1116-11-1174)

9:15AM ► (770) *The Average Order of an Element of the Symmetric Group.* **Joshua Harrington**, Cedar Crest College, **Lenny Jones***, Shippensburg University, and **Alicia Lamarche**, University of South Carolina (1116-11-1836)

9:30AM (771) *The sum of four squares over real quadratic number fields.* **Katherine Thompson**, Davidson College (1116-11-1893)

9:45AM (772) *A hybrid bound for sums of Fourier coefficients of cusp forms against $e(\alpha n^\beta)$.* **Nathan Salazar**, University of Iowa (1116-11-1397)

10:00AM (773) *Rankin's Method and Hermitian Jacobi Forms.* Preliminary report. **James D Martin**, University of North Texas (1116-11-1427)

10:15AM (774) *Divisibility properties of sporadic Apéry-like numbers.* **Amita Malik**, University of Illinois at Urbana-Champaign, and **Armin Straub***, University of South Alabama (1116-11-824)

10:30AM (775) *Fourier Coefficients of Theta Functions at Cusps other than Infinity.* **Joseph Hundley**, University at Buffalo, and **Qiao Zhang***, Texas Christian University (1116-11-1222)

10:45AM (776) *On Hilbert 2-class fields and 2-towers of imaginary quadratic number fields.* **Victor Y. Wang**, Massachusetts Institute of Technology (1116-11-552)

11:00AM (777) *Trinomials defining quintic number fields.* **Jesse Patsolic**, Baltimore, MD, and **Jeremy Rouse***, Wake Forest University (1116-11-906)

11:15AM (778) *Pair Correlation of Fractional Parts Derived from Rational Valued Sequences.* **Sneha Chaubey***, **Melinda Lanius** and **Alexandru Zaharescu**, University of Illinois, Urbana-Champaign (1116-11-924)

11:30AM (779) *Resonance Sums for Rankin-Selberg Products of $SL_m(\mathbb{Z})$ Maass Cusp Forms.* **Kyle J Czarnecki**, University of Iowa (1116-11-1741)

AMS Session on Probability Theory, Stochastic Processes, and Statistics, I

8:00 AM – 11:10 AM **Room 616, Washington State Convention Center**

8:15AM ► (780) *A Pruned Recursive Solution to the Multiple Change Point Problem.* **Eric Ruggieri**, College of the Holy Cross (1116-62-2723)

8:30AM (781) *Sampling random polygonal knot space.* **Jason Cantarella***, University of Georgia, and **Clayton Shonkwiler**, Colorado State University (1116-53-627)

8:45AM (782) *Spatial modeling of crop residue yield potential for the north central region of the USA.* **Mitra Lal Devkota***, Shawnee State University, **Gary D Hatfield** and **Rajesh Chintala**, South Dakota State University (1116-62-1307)

9:00AM (783) *Two-Sample Tests for Latent Recurrent Events: Application to Multiple Sclerosis EDSS Scores.* **Shannon Stock**, College of the Holy Cross (1116-62-2814)

9:15AM (784) *Stochastic Functional Differential Equations with Infinite Delay.* **Hongwei Mei***, ph.d student, **Fuke Wu**, Professor, and **George Yin**, professor (1116-60-157)

9:30AM (785) *Stabilization by Noise of a $\mathbb{C}^2$-valued Coupled System.* **Fan Ny Shum**, University of Connecticut (1116-60-565)

9:45AM ► (786) *The Probability that Two Samples on a Convex Curve Have Disjoint Convex Hulls.* **Yves Nievergelt**, Eastern Washington University (1116-52-148)

10:00AM (787) *Asymptotic enumeration of difference matrices over cyclic groups.* Preliminary report. **Aaron M. Montgomery**, Baldwin Wallace University (1116-05-78)

10:15AM ► (788) *The aggregate path coupling method for mixing times of Markov chains.* **Peter T. Otto**, Willamette University (1116-60-1190)

10:30AM ► (789) *Single-Seed Cascades on Clustered Networks.*
John K. McSweeney, Rose-Hulman Institute of Technology (1116-60-1597)

10:45AM ► (790) *Structure-Based Comparisons for Sequential Data.* Preliminary report.
Katherine M. Kinnaird, Macalester College (1116-62-2510)

11:00AM ► (791) *Boltzmann-Type Modeling of Two-Dimensional Grain Growth in Polycrystals.* Preliminary report.
R. M. Argus, George Mason University (1116-82-2734)

AMS Session on Topology and Knot Theory, III

8:00 AM – 11:25 AM **Chelan 4, Chelan Level Two, Washington State Conference Center**

8:00AM (792) *The Maximum Genus of planar 2-connected graphs and its generalizations.*
Lara El Sherif, George Washington University. (1116-00-2050)

8:15AM (793) *The Topological Complexity of a Surface.*
Aldo Cruz-Cota, Texas Wesleyan University (1116-57-1939)

8:30AM (794) *Positive-definite symplectic four-manifolds.*
Jennifer Hom, IAS/Georgia Tech, and **Tye Lidman***, IAS (1116-57-1369)

8:45AM (795) *Involutive Heegaard Floer homology.*
Kristen Hendricks* and **Ciprian Manolescu**, University of California Los Angeles (1116-57-1958)

9:00AM ► (796) *Using a Set of Monotonically Reducing Moves to Solve the Unknotting Problem.* Preliminary report.
Brian P Foley* and **Michael A Bush**, The College of Wooster (1116-55-1409)

9:15AM ► (797) *Topological Signatures of Singularities in Ricci Flow.*
Paul M. Alsing, Air Force Research Laboratory, **Howard A. Blair**, Syracuse University, **Matthew Corne***, University of Wisconsin-Stout, **Gordon Jones**, University of Michigan, **Warner A. Miller**, Florida Atlantic University, **Konstantin Mischaikow**, Rutgers University, and **Vidit Nanda**, University of Pennsylvania (1116-55-1721)

9:30AM (798) *Decorated Feynman Categories.*
Jason Lucas, Purdue University (1116-55-1859)

9:45AM (799) *Topology of Configurations on Trees.*
Safia Chettih, University of Oregon (1116-55-1970)

10:00AM (800) *Rational structures and their Differential Refinements.* Preliminary report.
Matthew G Wheeler, University of Pittsburgh (1116-55-2099)

10:15AM (801) *Encoding Equivariant Commutativity via Operads.*
David White*, Denison University, and **Javier Gutierrez**, University of Barcelona (1116-55-54)

10:30AM (802) *Free Group Actions on Products of Spheres.*
Courtney M Thatcher, University of Puget Sound (1116-55-2421)

10:45AM (803) *Equivariant formality and K-theory of compact homogeneous spaces.* Preliminary report.
Chi-Kwong Fok*, National Center for Theoretical Sciences Math Division, National Taiwan University, and **Jeffrey Carlson**, Instituto de Matematica e Estatistica, Universidade de Sao Paulo (1116-55-2452)

11:00AM (804) *Virtual Rational Tangles and Conway's Theorem.*
Noureen Khan, University of North Texas at Dallas (1116-55-176)

11:15AM (805) *Naturality of Heegaard Floer invariants under positive rational contact surgery.*
Thomas E Mark and **Bulent Tosun***, University of Virginia (1116-57-697)

MAA Session on Assessing Student Learning: Alternative Approaches, III

8:00 AM – 11:55 AM **Room 608, Washington State Convention Center**

Organizers: **David Clark**, Grand Valley State University
Jane Butterfield, University of Victoria
Robert Campbell, College of St. Benedict/St. John's University
Cassie Williams, James Madison University

8:00AM (806) *Mastery-Based Exams are Self-Evidently Better than Traditional Exams.* Preliminary report.
Austin Mohr, Nebraska Wesleyan University (1116-A5-2788)

8:20AM (807) *"You want to take more exams?": Standards-Based Grading in Calculus 1.* Preliminary report.
David Clark, Grand Valley State University (1116-A5-801)

8:40AM (808) *Specifications Grading in Calculus I: Implementation and Student Responses.* Preliminary report.
Thomas J Clark, Dordt College (1116-A5-770)

9:00AM ► (809) *Using a "Proficiency System" to Assess Student Learning in Calculus.* Preliminary report.
Jacquelyn L Rische, Hobart and William Smith Colleges (1116-A5-543)

9:20AM *Mastery-Based Testing in Calculus.*
► (810) Preliminary report.
J. B. Collins, West Texas A&M University (1116-A5-276)

9:40AM *Can we be a little more specific?: My*
► (811) *experiences with standards-based grading.* Preliminary report.
Timothy E. Goldberg, Lenoir-Rhyne University (1116-A5-1414)

10:00AM *Balancing the Assessment Challenges of*
► (812) *Competency Based Education.*
Heather Leah Rosenblatt, Western Governors University (1116-A5-1166)

10:20AM *A Points-Free Capstone Course.*
(813) Preliminary report.
Matt Boelkins, Grand Valley State University (1116-A5-1874)

10:40AM *Implementing Specifications Grading in a*
► (814) *Linear Algebra course.*
Mike Janssen, Dordt College (1116-A5-189)

11:00AM *Incorporating emails and discussions into*
(815) *weekly assessments.*
John D. Ross, Southwestern University (1116-A5-1963)

11:20AM *Alternative Assessment Approaches in*
► (816) *a "Math for Elementary Teachers" Sequence.* Preliminary report.
Sarah L. Marsh* and **Krista B. Hands**, Oklahoma Baptist University (1116-A5-2346)

11:40AM *Assessing student understanding in an*
(817) *introduction to proofs course.* Preliminary report.
Kristopher J Williams, Doane College (1116-A5-731)

MAA Session on Innovative Approaches to One-Semester Calculus Courses

8:00 AM – 10:15 AM **Room 619, Washington State Convention Center**

Organizers: **Joel Kilty**, Centre College

Alex M. McAllister, Centre College

8:00AM *A Calculus Course Focusing on New*
► (818) *Applications.*
Raymond N. Greenwell*, Hofstra University, and **Nathan P. Ritchey**, Edinboro Universiy (1116-G5-99)

8:20AM *A mathematically rigorous calculus*
► (819) *course in a laboratory format for undergraduate and graduate non-math majors.* Preliminary report.
Patricia Baggett*, Dept of Mathematical Sciences New Mexico State University, and **Andrzej Ehrenfeucht**, Computer Science Dept. University of Colorado (emeritus) (1116-G5-683)

8:40AM *Project/Problem Based Learning as a*
► (820) *Successful Approach to a One-Semester Calculus Course.* Preliminary report.
Tanya Huffman* and **Cara Brooks**, Florida Gulf Coast University (1116-G5-2115)

9:00AM *Quantitative Reasoning and Modeling in*
► (821) *a One-Semester Calculus Course.*
Erin M McNicholas, Willamette University (1116-G5-2218)

9:20AM *Concept Reflection Exercises in Online*
► (822) *and Blended Applied Calculus.*
Chris Oehrlein, Oklahoma City Community College (1116-G5-2292)

9:40AM *An Image Processing Approach to a*
► (823) *One-Semester Calculus Course.*
Yevgeniy V. Galperin, East Stroudsburg University of Pennsylvania (1116-G5-2434)

10:00AM *Yes, You Can Have It All.*
► (824) **Robin A. Cruz*** and **Lynda A. Danielson**, The College of Idaho (1116-G5-2639)

MAA Session on Recreational Mathematics: Puzzles, Card Tricks, Games, Game Shows, and Gambling, I

8:00 AM – 11:55 AM **Room 304, Washington State Convention Center**

Organizers: **Paul R. Coe**, Dominican University

Sara B. Quinn, Dominican University

Marioni Weedermann, Dominican University

10:00AM *Just One More Roll: An Analysis of Farkle*
► (825) *Strategies.*
Benjamin Thirey, United States Military Academy at West Point (1116-Q1-2756)

10:20AM *Waiting for a Sequence in Roulette.*
► (826) **Robert W Vallin**, Lamar University (1116-Q1-1284)

10:40AM *Simple Matching Game or Clever Counter*
► (827) *Trap? The Story of Pell (c. 1977-1982).*
Mark Bollman, Albion College (1116-Q1-174)

11:00AM *Odd or Even: Dominoes, Graphs, and the*
► (828) *"Missing Link.".*
Jay Malmstrom, Oklahoma City Community College (1116-Q1-40)

11:20AM *Fun applications of Abstract Algebra: The*
► (829) *15 Puzzle.*
Dibyajyoti Deb, Oregon Institute of Technology (1116-Q1-615)

11:40AM *The Hidden Mathematics of Super*
► (830) *Tic-Tac-Toe.*
Whitney George*, University of Wisconsin-La Crosse, and **Janine Janoski**, King's College (1116-Q1-1197)

MAA Session on Research in Undergraduate Mathematics Education, I

8:00 AM – 11:55 AM **Room 2B, Washington State Convention Center**

Organizer: **Karen A. Keene**, North Carolina State University

8:00AM ► (831) *Measuring student conceptual understanding: The case of Euler's method.*
William L Hall*, **Karen A Keene** and **Nicholas C Fortune**, North Carolina State University (1116-Q5-2395)

8:20AM ► (832) *Interpreting proof feedback: Do our students know what we're saying?*
Robert Moore, Andrews University, **Martha Byrne***, Earlham College, **Tim Fukawa-Connelly**, Drexel University, and **Sarah Hanusch**, Texas State University (1116-Q5-711)

8:40AM ► (833) *If I Can, So Can You: Peer Role Models Improve Self-Perception of Mathematical Ability for Women.*
Susan D Nickerson*, **Katie Bjorkman**, **Sei Jin Ko**, **David Marx** and **Christina Wu**, San Diego State University (1116-Q5-2294)

9:00AM (834) *Defining Quantitative Literacy Through College-Level Textbooks: A Preliminary Report.* Preliminary report.
Gizem Karaali, Pomona College (1116-Q5-2144)

9:20AM ► (835) *Experiencing the Roles of Proof.*
Jeffrey D Pair, Middle Tennessee State University (1116-Q5-2097)

9:40AM ► (836) *Secondary Preservice, In-Service, and Student Teachers' Noticing of Mathematical Work and Thinking in Trigonometry.*
May Chaar, Framingham State University (1116-Q5-2077)

10:00AM ► (837) *Using the Pancake Story to Make Sense of the Epsilon Delta Definition.*
Aditya P Adiredja, University of Arizona (1116-Q5-1988)

10:20AM ► (838) *Water coolers and parametrizations.*
Harrison E. Stalvey* and **Draga Vidakovic**, Georgia State University (1116-Q5-1847)

10:40AM ► (839) *Why do mathematicians present proofs? A case study of introductory abstract algebra and real analysis course.* Preliminary report.
Eyob Demeke* and **David Earls**, University of New Hampshire (1116-Q6-432)

11:00AM (840) *Changing personal epistemologies of mathematics across cohorts of pre-service secondary mathematics teachers.*
Tamara Lefcourt Ruby, Efrata College of Education (Jerusalem, Israel) (1116-Q5-1680)

11:20AM ► (841) *Investigating calculus students' struggles with algebra.* Preliminary report.
Sepideh Stewart* and **Stacy Reeder**, University of Oklahoma (1116-Q5-1627)

11:40AM Stacy Brown Discussion

MAA Session on The Broad Impact of Math Circles

8:00 AM – 11:55 AM **Room 303, Washington State Convention Center**

Organizers: **Amanda Matson**, Clarke University

Katherine Morrison, University of Northern Colorado

Philip Yasskin, Texas A&M University

8:00AM ► (842) *The benefits of running a Math Circle with college students for middle school students.*
Amy Wangsness Wehe, Fitchburg State University (1116-B5-1304)

8:20AM ► (843) *From 5th to 12th: Discoveries and Challenges of Multi-leveled Math Circles.*
Kaitlyn Phillipson*, **Frank Sottile**, **Alex Sprintson** and **Philip B. Yasskin**, Texas A&M University (1116-B5-1776)

8:40AM ► (844) *Building a Network: The North Carolina Network of Math Teachers' Circles.* Preliminary report.
Sloan Evans Despeaux, Western Carolina University (1116-B5-340)

9:00AM ► (845) *Developing Mathematics Teachers' Mathematical Problem Solving Through a Math Teachers' Circle Framework.*
Patrice Waller* and **Sandra Richardson**, Virginia State University (1116-B5-1585)

9:20AM ► (846) *UCI Math CEO: The ripple effect of the UCI Community Educational Outreach.*
Alessandra Pantano, University of California, Irvine (1116-B5-2905)

9:40AM ► (847) *Kittitas Valley Math Circle, a program for students and their parents.* Preliminary report.
Brandy S Wiegers*, Central Washington University, National Association of Math Circles, **Dominic Klyve**, Central Washington University, **Allyson Rogan-Klyve**, Central Washington University, Oregon State University, and **Janet Shiver**, Central Washington University (1116-B5-2889)

10:00AM ► (848) *In Their Own Words: Teachers Reflect on their MTC Experiences.* Preliminary report.
Michelle A Manes, University of Hawaii at Manoa (1116-B5-1346)

10:20AM ► (849) *The Broad Impact of Math Teachers' Circles: Results from the First Decade.*
Brianna Donaldson, American Institute of Mathematics (1116-B5-2666)

10:40AM ► (850) *Students' perceptions for an impact of Math and Logic enrichment program.* **Victoria Kofman**, **Aleksandra Fedorov***, **Ryan Marchenko**, Stella Academy, and **Ethan Soifer**, Stella Academy, Buffalo Grove IL (1116-B5-2921)

11:00AM ► (851) *Mentoring Students and Supporting Teachers: New Programs from the Navajo Nation Math Circles Project.* **Bob Klein***, **Rebecca Bycofski**, Ohio University Department of Mathematics, and **Henry Fowler**, Diné College Department of Mathematics (1116-B5-783)

11:20AM ► (852) *A Math Student Circle in rural Wisconsin.* Preliminary report. **Richard P Spindler**, University of Wisconsin - Eau Claire (1116-B5-290)

11:40AM A discussion session hosted by the National Association of Math Circles and the Math Teachers' Circle Network.

MAA Session on Using Philosophy to Teach Mathematics

8:00 AM – 11:25 AM **Room 617, Washington State Convention Center**

Organizers: **Carl Behrens**, Alexandria, VA

Dan Sloughter, Furman University

8:00AM ► (853) *Making Philosophical Choices in Statistics.* **Daniel C. Sloughter**, Furman University (1116-T5-103)

8:30AM ► (854) *Senior Seminar in Set Theory as a Springboard for Mathematical Philosophy.* **Sally Cockburn**, Hamilton College (1116-T5-608)

9:00AM ► (855) *Role of Real Numbers in an Introduction to Analysis.* Preliminary report. **Thomas Drucker**, University of Wisconsin–Whitewater (1116-T5-2355)

9:30AM ► (856) *Statistics as a Liberal Art.* **Brian R Zaharatos**, University of Colorado Boulder (1116-T5-2376)

10:00AM ► (857) *Strange Bedfellows: Thomae's Game Formalism and Developmental Algebra.* **James R Henderson**, Penn State Erie, the Behrend College (1116-T5-177)

10:30AM ► (858) *Gardens of Infinity: Cantor meets the real deep Web.* **Luke Wolcott**, Lawrence University (1116-T5-2300)

11:00AM ► (859) *Is Philosophy of Mathematics Important for Teachers?* Preliminary report. **Martin Flashman**, Humboldt State University (1116-T5-2556)

MAA General Contributed Paper Session on Applied Mathematics, II

8:00 AM – 11:40 AM **Room 214, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University

Bem Cayco, San Jose State University

Timothy Comar, Benedictine University

T. James Reid, University of Mississippi

8:00AM (860) *Residual Based Adaptivity and PWDG Methods for the Helmholtz Equation.* **Shelvean Kapita***, **Peter Monk**, University of Delaware, and **Timothy Warburton**, Virginia Tech (1116-VC-1782)

8:15AM ► (861) *Efficiently Testing Thermodynamic Compliance of Chemical Reaction Networks.* **Meredith McCormack-Mager***, Wellesley College, **Carlos Muñoz**, Texas A&M University, and **Zev Woodstock**, James Madison University (1116-VC-1805)

8:30AM (862) *A Black Litterman Model for CVaR Optimization.* **Tao Pang**, North Carolina State University, Department of Mathematics, and **Cagatay Karan***, North Carolina State University, Operations Research (1116-VC-1812)

8:45AM (863) *Positive Solutions to a General Non-linear Second Order System with Applications.* **Joon Hyuk Kang**, Andrews University (1116-VC-1926)

9:00AM (864) *A New Existence Result for Solutions to Impulsive Fractional Differential Equations.* **Hilmi Ergören**, Department of Mathematics, Yuzuncu Yil University, Van, Turkey (1116-VC-1954)

9:15AM (865) *Spike Time Dependent Plasticity in Spiking Neural Network.* **Anushaya Mohapatra***, Oregon State University, and **Mike Field**, Rice University (1116-VC-1994)

9:30AM ► (866) *Asymptotic Tracking and Disturbance Rejection of the Blood Glucose Regulation System.* Preliminary report. **Brandon P Ashley**, University of Central Arkansas (1116-VC-2023)

9:45AM ► (867) *Modelling copolymer adsorption near an inhomogeneous surface.* **Gerasim K. Iliev**, University of Georgia, Department of Mathematics (1116-VC-2105)

10:00AM ► (868) *Power Series Method for Hodgkin-Huxley Equations.* Preliminary report. **James Sochacki**, James Madison University (1116-VC-2107)

10:15AM ► (869) *A Model of Flocking in Three Zones.* **Ryan Christopher Theisen**, Arizona State University (1116-VC-2224)

10:30AM (870) *The Pauli-Lubanski Vector, Complex Electrodynamics, and Photon Helicity.* **Sergey I Kryuchkov**, School of Mathematical and Statistical Sciences, Arizona State University, Tempe, AZ, **Nathan A Lanfear*** and **Sergei K Suslov**, 1 School of Mathematical and Statistical Sciences, Arizona State University, Tempe, AZ (1116-VC-2228)

10:45AM (871) *Global Existence and Boundedness of a Certain Nonlinear Vector Integro-Differential Equation of Second Order With Multiple Deviating Arguments.* **Timur Ayhan**, Siirt University (1116-VC-2244)

11:00AM ► (872) *Fractal Image Compression Algorithms and Their Application to Steganography.* **Max K Black*** and **Jonas D'Andrea**, Westminster College (Utah) (1116-VC-2245)

11:15AM ► (873) *Mathematical Modeling of Epidemic with Exposed Group.* Preliminary report. **Alma Malibekova** and **Diana Marcela Morales***, University of Central Arkansas (1116-VC-2834)

11:30AM ► (874) *Computational Modeling of Murine GL261 Brain Tumors.* Preliminary report. **Barrett James Anderies***, **Erica Rutter**, **Eric Kostelich** and **Yang Kuang**, Arizona State University (1116-VC-2871)

MAA General Contributed Paper Session on Assessment

8:00 AM – 9:10 AM **Yakima 2, Yakima Level One, Washington State Conference Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

8:00AM ► (875) *Writing good questions: How and why we wrote our own bank of clicker questions.* Preliminary report. **Berit Nilsen Givens*** and **Arlo Caine**, Cal Poly Pomona (1116-VD-2485)

8:15AM ► (876) *An Assessment Study Across Multi-Sections of 'Large' College Algebra Classrooms: An On-going Report.* Preliminary report. **Perry Y.C. Lee*** and **Padraig McLoughlin**, Kutztown University of Pennsylvania (1116-VD-1447)

8:30AM ► (877) *Mathematical Problem Solving Item (MPSI) Development Project.* Preliminary report. **Kathryn Rhoads***, **James A. Mendoza Epperson** and **R. Cavender Campbell**, The University of Texas at Arlington (1116-VD-2401)

8:45AM (878) *Exploring the potential for alternative assessments to promote meaningful learning in an undergraduate mathematics course.* **Catherine Paolucci**, State University of New York at New Paltz (1116-VD-612)

9:00AM ► (879) *The University of Illinois Math Placement Program: A Retrospection on 8 years and 75,000+ students.* Preliminary report. **Alison Ahlgren Reddy**, University of Illinois (1116-VD-723)

MAA General Contributed Paper Session on Assorted Topics, I

8:00 AM – 11:55 AM **Room 213, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

8:00AM ► (880) *Probabilistic models of Trypanosome RNA tails.* **Marshall Hampton**, University of Minnesota Duluth (1116-VW-269)

8:15AM ► (881) *The Partial Differential: A New Operator in Multivariable Calculus.* **Jason Samuels**, City University of New York (1116-VW-2709)

8:30AM ► (882) *Role Reversal: Student Learning through Teaching.* Preliminary report. **Karen McCready**, King's College, Wilkes-Barre, PA (1116-VW-2041)

8:45AM ► (883) *Probability of Integer Area Lattice Figures.* Preliminary report. **C. Berge-Sisneros**, Nevada State College (1116-VW-1093)

9:00AM ► (884) *Exploring Hall's Genealogy of Pythagorean Triads.* Preliminary report. **Jathan W. Austin**, Salisbury University (1116-VW-136)

9:15AM ► (885) *A Decomposition of Parking Functions by Undesired Spaces.* **Ian Nicolas***, Pacific University, **Melody Bruce**, Western Carolina University, **Michael Dougherty**, University of California, Santa Barbra, **Max Hlavacek**, Harvey Mudd College, and **Ryo Kudo**, University of California, Los Angeles (1116-VW-1476)

9:30AM ► (886) *The Moore Method: A Decidedly American Educational Philosophy.*
Padraig M. McLoughlin, Kutztown University of Pennsylvania (1116-VW-1578)

9:45AM ► (887) *Helping students see connections between mathematics and other disciplines through a fun teaching exchange project.*
Maria Neophytou, Belmont University (1116-VW-1615)

10:00AM ► (888) *Polynomials of Binomial Type: an Analytic Connection between the Fibonacci Recurrence and the Binomial Coefficients.*
Soowhan Yoon, Mercer University (1116-VW-1648)

10:15AM ► (889) *Connectivity of One Step Apart Integers.*
Roman Wong, Washington & Jefferson College (1116-VW-1699)

10:30AM (890) *On the Existence of a Semi-Conjugation Between Certain Combinatorially Obtained Minimal Cantor Sets.*
Erin Denette* and **Araceli Bonifant**, University of Rhode Island (1116-VW-1820)

10:45AM ► (891) *Design and Implementation of a Mathematics Education Undergraduate Research Course.*
Nicole R Juersivich, Nazareth College (1116-VW-188)

11:00AM ► (892) *Accountability and the Texas Miracle.*
Bryan Nankervis, Texas State University (1116-VW-596)

11:15AM ► (893) *Extracting Square Roots of Power Series by Hand.*
Lee N. Collins, County College of Morris (1116-VW-893)

11:30AM ► (894) *Divisibility rules in different bases: an opportunity for discovery.*
Carl Olimb, Augustana University (1116-VW-2605)

11:45AM (895) *Riemannian submersion and Lagrangian isometric immersion II.*
Yun Myung Oh, Andrews University (1116-VW-2509)

MAA General Contributed Paper Session on Graph Theory, II

8:00 AM – 11:40 AM **Room 212, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University

Bem Cayco, San Jose State University

Timothy Comar, Benedictine University

T. James Reid, University of Mississippi

8:00AM ► (896) *The Smallest Non-autorgraph.*
Yijin Wei*, Department of Mathematics and Statistics, Smith College, **Ben Baumer**, Program in Statistical and Data Sciences, and **Gary S. Bloom**, Department of Computer Science, City College (1116-VF-1523)

8:15AM ► (897) *A new proof of Nash-Williams–Tutte and generalizations to S-connectors.*
Tyler Seacrest*, The University of Montana Western, and **Jitender Deogun**, University of Nebraska - Lincoln (1116-VF-1639)

8:30AM ► (898) *Chromatic Connections in Graphs.*
Elliot M Laforge, Western Michigan University (1116-VF-1682)

8:45AM (899) *Short Induced Cycles in Graphs.*
Axel Brandt*, University of Colorado Denver, **Bernard Lidický**, Iowa State University, and **Florian Pfender**, University of Colorado Denver (1116-VF-1705)

9:00AM ► (900) *Using Graphs to Examine Benzene-like Structures.*
Jessie Lenarz, St. Catherine University (1116-VF-1800)

9:15AM (901) *Finding all small induced cycles in polynomial-time.* Preliminary report.
Dalal Alrowaili*, **Dong Ye** and **Xiaoya Zha**, Middle Tennessee State University (1116-VF-1968)

9:30AM (902) *Graphs Are Uniquely Determined by Their Inverse Semigroup.*
Demitri Plessas*, Northeastern State University, and **Tien Chih**, Newberry College (1116-VF-1977)

9:45AM (903) *Neighbor sum distinguishing total coloring of graphs.* Preliminary report.
Miaomiao Han* and **Rong Luo**, West Virginia University (1116-VF-1987)

10:00AM (904) *The giant strong component in random directed graphs.*
Daniel J Poole, The Ohio State University (1116-VF-2043)

10:15AM ► (905) *On three coloring planar graphs containing no C_4, C_5, or triangles sharing a vertex.*
Addie E. Armstrong, University of Rhode Island (1116-VF-2075)

10:30AM (906) *The decomposition of a cubic graph for the domination number.*
Misa Nakanishi, Sagamihara city, Japan (1116-VF-2185)

10:45AM ► (907) *Stable Matchings with Bounded Preferences.* Preliminary report.
Christine T Cheng, Department of Computer Science, University of Wisconsin-Milwuakee, and **Will Rosenbaum***, Department of Mathematics, UCLA (1116-VF-2187)

11:00AM (908) *Algebraic Graph Theoretic Methods in Control Theory.*
Mathias Hudoba de Badyn, University of Washington (1116-VF-2219)

11:15AM ► (909) *Prime labelings of generalized Petersen graphs and large cubic bipartite graphs.* **Steven Schluchter*** and **Tom Wilson**, George Mason University (1116-VF-2325)

11:30AM (910) *Decomposition of a Graph into its Quasi 4-Connected Components.* **Guoli Ding** and **Kimberly D'souza***, Louisiana State University (1116-VF-876)

SIAM Minisymposium on Probability Meets Dynamics in Biology

8:00 AM – 10:55 AM **Room 3A, Washington State Convention Center**

Organizer: **Rachel Kuske**, University of British Columbia

8:00AM (911) *Assembling collective activity in neural circuits.* **Eric Shea-Brown***, Applied Mathematics / U. Washington, **Yu Hu**, Harvard University, **Nathan Kutz**, **Steven Brunton**, University of Washington, **Stefan Mihalas** and **Nick Cain**, Allen Institute for Brain Science (1116-92-216)

8:30AM ► (912) *Chaos and Noise: the implications of stochasticity in growth laws.* **Ami Radunskaya**, Pomona College (1116-60-528)

9:00AM (913) *Randomly switching PDEs and SDEs.* **Sean D. Lawley**, University of Utah (1116-60-2333)

9:30AM ► (914) *Eye Tracking Studies of Category Learning: Fitting Complex Models to Individuals.* **Paul F Tupper**, Simon Fraser University (1116-92-1821)

10:00AM ► (915) *Oscillatory behavior of a genetic circuit with delayed negative feedback.* **David Lipshutz***, Brown University, and **Ruth J. Williams**, University of California, San Diego (1116-34-1887)

10:30AM (916) *Interpretation and modelling with super-resolution microscopy.* **Daniel Coombs**, University of British Columbia (1116-92-1308)

Project NExT Workshop

8:00 AM – 6:00 PM **Room 4C-2, Washington State Convention Center**

MAA Workshop

8:00 AM – 9:20 AM **Metropolitan A, 3rd Floor, Sheraton Seattle Hotel**

Applications of Gapminder for undergraduate mathematics and statistics courses.

Organizers: **Samuel L. Tunstall**, Appalachian State University
Sarah Greenwald, Appalachian State University
Bill Bauldry, Appalachian State University

PME Council Meeting

8:00 AM – 11:00 AM **Everett, 3rd Floor, Sheraton Seattle Hotel**

Employment Center

8:00 AM – 5:30 PM **Hall 4B, 4th Floor, Washington State Convention Center**

MAA Session on Preparation, Placement and Support of Elementary Mathematics Specialists

8:20 AM – 9:55 AM **Room 2A, Washington State Convention Center**

Organizers: **Laurie J. Burton**, Western Oregon University
Cheryl Beaver, Western Oregon University
Klay Kruczek, Southern Connecticut State University

8:20AM ► (917) *A Snapshot of Pre-service Teachers' Use of Visual Representation for Solving Word Problems.* **Victoria Kofman***, Stella Academy, and **Sayonita Ghosh Hajra**, University of Utah (1116-N1-1468)

8:40AM ► (918) *TPACK & Training Teachers: Preparing Pre-Service Elementary Math Specialists.* **Cheryll Elizabeth Crowe**, Asbury University (1116-N1-249)

9:00AM ► (919) *Supporting In-service Elementary Mathematics Teachers in Implementing Inquiry-Based Instruction and the CCSS for Mathematical Practice.* Preliminary report. **Bernadette Mullins**, Birmingham-Southern College (1116-N1-2857)

9:20AM (920) *The Elementary Mathematics Instructional Leaders (EMIL) program: Preparing community leaders.* **Laurie Burton** and **Cheryl Beaver***, Western Oregon University (1116-N1-2378)

9:40AM ► (921) *Virginia's K-8 Mathematics Specialists: How They Are Prepared to be Mathematics Leaders and Their Impact on Students and Teachers.* **Aimee J. Ellington***, **Joy W. Whitenack** and **David J. Edwards**, Virginia Commonwealth University (1116-N1-2338)

MAA Minicourse #6: Part A

8:30 AM – 10:30 AM **Tahoma 5, Tahoma Level Three, Washington State Conference Center**

Getting started in the scholarship of teaching and learning.

Presenters: **Jacqueline M. Dewar**, Loyola Marymount University

Curtis D. Bennett, Loyola Marymount University

AMS-MAA-SIAM Panel Discussion

8:30 AM – 10:00 AM **Room 3B, Washington State Convention Center**

Computing across the curriculum: Opportunities and challenges.

Organizers: **Rachel Levy**, Harvey Mudd College
Lee Zia, National Science Foundation

MAA Invited Address

9:00 AM – 9:50 AM **Ballroom 6BC, Washington State Convention Center**

(922) *Fair division.*
Steven Brams, New York University (1116-A0-17)

MAA Invited Paper Session on Current Trends in Mathematical and Computational Biology

9:00 AM – 11:20 AM **Room 607, Washington State Convention Center**

Organizers: **Brian Walton**, James Madison University
Maeve McCarthy, Murray State University

9:00AM ► (923) *Canine Distemper Outbreak Modeled in an Animal Shelter.* Preliminary report.
Suzanne Lenhart, University of Tennessee and NIMBioS (1116-AA-774)

9:30AM ► (924) *Mathematically informed cancer vaccines.*
Ami Radunskaya, Pomona College (1116-AA-527)

10:00AM (925) *Simplifying computations of likelihoods for a multivariate Ornstein-Uhlenbeck process on an evolutionary tree.* Preliminary report.
Joeph Felsenstein, University of Washington (1116-AA-2015)

10:30AM ► (926) *Discrete Models for the Simulation and Control of Gene Regulatory Networks.*
David Murrugarra, University of Kentucky (1116-AA-1331)

11:00AM ► (927) *Reducing Ambiguity in Biological Network Inference via Grobner Bases.*
Brandilyn Stigler, Southern Methodist University (1116-AA-2890)

MAA Minicourse #14: Part A

9:00 AM – 11:00 AM **Metropolitan B, 3rd Floor, Sheraton Seattle Hotel**

Teaching quantitative reasoning with common sense and common knowledge.

Presenters: **Maura B. Mast**, University of Massachusetts Boston
Ethan D. Bolker, University of Massachusetts Boston

MAA Session for Chairs

9:00 AM – 10:20 AM **Room 609, Washington State Convention Center**

What department chairs should know about teaching with technology.

Organizers: **Catherine M. Murphy**, Purdue University Calumet
Daniel Maki, Indiana University

Panelists: **Michael Gage**, University of Rochester
Gavin LaRose, University of Michigan
Peter Turbek, Purdue University Calumet

Student Hospitality/Information Center

9:00 AM – 5:00 PM **Skybridge, 4th Floor, Washington State Convention Center**

AMS - MAA - SIAM - TPSE Math Panel Discussion

9:00 AM – 10:30 AM **Room 611, Washington State Convention Center**

Recent graduates, what we wish we had learned.

Organizers: **Tara Holm**, Cornell University
Charles Steinhorn, Vassar College

Moderator: **Don Saari**, Conference Board of Mathematical Sciences

MAA Workshop

9:00 AM – 10:20 AM **Room 612, Washington State Convention Center**

9:00—10:20—*Guiding your PhDs to nonacademic careers.*¡

Organizer: **Douglas Kalish**, University of California Berkeley

MAA General Contributed Paper Session on Teaching and Learning Advanced Mathematics

9:30 AM – 11:25 AM **Yakima 2, Yakima Level One, Washington State Conference Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University

T. James Reid, University of Mississippi

9:30AM *Applied Abstract Algebra.*
► (928) **Mary K. Flagg**, University of St. Thomas (1116-VS-1543)

9:45AM *Suitable Topics and Appropriate Depth in*
► (929) *a Junior/Senior Level Elementary Number Theory Course.* Preliminary report. **Danny T Lau**, University of North Georgia (1116-VS-1738)

10:00AM *Bridge Courses for Undergraduates –*
► (930) *What May Be Missing.* Preliminary report. **David W Mauro**, Trinity College (1116-VS-2064)

10:15AM *Connecting Collegiate Mathematics to*
(931) *Secondary Mathematics for Pre-service Teachers.* **Timothy B Flowers**, Indiana University of Pennsylvania (1116-VS-2259)

10:30AM *Using Proof Portfolios in an Introduction*
(932) *to Proofs Course.* Preliminary report. **Alyssa M. Armstrong**, Wittenberg University (1116-VS-2477)

10:45AM *Behind the Scene: What the Brain Thinks*
► (933) *the Eyes Are Seeing.* **Russell R Coe**, Suffolk County Community College (1116-VS-357)

11:00AM *Publishing or perishing in an*
(934) *intro-to-proof course.* Preliminary report. **Eric Errthum**, Winona State University (1116-VS-588)

11:15AM *MATLAB simulation an aid for teaching*
► (935) *probability.* **Pablo Ulises Suarez Joya**, Delaware State University (1116-VS-79)

AMS Special Presentation

9:30 AM – 11:50 AM **Ballroom 6A, Washington State Convention Center**

Who wants to be a mathematician—National contest and public talk.

Organizers: **Michael S Breen**, American Mathematical Society
William T Butterworth, DePaul University

Exhibits and Book Sales

9:30 AM – 5:30 PM **Hall 4A, 4th Floor, Washington State Convention Center**

MAA Minicourse #15: Part A

10:00 AM – NOON **Metropolitan A, 3rd Floor, Sheraton Seattle Hotel**

Teaching statistics using R and R Studio.

Presenter: **Randall Pruim**, Calvin College

MAA Poster Session

10:00 AM – NOON **Hall 4F, 4th Floor, Washington State Convention Center**

Mathematical outreach programs.

Organizer: **Elizabeth Yanik**, Emporia State University

Project NExT Session

10:00 AM – 11:15 AM **Room 4C-2, Washington State Convention Center**

Integrating writing in undergraduate courses.

AWM-AMS Noether Lecture

10:05 AM – 10:55 AM **Ballroom 6BC, Washington State Convention Center**

(936) *The Power of Noether's Ring Theory in Understanding Singularities of Complex Algebraic Varieties.* **Karen E Smith**, University of Michigan (1116-13-1864)

AMS Special Presentation

10:30 AM – NOON **Skagit 2, Skagit Lower Level, Washington State Conference Center**

A conversation on nonacademic employment.

SIGMAA Officers Meeting

10:30 AM – NOON **Willow, 2nd Floor, Sheraton Seattle Hotel**

Chair: **Karen A. Marrongelle**, Portland State University

AMS & AWM Committees on Education Panel Discussion

10:30 AM – NOON **Room 203, Washington State Convention Center**

Work in Mathematics Education in Departments of Mathematical Sciences.

Organizers: **Jacqueline Dewar**, Loyola Marymount University
Pao-sheng Hsu, University of Maine

Moderator: **Elizabeth Burroughs**, Montana State University

Panelists: **Curtis Bennett**, Loyola Marymount University
Brigitte Lahme, Sonoma State University
Yvonne Lai, University of Nebraska-Lincoln
Kristin Umland, University of New Mexico

MAA-Young Mathematicians' Network Panel Discussion

10:35 AM – 11:55 AM **Room 609, Washington State Convention Center**

Career options for undergraduates.

Organizers: **Thomas P. Wakefield**, Youngstown State University
Kristine Roinestad, US Census Bureau

Panelists: **Thomas Grandine**, Boeing Corporation
Katie Oliveras, Seattle University
Marcia A. Ciol, University of Washington

MAA Panel Discussion

10:35 AM – 11:55 AM **Room 612, Washington State Convention Center**

Developing mathematical concepts with technology.

Organizer: **Gail Burrill**, Michigan State University

Panelists: **Wade Ellis**, West Valley Community College
Tom Dick, Oregon State University
Andrew Bennett, University of Kansas
Gail Burrill, Michigan State University

SIAM Invited Address

11:10 AM – NOON **Ballroom 6BC, Washington State Convention Center**

(937) *Stochastic facilitation and sensitivities in discontinuous dynamics.*
Rachel Kuske, Department of Mathematics, University of British Columbia (1116-00-209)

AMS Colloquium Lectures: Lecture II

1:00 PM – 2:00 PM **Ballroom 6BC, Washington State Convention Center**

(938) *Arithmetic progressions of length 4, quadratic Fourier analysis, and 3-uniform hypergraphs.*
W Timothy Gowers, University of Cambridge, UK (1116-05-1515)

AMS-MAA Special Session on the History of Mathematics, III

1:00 PM – 3:50 PM **Tahoma 3, Tahoma Level Three, Washington State Conference Center**

Organizers: **Patti Hunter**, Westmont College
Adrian Rice, Randolph-Macon College
Sloan Despeaux, Western Carolina University
Deborah Kent, Drake University

1:00PM ► (939) *The Contributions to Mathematics of Piet Hein.*
Toke Knudsen, State University of New York at Oneonta (1116-01-1637)

1:30PM ► (940) *Medieval Mathematics in Three Languages.* Preliminary report.
Victor J. Katz, University of the District of Columbia (1116-01-1326)

2:00PM ► (941) *Francesco Maurolico and the problem of filling space with regular polyhedra (1529).*
Veronica Gavagna, Department of Mathematics, University of Salerno (Italy) (1116-01-1381)

2:30PM ► (942) *Rheticus, Maurolico, and the Birth of the Secant Function.*
Glen R Van Brummelen* and **James Byrne**, Quest University (1116-01-781)

3:00PM ► (943) *The Mathematics of Thomas Harriot.*
Janet L. Beery, University of Redlands (1116-01-2431)

3:30PM Discussion.

AMS-ASL Special Session on Surreal Numbers, I

1:00 PM – 3:50 PM **Room 602, Washington State Convention Center**

Organizers: **Philip Ehrlich**, Ohio University, Athens
Ovidiu Costin, Ohio State University, Columbus

1:00PM (944) *Transserial derivations on surreal numbers.*
Alessandro Berarducci*, University of Pisa, and **Vincenzo Mantova**, Scuola Normale Superiore (1116-03-1521)

1:30PM (945) *Transserial derivations on surreal numbers.*
Alessandro Berarducci, University of Pisa, and **Vincenzo Mantova***, Scuola Normale Superiore (1116-03-1522)

2:00PM (946) *The surreals as a differential field.*
Lou van den Dries, University of Illinois (1116-03-696)

2:30PM (947) *Integration on the Surreals: A Conjecture of Conway, Kruskal and Norton.*
Ovidiu Costin, Mathematics Department/The Ohio State University, **Philip Ehrlich***, Department of Philosophy/Ohio University, and **Harvey M. Friedman**, Mathematics Department/The Ohio State University (1116-03-1208)

3:00PM (948) *Integration on the Surreals: A Conjecture of Conway, Kruskal and Norton.*
Ovidiu Costin*, The Ohio State University, **Philip Ehrlich**, Ohio University, and **Harvey M Friedman**, The Ohio State University (1116-03-1281)

3:30PM ► (949) *The History of the Surreal Numbers.*
John H Conway, Department of Mathematics/Princeton University (1116-01-1845)

AMS Special Session on Advances in Free Analysis: the Theory and Applications of Noncommutative Functions, Inequalities, and Domains, II

1:00 PM – 4:20 PM **Room 400, Washington State Convention Center**

Organizers: **Joseph A. Ball**, Virginia Polytechnic Institute
Paul S. Muhly, University of Iowa, Iowa City

1:00PM (950) *Higher order noncommutative functions and the universal skew field of fractions of a tensor product of free algebras.*
Victor Vinnikov, Ben Gurion University of the Negev (1116-47-2417)

2:00PM (951) *Higher Order Non-commutative Functions.*
Leonard Stevenson, Drexel University (1116-15-1729)

3:00PM (952) *Completely Bounded Noncommutative Kernels.*
J. A. Ball, **G. Marx***, Virginia Tech, and **V. Vinnikov**, Ben-Gurion University of the Negev (1116-47-2776)

3:30PM (953) *Interpolation and transfer-function realization for the noncommutative Schur-Agler class.*
Joseph A Ball, Virginia Tech (1116-47-2438)

4:00PM (954) *Matrix Bundles, Function Algebras, and Azumaya Algebras.*
Erin Griesenauer*, **Paul Muhly**, Department of Mathematics, University of Iowa, and **Baruch Solel**, Department of Mathematics, Technion (1116-47-1395)

AMS Special Session on Analysis and Geometry in Nonsmooth Metric Measure Spaces, III

1:00 PM – 3:50 PM **Room 401, Washington State Convention Center**

Organizers: **Luca Capogna**, Worcester Polytechnic Institute
Jeremy Tyson, University of Illinois at Urbana-Champaign

1:00PM (955) *New examples of spaces satisfying Poincare inequalities.*
Bruce Kleiner, New York University (1116-28-1130)

1:30PM (956) *Fine properties of BV functions-analogs of quasicontinuity.*
Nageswari Shanmugalingam*, University of Cincinnati, and **Panu Lahti**, Aalto University (1116-30-990)

2:00PM (957) *Analyst's Traveling Salesman theorems in limits of metric graphs.* Preliminary report.
Guy C. David*, Courant Institute, New York University, and **Raanan Schul**, SUNY Stony Brook (1116-28-1253)

2:30PM (958) *Rectifiable and purely unrectifable measures in the absence of absolute continuity.*
Matthew Badger, University of Connecticut (1116-28-411)

3:00PM (959) *The geometry of Radon Nikodym Lipschitz differentiability spaces.*
David Bate, University of Chicago (1116-58-953)

3:30PM ► (960) *Nonsmooth differential geometry.*
Nicola Gigli, SISSA (1116-53-2237)

AMS Special Session on Combinatorial Design Theory, II

1:00 PM – 3:50 PM **Room 310, Washington State Convention Center**

Organizer: **Esther R. Lamken**, San Francisco

1:00PM ► (961) *A notion of parity for orthogonal Latin squares.*
Ian Wanless, Monash University, Australia (1116-05-1009)

1:30PM (962) *λ-fold 5-cycle systems and the FUTURE!* Preliminary report.
John Asplund, Dalton State College (1116-05-725)

2:00PM ► (963) *Block orderings for triple systems.*
David A Pike, Memorial University of Newfoundland (1116-05-1057)

2:30PM ► (964) *Non-existence results for symmetric pair coverings with 2-regular excess.*
Nevena Francetic*, **Sarada Herke** and **Daniel Horsley**, Monash University (1116-05-985)

3:00PM (965) *Cycle decompositions: resolvable or without parallel classes.*
Tommaso Traetta, Ryerson University (1116-05-1669)

3:30PM (966) *On the Hamilton-Waterloo Problem.*
Peter Danziger, Ryerson University (1116-05-1003)

AMS Special Session on Commutative Algebra, II (a Mathematics Research Communities Session)

1:00 PM – 3:50 PM **Skagit 3, Skagit Lower Level, Washington State Conference Center**

Organizers: **Linquan Ma**, University of Utah

Sarah Mayes-Tang, Quest University

Jonathan Montaño, University of Kansas

1:00PM (967) *Duality for Residual Intersections.* **David Eisenbud**, MSRI and U.C. Berkeley (1116-13-462)

1:30PM (968) *Perfect complexes over commutative rings.* Preliminary report. **Hannah Altmann***, University of Minnesota, Morris, **Eloisa Grifo**, University of Virginia, **Srikanth Iyengar**, University of Utah, **Jonathan Montano**, University of Kansas, **William Sanders**, Norwegian University of Science and Technology, and **Thanh Vu**, University of Nebraska-Lincoln (1116-13-1983)

2:00PM (969) *Equations of Rees algebras of ideals in two variables.* **Jeff Madsen**, University of Notre Dame (1116-13-2280)

2:30PM (970) *Splendid complexes on products of projective space.* Preliminary report. **Daniel Erman**, University of Wisconsin, **Gregory G. Smith***, Queen's University, and **Christine Berkesch Zamaere**, University of Minnesota (1116-13-1712)

3:00PM (971) *Rees algebra of Ideals.* **Vivek Mukundan*** and **Jacob Boswell**, Purdue University (1116-13-1318)

3:30PM (972) *Cohomology of finite modules over short Gorenstein rings.* **Liana M Sega*** and **Melissa Menning**, University of Missouri Kansas City (1116-13-2178)

AMS Special Session on Differential Equations, Probability and Sea Ice, II (a Mathematics Research Communities Session)

1:00 PM – 3:50 PM **Skagit 5, Skagit Lower Level, Washington State Conference Center**

Organizers: **B.Cael Barry**, MIT and Woods Hole Oceanographic Institution

Kaitlin Hill, Northwestern University

Ross Lieb-Lappen, Dartmouth College

Christian Sampson, University of Utah

Alexandria Volkening, Brown University

1:00PM (973) *Stochastic Perturbation Theory, Stochastic Dynamics and the Climatic Transitions of Arctic sea ice.* **John S. Wettlaufer**, Yale University, University of Oxford, and Nordic Institute for Theoretical Physics (1116-60-2350)

1:30PM (974) *A stochastic perturbation theory for non-autonomous systems.* **Woosok Moon***, Department of Applied Mathematics Theoretical Physics, University of Cambridge, and **John S Wettlaufer**, Department of Geology & Geophysics, Yale University (1116-60-1238)

2:00PM (975) *How climate model complexity influences sea ice stability.* **Till Wagner** and **Ian Eisenman***, Scripps Institution of Oceanography, UC San Diego (1116-86-315)

2:30PM ► (976) *Wind-driven expansion of the Antarctic sea-ice cover.* Preliminary report. **Kyle C Armour***, University of Washington, **Yavor Kostov**, Massachusetts Institute of Technology, **Cecilia M Bitz**, University of Washington, and **John Marshall**, Massachusetts Institute of Technology (1116-76-2817)

3:00PM ► (977) *The Probability Distribution of Near-Surface Wind Speed in Stably Stratified Conditions.* **Adam H Monahan***, **Amber Holdsworth** and **Timothy Rees**, School of Earth and Ocean Sciences/University of Victoria (1116-86-2557)

3:30PM (978) *A multiscale, anisotropic, elastic-decohesive constitutive relation for modeling sea ice.* **D. Sulsky***, University of New Mexico, **H. Tran**, Vietnamese German University, and **H. Schreyer**, University of New Mexico (1116-86-1877)

AMS Special Session on Essential Mathematical Structures and Practices in K–12 Mathematics

1:00 PM – 3:50 PM **Chelan 2, Chelan Level Two, Washington State Conference Center**

Organizers: **William McCallum**, University of Arizona, Tucson

Kristin Umland, University of New Mexico

Ellen Whitsides, University of Arizona, Tucson

1:00PM ► (979) *Essential Mathematical and Cognitive Structures in K-5 Mathematics: Where They Come From and Where They Go.* Preliminary report. **Susan L. Addington**, California State University, San Bernardino (1116-97-1775)

1:30PM (980) *An Historical Perspective of Proportion, Ratio and Measurement.* **James J Madden**, Louisiana State University (1116-97-639)

2:00PM ► (981) *What Do We Mean by Proportionality?* Preliminary report. **Kristin L. Umland**, University of New Mexico (1116-97-2323)

2:30PM ► (982) *The Emergence of Essentiality from Educator-Mathematician interactions in context.* Preliminary report.
Hugo Rossi* and **Margarita Cummings**, Mathematics, University of Utah (1116-97-459)

3:00PM (983) *Functions, Rates, and Quantitative Reasoning: From Proportionality to Exponential Growth.*
Cody L. Patterson, The University of Texas at San Antonio (1116-97-2234)

3:30PM (984) *From the ark of history to the arc of reasoning.*
William G. McCallum, The University of Arizona (1116-97-2968)

AMS Special Session on Financial Mathematics, II (a Mathematics Research Communities Session)

1:00 PM – 4:00 PM **Skagit 4, Skagit Lower Level, Washington State Conference Center**

Organizers: **Triet Pham**, Rutgers University
Wilber A Ventura, University of Texas at Arlington
Kim Weston, Carnegie Mellon University

1:00PM (985) *Dynamic Approaches for Some Time Inconsistent Problems.*
Jianfeng Zhang, University of Southern California (1116-60-993)

2:00PM (986) *A Gaussian Markov alternative to fractional Brownian motion for pricing financial derivatives.*
Daniel Conus and **Mackenzie Wildman***, Lehigh University (1116-60-839)

2:30PM (987) *Dynamics of Large, Rank Based Models.*
Cameron Bruggeman, Columbia University (1116-60-1757)

3:00PM (988) *Mean field games in interbank models.*
S.M. Mousavi*, PhD researcher, Department of Statistics and Applied Probability, University of California Santa Barbara, and **J-P Fouque**, Professor, Department of Statistics and Applied Probability, University of California Santa Barbara (1116-60-1467)

3:30PM (989) *Market Models with Splits and Mergers.*
Andrey Sarantsev*, University of California, Santa Barbara, and **Ioannis Karatzas**, Columbia University (1116-60-600)

AMS Special Session on Fractal Geometry and Dynamical Systems, II

1:00 PM – 3:50 PM **Room 4C-1, Washington State Convention Center**

Organizers: **John Rock**, Cal Poly Pomona
Machiel van Frankenhuijesen, Utah Valley University
Michel L. Lapidus, University of California, Riverside

1:00PM (990) *Julia sets and discrete group actions.*
Raluca Tanase, Stony Brook University (1116-37-2706)

1:30PM ► (991) *Global regularity for solutions of nonlocal Robin problems in a class of "bad" domains.*
Alejandro Vélez-Santiago, University of California Riverside (1116-35-991)

2:00PM (992) *Lower quantum dynamical bounds and arithmetic criterion of full spectral dimensionality for analytic quasi-periodic Schrödinger operators.*
Svetlana Jitomirskaya and **Shiwen Zhang***, Univeristy of California, Irvine (1116-37-637)

2:30PM (993) *Noncommutative Fractal Geometry.*
Andrea Arauza, University of California, Riverside (1116-51-1742)

3:00PM (994) *Fractal geometry and complex dimensions in Ahlfors regular spaces.* Preliminary report.
Michel L Lapidus and **Sean Watson***, University of California, Riverside (1116-37-1424)

3:30PM (995) *Quantized Modular Forms and Elliptic Curves.*
T. Cobler*, Fullerton College, and **M. L. Lapidus**, University of California, Riverside (1116-46-2615)

AMS Special Session on Knots in Washington (State), II

1:00 PM – 3:50 PM **Room 201, Washington State Convention Center**

Organizers: **Allison Henrich**, Seattle University
Sam Nelson, Claremont McKenna College
Jozef Przytycki, George Washington University
Radmila Sazdanovic, North Carolina State University, Raleigh

1:00PM (996) *Frieze and wallpaper graphs and their medial links.*
Susan G Williams* and **Daniel S. Silver**, University of South Alabama (1116-57-875)

1:30PM (997) *Periodic Graphs, Spanning Trees and Mahler Measure.*
Daniel S. Silver* and **Susan G. Williams**, University of South Alabama (1116-57-693)

2:00PM (998) *Finite-type invariants of framed virtual knots.*
Nicolas Petit, Dartmouth College (1116-57-1156)

2:30PM (999) *Normal virtual link diagrams and double covers of twisted link diagrams.* **Naoko Kamada**, Nagoya City University (1116-57-1007)

3:00PM (1000) *Red black Khovanov Homology for virtual knots.* Preliminary report. **Heather A Dye**, McKendree University (1116-57-493)

3:30PM (1001) *Rotational Virtual Links and Quantum Link Invariants.* Preliminary report. **Louis H Kauffman**, University of Illinois at Chicago (1116-57-1016)

AMS Special Session on Number Theory and Cryptography, I

1:00 PM – 3:50 PM **Room 606, Washington State Convention Center**

Organizers: **Matilde Lalin**, University of Montreal
Michelle Manes, University of Hawaii, Honolulu
Christelle Vincent, University of Vermont

1:00PM (1002) *Some discrete log questions in $\mathbb{Q}$-algebras.* **Hendrik W. Lenstra**, Universiteit Leiden, and **Alice Silverberg***, University of California, Irvine (1116-13-1453)

1:30PM (1003) *Constructing genus 2 curves over finite fields.* **Kirsten Eisentraeger**, Penn State University (1116-11-762)

2:00PM (1004) *p-adic families of Eisenstein series and applications.* **Ellen Eischen**, University of Oregon (1116-11-333)

2:30PM (1005) *Fourier coefficients of metaplectic Eisenstein series.* **Reinier Broker**, Center for Communications Research (1116-11-197)

3:00PM (1006) *On the modularity of hyperelliptic curves of genus 2.* **Jennifer M Johnson-Leung*** and **Brooks Roberts**, University of Idaho (1116-11-904)

3:30PM (1007) *Visualising the arithmetic of imaginary quadratic fields.* **Katherine E Stange**, University of Colorado, Boulder (1116-11-936)

AMS Special Session on Parabolic Geometries, Twistor Theory, and the AdS/CFT Correspondence, III

1:00 PM – 3:40 PM **Room 4C-4, Washington State Convention Center**

Organizers: **Jonathan Holland**, University of Pittsburgh
George Sparling, University of Pittsburgh
Daniela Mihai, Carnegie Mellon University

1:00PM ► (1008) *On the structure of the null geodesics of space-time.* **George A. J. Sparling**, Laboratory of Axiomatics, University of Pittsburgh (1116-53-2733)

2:00PM (1009) *Null geodesics and the universal Teichmüller space.* Preliminary report. **Jonathan Holland**, Rochester Institute of Technology (1116-53-2459)

3:00PM Discussion.

AMS Special Session on Problems in Geometry and Design of Materials, III

1:00 PM – 3:50 PM **Room 604, Washington State Convention Center**

Organizers: **Marta Lewicka**, University of Pittsburgh
Petronela Radu, University of Nebraska

1:00PM (1010) *Multiscale and Coarse Graining Methods in Peridynamic Mechanics.* **Stewart A Silling**, Sandia National Laboratories (1116-74-1878)

2:00PM (1011) *Nonlocal diffusion in composites.* **Bacim Alali**, Kansas State University (1116-80-2232)

2:30PM (1012) *A fourth-order nonlocal operator and its connection with the local counterpart.* **Petronela Radu**, **Daniel Toundykov**, University of Nebraska-Lincoln, and **Jeremy Trageser***, The George Washington University (1116-35-1390)

3:00PM (1013) *On measure-valued solutions to compressible Euler and similar systems.* **Piotr Gwiazda**, University of Warsaw (1116-35-1561)

3:30PM (1014) *A phase field model for Willmore's energy with topological constraint.* **Patrick Dondl***, Albert-Ludwigs-Universität Freiburg, and **Stephan Wojtowytsch**, Durham University (1116-35-2415)

AMS Special Session on Representation Theory of Algebraic Groups

1:00 PM – 3:50 PM **Rooms 307/308, Washington State Convention Center**

Organizers: **Daniel K. Nakano**, University of Georgia
Cornelius Pillen, University of South Alabama

1:00PM (1015) *Projective indecomposable $G_{(r)}$-modules.* **Paul Sobaje**, University of Georgia (1116-20-1640)

1:30PM (1016) *Exotic sheaves, parity sheaves and the Mirković–Vilonen conjecture.* **Carl Mautner***, University of California, Riverside, and **Simon Riche**, Université Blaise Pascal - Clermont-Ferrand (1116-20-1059)

2:00PM (1017) *Localizing subcategories for modules of finite group schemes.*
Julia Pevtsova*, University of Washington, **Dave Benson**, University of Aberdeen, **Srikanth Iyengar**, University of Utah, and **Henning Krause**, University of Bielefeld (1116-20-1303)

2:30PM (1018) *Third cohomology for algebraic groups and Lie algebras.*
Christopher P. Bendel*, University of Wisconsin-Stout, **Daniel K. Nakano**, University of Georgia, and **Cornelius Pillen**, University of South Alabama (1116-20-844)

3:00PM (1019) *Equivalence of representation categories of various quantum and super quantum groups.* Preliminary report.
Zhaobing Fan, Dept of Mathematics, Kansas State University, **Yiqiang Li**, State University of New York at Buffalo, and **Zongzhu Lin***, Department of Mathematics, Kansas State University (1116-16-1654)

3:30PM (1020) *Extending Hecke Endomorphism Algebras.*
Jie Du, University of New South Wales, **Brian Parshall** and **Leonard Scott***, The University of Virginia (1116-20-1215)

AMS Special Session on Research by Postdocs of the Alliance for Diversity in Mathematics, II

1:00 PM – 3:55 PM **Room 4C-3, Washington State Convention Center**

Organizers: **Aloysius Helminck**, North Carolina State University, Raleigh
Michael Young, Iowa State University, Ames

1:00PM (1021) *From bee species aggregation to models of disease avoidance: The Ben-Hur effect.*
Kamuela E Yong*, University of Hawaii - West Oahu, **Edgar Díaz Herrera**, Instituto Nacional De Salud Pública, and **Carlos Castillo-Chavez**, Arizona State University (1116-92-1442)

► 1:30PM (1022) *The optimal timing of reintroduction: The case of the endangered black-footed ferret.* Preliminary report.
Kehinde Rilwan Salau*, University of Arizona, **David W Shanafelt**, Arizona State University, and **Richard T Melstrom**, Oklahoma State University (1116-49-2225)

► 2:00PM (1023) *Modeling ovulatory dysfunction through mechanisms of reproductive hormone regulation.*
Erica J. Graham*, Bryn Mawr College, and **James F. Selgrade**, North Carolina State University (1116-92-1768)

2:30PM (1024) *On Invariant-Preserving Finite Difference Schemes for The Camassa-Holm Equation and the Two Component Camassa-Holm System.*
Hailiang Liu and **Terrance Pendleton***, Iowa State University (1116-65-1927)

3:00PM (1025) *Statistical validation of continuously structured population models for Daphnia magna.*
Kevin B Flores, North Carolina State University (1116-92-2383)

3:30PM (1026) *Random billiards and a thermally active Brownian particle.*
Timothy Chumley*, Iowa State University, **Scott Cook**, Tarleton State University, and **Renato Feres**, Washington University in St. Louis (1116-60-1832)

AMS Special Session on Stochastic Models in Population Biology

1:00 PM – 2:50 PM **Room 603, Washington State Convention Center**

Organizers: **Brian Dennis**, University of Idaho, Moscow
Eddy Kwessi, Trinity University

► 1:00PM (1027) *Allee effects and resilience in stochastic populations.*
Brian Dennis, University of Idaho (1116-92-2442)

► 1:30PM (1028) *A population biology interpretation of Bayesian Nonparametric Inference from Gene Genealogies.* Preliminary report.
José M. Ponciano, University of Florida, Biology Department (1116-92-2490)

► 2:00PM (1029) *Establishment of sexual invaders: Insights from frequency-dependent branching processes.*
Sebastian J. Schreiber*, University of California, Davis, and **Mathieu Faure**, Aix-Marseille School of Economics (1116-92-726)

2:30PM (1030) *Stochastic modified Beverton-Holt model with Allee effect II: the Cushing-Henson conjecture.*
Eddy Kwessi*, Trinity University, **Laila Assas**, King Abdul-Aziz University, **Brian Dennis**, University of Idaho, and **Saber Elaydi**, Trinity University (1116-60-2729)

AMS Special Session on The Mathematics of Computation

1:00 PM – 3:50 PM **Room 610, Washington State Convention Center**

Organizer: **Susanne C. Brenner**, Louisiana State University

► 1:00PM (1031) *Algorithms for Probabilistic Tsunami Hazard Assessment.* Preliminary report.
Randall J LeVeque, University of Washington (1116-86-1319)

1:30PM (1032) *Finite Element Methods for the Stochastic Allen-Cahn Equation with Gradient-type Multiplicative Noises.*
Xiaobing Feng, **Yukun Li** and **Yi Zhang***, The University of Tennessee, Knoxville (1116-65-2106)

► 2:00PM (1033) *Energy-Conserving Numerical Scheme for the Poisson-Nerst-Plank Equations.* Preliminary report.
Julienne Kabre, Illinois Institute of Technology (1116-35-518)

2:30PM (1034) *Adaptive BDDC methods for problems posed in $H(div)$.*
Duk-Soon Oh*, Rutgers University, **Olof B. Widlund**, Courant Institute, **Clark R. Dohrmann**, Sandia National Laboratories, and **Stefano Zampini**, King Abdullah University of Science and Technology (1116-65-1653)

3:00PM (1035) *A finite element method for high-contrast interface problems with error estimates independent of contrast.*
Manuel A. Sanchez-Uribe, Division of Applied Mathematics, Brown University (1116-65-2457)

► 3:30PM (1036) *Fast Structured Spectral Methods.*
Jie Shen, **Yingwei Wang*** and **Jianlin Xia**, Department of Mathematics, Purdue University (1116-65-26)

AMS Special Session on Topological Graph Theory: Structure and Symmetry, II

1:00 PM – 3:50 PM **Room 204, Washington State Convention Center**

Organizers: **Jonathan L. Gross**, Columbia University
Thomas W. Tucker, Colgate University

1:00PM (1037) *Combinatorial Conjectures that Imply Local Log-Connectivity of Graph Genus Polynomials.*
Jonathan L. Gross*, Columbia University, **Toufik Mansour**, University of Haifa, **Thomas W. Tucker**, Colgate University, and **David G.L. Wang**, Beijing Institute of Technology (1116-05-324)

1:30PM (1038) *The CLLC conjecture holds for cyclic permutations.*
J L Gross, Columbia University, **T Mansour**, University of Haifa, **T W Tucker**, Colgate University, and **Guoliang Wang***, Beijing Institute of Technology (1116-05-1715)

2:00PM (1039) *Embedding distributions of the ring-like families of graphs.*
Yichao Chen, Hunan University, China (1116-05-2282)

2:30PM (1040) *The recursive structure of genus polynomials for linear families.*
Thomas W Tucker*, Colgate University, **Jonathan L Gross**, Columbia University, and **Toufik Mansour**, University of Haifa, Israel (1116-05-2112)

► 3:00PM (1041) *Algorithms and Obstructions for Graph Embedding.* Preliminary report.
Wendy Myrvold, University of Victoria (1116-05-2677)

► 3:30PM (1042) *Practical computations in topological graph theory.*
Michal Kotrbcik, University of Southern Denmark (1116-05-2692)

MAA Invited Paper Session on Fair Division

1:00 PM – 3:50 PM **Room 607, Washington State Convention Center**

Organizers: **Michael Jones**, *Mathematical Reviews*
Jennifer Wilson, The New School

► 1:00PM (1043) *Maximin Envy-Free Division of Indivisible Items.*
Steven J. Brams, New York University, New York, NY, 10012, **D. Marc Kilgour***, Wilfrid Laurier University, Waterloo, ON, CANADA, N2L 3C5, and **Christian Klamler**, Institute of Public Economics, University of Graz, A-8010 Graz, Austria (1116-AC-984)

► 1:30PM (1044) *Super Fair Division - How Many Cuts.*
William Webb*, Washington State University, and **Thomas Hatdock**, US Army (1116-AC-372)

► 2:00PM (1045) *Envy-free divisions of continuous and discrete cakes.* Preliminary report.
Kathryn Nyman*, Willamette University, **Francis Su**, Harvey Mudd College, **Yan Zhang**, UC Berkeley, **Amanda Ruiz**, University of San Diego, and **Roberto Barrera**, Texas A&M University (1116-AC-2716)

2:30PM (1046) *Geometric Perspectives on Fair Division.*
Julius Barbanel, Union College (1116-AC-1278)

► 3:00PM (1047) *Dividing Child Support Funds Between Parents.*
Michael A Jones*, Mathematical Reviews/AMS, and **Jennifer Wilson**, Eugene Lang College, New School University (1116-AC-2450)

► 3:30PM (1048) *Solutions for Partially Defined Coalition Games.* Preliminary report.
David Housman, Goshen College (1116-AC-1944)

MAA Minicourse #10: Part A

1:00 PM – 3:00 PM **Tahoma 5, Tahoma Level Three, Washington State Conference Center**

Directing undergraduate research.

Presenter: **Aparna Higgins**, University of Dayton

MAA Minicourse #13: Part A

1:00 PM – 3:00 PM **Metropolitan B, 3rd Floor, Sheraton Seattle Hotel**

Introduction to process-oriented, guided-inquiry learning (POGIL) in mathematics courses.

Presenters: **Zdeňka Guadarrama**, Rockhurst University

Jill E. Guerra, University of Arkansas Fort Smith

Laurie Lenz, Mayrmount University

MAA Minicourse #7: Part A

1:00 PM – 3:00 PM **Metropolitan A, 3rd Floor, Sheraton Seattle Hotel**

Making sense of calculus with mapping diagrams.

Presenter: **Martin Flashman**, Humboldt State University

AMS Session on Associative and Nonassociative Algebra and Rings, I

1:00 PM – 4:10 PM **Chelan 4, Chelan Level Two, Washington State Conference Center**

1:00PM (1049) *Free Inverse Semigroupoid and Their Inverse Subsemigroups.*
Jon M Corson and **Veny Liu***, University of Alabama (1116-55-252)

1:15PM (1050) *Frobenius-Schur indicators for near group and Haagerup-Izumi fusion categories.*
Henry J. Tucker, University of Southern California (1116-18-1807)

1:30PM (1051) *Twisted complexes and the homotopy limit of some cosimplicial dg-categories.* Preliminary report.
Jonathan Block, University of Pennsylvania, **Julian Holstein**, University of Cambridge and Max Planck Institute for Mathematics, and **Zhaoting Wei***, Indiana University Bloomington (1116-18-2004)

1:45PM (1052) *A q-deformation of Fock and Goncharov's canonical basis for moduli spaces of local systems on surfaces.*
Dylan G.L. Allegretti, Yale University (1116-51-807)

2:00PM (1053) *Implicit Equations and Rees Algebra.*
Haohao Wang, Southeast MO State University (1116-13-408)

2:15PM (1054) *Ultraproducts of tannakian categories.*
Michael N Crumley, The University of Findlay (1116-18-2888)

2:30PM (1055) *On Classification of Solvable Leibniz Algebras.*
Ismail Demir, North Carolina State University (1116-17-916)

2:45PM (1056) *Leibniz Algebras and Vertex Algebras.*
Allison McAlister, High Point University (1116-17-1918)

3:00PM (1057) *Permutation Orbifolds.*
Nina Yu, University of California at Riverside (1116-17-1905)

► 3:15PM (1058) *Elasticity in Arithmetic Congruence Monoids.*
Paul Baginski, Fairfield University (1116-13-2771)

3:30PM (1059) *Shifted twisted Yangians and finite W-algebras.* Preliminary report.
Jonathan S Brown, SUNY Oneonta (1116-17-2034)

3:45PM (1060) *Crossed-product orders over valuation rings and the graphs of their cocycles.*
John S. Kauta, The University of the South Pacific (1116-16-164)

4:00PM (1061) *On Rings with some kinds of centrally-extended maps.*
Najat Mohammed Muthana, King Abdullaziz University (1116-16-500)

AMS Session on Combinatorics and Graph Theory, I

1:00 PM – 4:10 PM **Room 605, Washington State Convention Center**

1:00PM (1062) *Steiner systems, equiangular tight frames, and strongly regular graphs.*
John D Jasper*, University of Cincinnati, **Matthew Fickus**, **Dustin G Mixon** and **Jesse D Peterson**, Air Force Institute of Technology (1116-42-2710)

► 1:15PM (1063) *Cut Structures in Zero-Divisor Graphs of Commutative Rings.*
Michael Axtell, University of St. Thomas, **Nicholas Baeth**, University of Central Missouri, and **Joe Stickles***, Millikin University (1116-13-2599)

1:30PM (1064) *Partial coloring, vertex decomposability, and sequentially Cohen-Macaulay simplicial complexes.*
Jennifer Biermann*, Mount Holyoke College, **Christopher A. Francisco**, Oklahoma State University, **Huy Tài Hà**, Tulane University, and **Adam Van Tuyl**, McMaster University (1116-13-212)

► 1:45PM (1065) *Equitable Decompositions Using Automorphisms of Graphs.* Preliminary report.
Amanda Ellis Francis*, Brigham Young University, **B Webb**, Brigham Young Unversity, **W Barrett**, **R Echols** and **D Sorenson**, Brigham Young University (1116-15-2083)

► 2:00PM (1066) *Combinatorics of the q,t-symmetry relation in Macdonald polynomials.*
Maria Monks Gillespie, UC Berkeley (1116-05-393)

2:15PM (1067) *Tighter bounds on the Energy of Ramanujan graphs.*
Michelle R DeDeo, Univ. of North Florida (1116-11-2024)

2:30PM (1068) *An Algebraic Formula for the Kostka-Foulkes Polynomials.* Preliminary report.
Timothee William Bryan* and **Naihuan Jing**, North Carolina State University (1116-05-705)

2:45PM (1069) *A Lattice Path Interpretation of the Diamond Product.*
N Bradley Fox, Austin Peay State University (1116-05-741)

► 3:00PM (1070) *Lazy Cops and Robbers on Product Graphs.*
Brendan W Sullivan*, **Nikolas Townsend** and **Mikayla Werzanski**, Emmanuel College (1116-05-1605)

3:15PM (1071) *An upper bound on the algebraic connectivity of outerplanar graphs.*
Jason J Molitierno, Sacred Heart University (1116-15-1062)

► 3:30PM (1072) *The minimum span of $L(2,1)$-labelings of generalized flowers.*
Nathaniel Karst, Babson College, **Jessica Oehrlein***, Franklin W. Olin College of Engineering, **Denise Sakai Troxell**, Babson College, and **Junjie Zhu**, Stanford University (1116-05-277)

3:45PM (1073) *A new shellability proof of an old identity of Dixon.*
Ruth Davidson, University of Illinois Urbana-Champaign, **Augustine O'Keefe***, Connecticut College, and **Daniel Parry**, University of Cologne (1116-05-211)

4:00PM (1074) *Roger–Ramanujan Type Identities and Restricted k–Color F–Partitions.*
Dr. Meenakshi Rana, Thapar University, Punjab, India (1116-05-261)

AMS Session on Mathematical Biology and Related Fields, III

1:00 PM – 4:10 PM **Skagit 1, Skagit Lower Level, Washington State Conference Center**

► 1:00PM (1075) *Surviving through California's drought.*
Nikhil S Ladva*, **Rex Woon**, **Jesus Navarro** and **Alex Nguyen**, Cal Poly Pomona (1116-92-2850)

1:15PM (1076) *Vector-borne diseases model with residence time - a Lagrangian perspective.*
Derdei Bichara* and **Carlos Castillo-Chavez**, Arizona State University (1116-58-2645)

► 1:30PM (1077) *Real and Idealized Simulations of Tropical Cyclone Dynamics: The Impact of Environmental Flow.*
Joey A Cimochowski, Arizona State University (1116-76-2617)

1:45PM (1078) *Identifying Dysentery Vaccine Targets with a Clinically Parameterized Mathematical Model of Shigella Immunity.* Preliminary report.
Courtney L Davis, Pepperdine University (1116-92-1206)

► 2:00PM (1079) *Effect of Delayed Dispersal in an Infectious Disease Model of a Large Metapopulation.* Preliminary report.
Patrick Davis, Central Michigan University (1116-92-1759)

► 2:15PM (1080) *Numerical Solutions of the Barotropic Non-Divergent Vorticity Equation in the Presence of Tropical Cyclones.*
Brandon Hoogstra*, **Maher Achour**, **Joey Cimochowski** and **Ché Ortega**, Arizona State University, Tempe, Arizona (1116-76-2643)

2:30PM (1081) *An HIV model with age-structured latently infected cells.*
Areej M. Alshorman*, **Chathuri Samarasinghe**, Oakland University, MI, **Wenlian Lu**, Fudan University, China, and **Libin Rong**, Oakland University, MI (1116-92-709)

► 2:45PM (1082) *Inhomogeneous logistic equation and the Newton diagram.* Preliminary report.
Faina S Berezovskaya*, Howard University, Washington DC, and **Georgiy P Karev**, National Center for biotechnological information, National Institute of Health (1116-34-1630)

3:00PM (1083) *Towards a Better Image: The Hyperspectral Diffuse Optical Tomography Inverse Problem.*
Rachel Grotheer, Clemson University (1116-35-998)

► 3:15PM (1084) *Vegetative rhombic pattern formation driven by root suction for an interaction-diffusion plant-ground water model system in an arid flat environment.*
David J Wollkind*, Washington State University, **Inthira Chaiya**, Mahidol University, **Richard A Cangelosi**, **Bonni J Kealy-Dichone**, Gonzaga University, and **Chontita Rattanakul**, Mahidol University (1116-92-29)

3:30PM (1085) *A Spatiotemporal Stochastic Model for Tropical Precipitation and Water Vapor Dynamics.*
Scott Hottovy* and **Samuel N. Stechmann**, University of Wisconsin-Madison (1116-92-1139)

3:45PM (1086) *The influence of surfactant on the stability of a liquid bilayer inside a rigid tube.* Preliminary report.
Yuanyuan Song*, **David Halpern**, University of Alabama, and **James Grotberg**, University of Michigan (1116-35-2517)

► 4:00PM (1087) *Multi-scale asymptotics for atmospheric waves and precipitation.*
Shengqian Chen*, **S. N. Stechmann**, University of Wisconsin at Madison, and **A. J. Majda**, New York University (1116-76-1328)

AMS Session on Number Theory, III

1:00 PM – 3:55 PM **Chelan 5, Chelan Level Two, Washington State Conference Center**

1:00PM (1088) *Artin-Schreier Curves and Orbits of n-sets under* $\mathrm{PGL}_2(k)$. Preliminary report.
Anne M. Ho, Coastal Carolina University (1116-11-928)

1:15PM (1089) *Average Results on the Order of a modulo p.* Preliminary report.
Sungjin Kim, University of California Los Angeles (1116-11-1030)

► 1:30PM (1090) *Congruences for diagonals of rational power series.*
Eric Rowland*, University of Liege, and **Reem Yassawi**, Trent University (1116-11-451)

1:45PM (1091) *A modified Selberg's lower bound sieve and its applications.*
Pin-Hung Kao, Central Michigan University (1116-11-2076)

2:00PM (1092) *Elliptic Curve Variants of the Least Quadratic Nonresidue Problem and Linnik's Theorem.*
Ashvin Anand Swaminathan*, Harvard College, **Evan Chen**, Massachusetts Institute of Technology, and **Peter S. Park**, Princeton University (1116-11-360)

2:15PM (1093) *On A Simple Recurrence In the Accelerated $3x+1$ Minimum-Inverse Problem.*
Andrey Rukhin, Naval Surface Warfare Center - Dahlgren Division (1116-11-670)

2:30PM (1094) *Positivity of Constants Related to Elliptic Curves.*
Sungjin Kim, University of California Los Angeles (1116-11-1)

2:45PM (1095) *Realizable Classes and Embedding Problems.* Preliminary report.
Cindy Tsang, University of California, Santa Barbara (1116-11-2)

3:00PM (1096) *Idempotents in Skew-Constacyclic Codes.*
Neville Fogarty, University of Kentucky (1116-12-634)

3:15PM (1097) *Images of Galois representations associated to Hida families.*
Jaclyn A Lang, University of California, Los Angeles (1116-11-1067)

3:30PM (1098) *Arithmetic of algebraic tori.* Preliminary report.
Saikat Biswas, Arizona State University (1116-11-374)

3:45PM (1099) *Resolving Grosswald's Conjecture on GRH.*
Kevin McGown*, California State University, Chico, **Enrique Treviño**, Lake Forest College, and **Tim Trudgian**, Mathematical Sciences Institute, The Australian National University (1116-11-397)

AMS Session on Numerical Analysis, I

1:00 PM – 3:55 PM **Room 615, Washington State Convention Center**

1:00PM (1100) *Numerical Results for Linear Caputo Fractional Differential Equations with Variable Coefficients and Applications.* Preliminary report.
Bhuvaneswari Sambandham* and **Aghalaya S. Vatsala**, University of Louisiana at Lafayette (1116-34-316)

1:15PM (1101) *A Residual Based A Posteriori Error Estimation in hp-adaptive FEM for the Stokes Equations.*
Arezou Ghesmati*, **Bruno Turcksin** and **Wolfgang Bangerth**, Texas A&M University (1116-65-180)

1:30PM (1102) *Modeling the Effects of Sound in Chemical Reactions.* Preliminary report.
Jeffrey K Landgren* and **Gerhard Strohmer**, University of Iowa Mathematics Department (1116-76-2129)

1:45PM (1103) *Well-Balanced Central Upwind Schemes for the Euler Equations with Gravity.*
Şeyma N Özcan*, **Alina Chertock**, North Carolina State University, **Shumo Cui**, Temple University, **Alexander Kurganov**, Tulane University, and **Eitan Tadmor**, Center of Scientific Computation and Mathematical Modeling (CSCAMM), University of Maryland, College Park (1116-65-2540)

► 2:00PM (1104) *A Locking-Free Weak Galerkin Finite Element Method for Elasticity Problems in the Primal Formulation.* Preliminary report.
Chunmei Wang, Georgia Institute of Technology (1116-65-245)

► 2:15PM (1105) *Numerical solutions of higher order eigenvalue problems.*
Md. Shafiqul Islam, Department of Applied Mathematics, University of Dhaka, Dhaka 1000, Bangladesh (1116-65-321)

2:30PM (1106) *Nonconforming Immersed Finite Element Methods for Interface Problems.*
Xu Zhang, Purdue University (1116-65-384)

2:45PM (1107) *A posteriori error estimation for a cut cell method with uncertain interface location.*
J. B. Collins*, West Texas A&M University, **Don Estep** and **Simon Tavener**, Colorado State University (1116-65-251)

► 3:00PM (1108) *Guaranteed Local Adaptive Interpolation.*
Yuhan Ding, Illinois Institute of Technology, **Sou-Cheng T Choi**, U Chicago NORC and Illinois Institute of Technology, and **Fred J Hickernell***, Illinois Institute of Technology (1116-65-1620)

3:15PM (1109) *A time-splitting scheme for non-hydrostatic atmospheric models.*
Andrei Bourchtein* and **Ludmila Bourchtein**, Pelotas State University, Brazil (1116-65-481)

3:30PM (1110) *A New Method for Solving the Obstacle Problem.*
Joseph Eichholz, Rose-Hulman Institute of Technology (1116-65-749)

► 3:45PM (1111) *Analysis of the Self-Consistent IMEX Method for Tightly Coupled Non-linear Systems.* Preliminary report.
Samet Y Kadioglu, Idaho National Laboratory (1116-65-874)

AMS Session on Probability Theory, Stochastic Processes, and Statistics, II

1:00 PM – 3:10 PM **Room 616, Washington State Convention Center**

1:00PM (1112) *Covariance structure of time-changed fractional Brownian motion.*
Jebessa B Mijena, Georgia College & State University (1116-60-2051)

► 1:15PM (1113) *A comparison of stochastic differential equation models in population biology.* Preliminary report.
Don G Wilathgamuwa, Montana State University Billings (1116-60-2138)

► 1:30PM (1114) *Grounding Algorithms in Principled Mathematics: A Perspective from Industry.*
Jim Ferry, Metron, Inc. (1116-60-2393)

► 1:45PM (1115) *Discrete Time Random Walks and p-Adic Brownian Motion.*
David Eric Weisbart*, University of California, Riverside, and **Erik Bakken**, Norwegian University of Science and Technology (1116-60-2726)

2:00PM (1116) *A lower bound for the difference between the bond percolation thresholds of the cubic and face-centered cubic lattices.* Preliminary report.
John C. Wierman, Johns Hopkins University (1116-60-442)

2:15PM (1117) *Estimating parameters for the spatial Ornstein-Uhlenbeck process with missing observations.* Preliminary report.
Sami Cheong, University of Wisconsin, Milwaukee (1116-62-1356)

2:30PM (1118) *Stochastic Vector-Host Epidemic Model with direct transmission.*
Dawit Befekadu Denu, PhD student at Auburn University (1116-60-2951)

► 2:45PM (1119) *Analysis of KCSE performance in Nakuru county: A generalized estimating equations approach.*
Elvis Karanja Muchene, University of Nairobi (1116-62-83)

► 3:00PM (1120) *Spectral graph methods for inference on attributed graphs.* Preliminary report.
David J Marchette, Naval Surface Warfare Center, Dahlgren Division (1116-62-1121)

MAA Session on Assessing Student Learning: Alternative Approaches, IV

1:00 PM – 2:55 PM **Room 608, Washington State Convention Center**

Organizers: **David Clark**, Grand Valley State University
Jane Butterfield, University of Victoria
Robert Campbell, College of St. Benedict/St. John's University
Cassie Williams, James Madison University

► 1:00PM (1121) *Using Poetry to Assess Students' Learning of Mathematics.*
Karen D Morgan, New Jersey City University (1116-A5-2720)

► 1:20PM (1122) *Weekly writing: a lab-notebook in calculus for non-majors.* Preliminary report.
Sean M Laverty* and **Brittany E Bannish**, University of Central Oklahoma, Department of Mathematics and Statistics (1116-A5-2644)

► 1:40PM (1123) *Have Students write memos (with a word limit but no limit on pictures) for each other to enhance their understanding of mathematical ideas and concepts.*
Rob Eby, Blinn College - Bryan Campus (1116-A5-1038)

► 2:00PM (1124) *Exploration of College Students' Learning through Writing in a Developmental Mathematics Course.*
Soofia Malik, University of Wyoming (1116-A5-577)

► 2:20PM (1125) *Journaling to Assess Progress in Undergraduate Research.*
William E. Gryc, Muhlenberg College (1116-A5-396)

► 2:40PM (1126) *Concept Maps as a Way to Assess Form and Quality of Student Understanding of Algebra Concepts.*
Aaron Brakoniecki, Boston University (1116-A5-912)

MAA Session on Bringing the Community into the College Mathematics Classroom

1:00 PM – 2:15 PM **Room 620, Washington State Convention Center**

Organizer: **Ksenija Simic-Muller**, Pacific Lutheran University

► 1:00PM (1127) *Mathematical Modeling in Service of Community or Teaching Without Answers in the Back of the Book.*
Joanne C Caniglia, Kent State University (1116-B1-35)

► 1:20PM (1128) *Collaboration with the Boston Children's Museum.*
Emma Smith Zbarsky, Wentworth Institute of Technology (1116-B1-1119)

1:40PM ► (1129) *Improving algebra skills of university students through participation in academic service-learning.*
Ekaterina Yurasovskaya, Department of Mathematics, Seattle University (1116-B1-341)

2:00PM ► (1130) *Connecting Quantitative Literacy to Financial Literacy in the Community.* Preliminary report.
Andrew J Miller, Belmont University (1116-B1-2339)

MAA Session on Common Core State Standards (CCSS) for Mathematics Practices and Content: The Role of Math Departments in Preparing Math Education Candidates for New Assessments

1:00 PM – 4:15 PM **Room 303, Washington State Convention Center**

Organizers: **William Martin**, North Dakota State University
Karen Morgan, New Jersey City University
Gulden Karakok, University of Northern Colorado
James A. Mendoza Epperson, University of Texas-Arlington

1:00PM (1131) *Rethinking the Undergraduate Curriculum for Secondary Mathematics Teacher Preparation: Using Mathematical Modeling Modules to Address Common Core Standards.*
Cynthia Oropesa Anhalt*, The University of Arizona, and **Ricardo Cortez**, Tulane University (1116-C1-423)

1:20PM ► (1132) *The Challenges of implementing the Common Core State Standards in Mathematics: A survey analysis.* Preliminary report.
Xiaofen Zhang, Indiana State University (1116-C1-784)

1:40PM (1133) *Collaborative Effort to Address the Common Core State Standards for Mathematics In a Middle School Mathematics Teacher Certification Program.*
Ruthmae Sears* and **Fernando Burgos**, University of South Florida (1116-C1-2398)

2:00PM ► (1134) *How Mathematics Departments and Schools of Education must collaborate to prepare future teachers for the new certification assessments and for successfully teaching Common Core State Standards.*
Betty C Rogers, Piedmont College (1116-C1-2969)

2:20PM (1135) *Reconsidering the role of a university math department in the local community of teachers.* Preliminary report.
Greisy Winicki-Landman, Department of Mathematics and Statistics - Cal Poly Pomona (1116-C1-359)

2:40PM ► (1136) *A report from the field: CCSS, PARCC and higher education.*
J. D. Berg, Fitchburg State University (1116-C1-1731)

3:00PM (1137) *The Cycle: Changing the Culture in K-12 Classrooms.*
Kimberly R Elce, CSU Sacramento (1116-C1-2141)

3:20PM ► (1138) *Contextualizing CCSS-M in Geometry Course: Innovative Approach, Effectiveness of Fundamental Changes.* Preliminary report.
Tetyana Berezovski, Associate Professor/Department of Mathematics, St. Joseph's University, Philadelphia (1116-C1-1796)

3:40PM ► (1139) *Teacher Candidates Discover the Power of CCSS Mathematical Practices.* Preliminary report.
Mark D Oursland, Central Washington University (1116-C1-1201)

4:00PM ► (1140) *Comparing Warren Colburn's 1825 Text, First Lessons in Arithmetic, with the Common Core State Standards in Mathematics.*
Crystal Sue Montana, New Mexico State University (1116-C1-1172)

MAA Session on Innovative Targeted Solutions in Teaching Introductory Statistics, II

1:00 PM – 4:15 PM **Yakima 1, Yakima Level One, Washington State Conference Center**

Organizers: **Patti Frazer Lock**, St. Lawrence University
Randall Pruim, Calvin College
Sue Schou, Idaho State University

1:00PM (1141) *Using Targeted Fun in College Introductory Statistics to Decrease Anxiety and Increase Learning: Research, Resources, and Recommendations.*
Lawrence M. Lesser*, The University of Texas at El Paso, **John J. Weber III**, Georgia Perimeter College, and **Dennis K. Pearl**, Pennsylvania State University (1116-H5-1335)

1:20PM ► (1142) *Updating the GAISE College Report.* Preliminary report.
Robin H Lock, St. Lawrence University (1116-H5-2036)

1:40PM ► (1143) *Readin', Writin', and Calculatin': Our Intro Stats Course Foci.*
Timothy Kelly, **Larry Edward Knop*** and **Chinthaka Kuruwita**, Hamilton College, Clinton, NY (1116-H5-2529)

2:00PM ► (1144) *Introductory Statistics in a Scale-Up Classroom.* Preliminary report.
Beverly M Reed, Kent State University (1116-H5-2869)

2:20PM ► (1145) *A "Hybrid Flipped" Introduction to Biostatistics to Promote Research-Like Experiences.*
Rodney X. Sturdivant* and **Rebecca R. Andridge**, The Ohio State University (1116-H5-933)

2:40PM ► (1146) *Undergraduate Students Can Do Original Mathematical Research.*
Stanley Rothman, Quinnipiac University Hamden Ct. 06518 (1116-H5-142)

3:00PM ► (1147) *From Conjecture to Conclusion: Achieving student engagement through an emphasis on the power and limitations of statistical ways of knowing.*
Troy Riggs, Union University (1116-H5-1321)

3:20PM (1148) *Students' Conceptual Understanding of Variability throughout an Introductory Statistics Course.*
Rachel M Chaphalkar, University of Wisconsin - Whitewater (1116-H5-2737)

3:40PM ► (1149) *Effects of Supplemental Instruction on Student Achievement in an Introductory Statistics Course.* Preliminary report.
Emily D Baum* and **Brandon L Samples**, Georgia College & State University (1116-H5-2443)

4:00PM ► (1150) *Language in the Statistics Classroom: When the Problem Isn't Just the Math.*
Jon Pierre Fortney*, Department of Mathematics and Statistics, Zayed University, and **Liane Sandrey**, Academic Bridge Program, Zayed University (1116-H5-1015)

MAA Session on Inquiry-Based Teaching and Learning, I

1:00 PM – 4:15 PM **Room 619, Washington State Convention Center**

Organizers: **Brian Katz**, Augustana College
Victor Piercey, Ferris State University

1:00PM ► (1151) *Secondary School Mathematics without a Textbook.*
Aviva A. Halani* and **Thomas D. Seidenberg**, Phillips Exeter Academy, Exeter, NH (1116-J5-1168)

1:20PM ► (1152) *Introducing Inquiry-Based Mathematics Learning Materials into South African Public Schools.* Preliminary report.
Sarah Wolff, Denison University (1116-J5-1957)

1:40PM (1153) *A New Method to develop the Logical-Mathematical Intelligence for solving the Mathematical problems.*
Daoud Salman, E. I. B International School of Paris-France (1116-J5-1261)

2:00PM (1154) *Inquiry-based approach to teaching an introduction to proving course.*
Shiv Smith Karunakaran* and **Abigail L Higgins**, Washington State University (1116-J5-1149)

2:20PM ► (1155) *Constructing a Growth Mindset Environment: Using Psychological Interventions to Support IBL Pedagogies.* Preliminary report.
Benjamin Braun, University of Kentucky (1116-J5-300)

2:40PM (1156) *Introducing IBL to Future Elementary Teachers and Others in a Geometrical Explorations Course.* Preliminary report.
Teresa D Magnus, Rivier University (1116-J5-2600)

3:00PM ► (1157) *From Patterns to Proof: Using Inquiry-Based Learning to Turn Elementary School Classrooms into Communities of Mathematicians.* Preliminary report.
Reva Kasman, Salem State University (1116-J5-190)

3:20PM ► (1158) *An Active STEM Prep Curriculum.*
Frank Savina, The Charles A. Dana Center at the University of Texas at Austin, **Stuart Boersma***, Central Washington University, and **Rebecca Hartzler**, Seattle Central College (1116-J5-1886)

3:40PM (1159) *Developing Elementary Teachers' Pedagogical Knowledge through Improving their Math Content knowledge.*
Ali S Shaqlaih, University of North Texas at Dallas (1116-J5-2508)

4:00PM ► (1160) *Inquiry-Based Activities for Linear Algebra.*
Steven Schlicker* and **Feryal Alayont**, Grand Valley State University (1116-J5-1288)

MAA Session on Recreational Mathematics: Puzzles, Card Tricks, Games, Game Shows, and Gambling, II

1:00 PM – 4:15 PM **Room 304, Washington State Convention Center**

Organizers: **Paul R. Coe**, Dominican University
Sara B. Quinn, Dominican University
Marioni Weedermann, Dominican University

1:00PM ► (1161) *Chuteless and Ladderless.* Preliminary report.
Darren Glass, Gettysburg College, **S K Lucas**, James Madison University, and **Jonathan Needleman***, Le Moyne College (1116-Q1-1984)

1:20PM ► (1162) *Mathematics in the Settlers of Catan.* Preliminary report.
Susanna Molitoris Miller*, Kennesaw State University, **Brian G. Kronenthal**, Kutztown University, **Jathan W. Austin**, Salisbury University, and **Jonathon A. Miller**, Kennesaw State University (1116-Q1-407)

1:40PM ► (1163) *Cops and Robbers meets Chess.*
Brendan W Sullivan*, **Nikolas Townsend** and **Mikayla Werzanski**, Emmanuel College (1116-Q1-1632)

2:00PM ► (1164) *Grime Dice and the Archbishop.* Preliminary report.
Ward Heilman*, **Leonard Sprague** and **Nicholas Pasciuto**, Bridgewater State University (1116-Q1-1904)

2:20PM ► (1165) *Confused Electrician Games.* Preliminary report.
Tom Edgar* and **Jessica Sklar**, Pacific Lutheran University (1116-Q1-1160)

2:40PM ► (1166) *Discussion on some combinatorial problems in "2048" Game.* Preliminary report.
Tong Liu, Tsinghua University (1116-Q1-2278)

3:00PM ► (1167) *Fibonacci over Lucas; Lucas over Five Fibonacci - Winning Probabilities in a Game of Chance.*
Bruce Torrence, Randolph-Macon College (1116-Q1-304)

3:20PM ► (1168) *Knights and Knaves in the Classroom.*
Oscar Levin, University of Northern Colorado (1116-Q1-1955)

3:40PM ► (1169) *On Prisoners, Hats, and Sperner Labelings.* Preliminary report.
Deborah E. Seacrest* and **Tyler P. Seacrest**, University of Montana Western (1116-Q1-1363)

4:00PM (1170) *What is left after everything is removed? Unexpected results from infinite processes.*
Aaron Montgomery, Central Washington University (1116-Q1-951)

MAA Session on Research in Undergraduate Mathematics Education, II

1:00 PM – 3:55 PM **Room 2B, Washington State Convention Center**

Organizer: **Karen A. Keene**, North Carolina State University

1:00PM ► (1171) *An investigation into learning about integrals as participation in different professional communities.*
William L Hall, North Carolina State University (1116-Q5-2384)

1:20PM ► (1172) *The State of Student Understanding in Introductory Group Theory: Results from the Group Concept Inventory.*
Kathleen Melhuish, Teachers Development Group (1116-Q5-532)

1:40PM ► (1173) *Gender, switching, and student perceptions of Calculus I.*
Jessica Ellis and **Rebecca Cooper***, Colorado State University (1116-Q5-421)

2:00PM ► (1174) *Graphing habits and students' thinking about graphs emergently.*
Kevin C. Moore, University of Georgia (1116-Q5-91)

2:20PM ► (1175) *An investigation of student resources for function and rate of change in differential equations.*
George Kuster, Virginia Tech (1116-Q6-2748)

2:40PM ► (1176) *Teachers' meanings for function notation in U.S.A. and Korea.*
Hyunkyoung Yoon* and **Patrick W Thompson**, Arizona State University (1116-Q6-2736)

3:00PM ► (1177) *The Transition to Proof in Collegiate Mathematics: Examining A Hybrid Lecture/Laboratory Approach at a Large Public Research University.* Preliminary report.
Mariana Levin*, Department of Mathematics, Western Michigan University, **John P. Smith III**, College of Education, Michigan State University, **Aaron Levin**, Department of Mathematics, Michigan State University, **V. Rani Satyam** and **Younggon Bae**, Program in Mathematics Education, Michigan State University (1116-Q6-2674)

3:20PM (1178) *Realizations of the Derivative in Three Widely Used Calculus Textbooks.*
Jungeun Park, University of Delaware (1116-Q6-2470)

3:40PM ► (1179) *An Analysis of Undergraduate Students' Mathematical Foresight.* Preliminary report.
Wes Maciejewski* and **Bill Barton**, The University of Auckland (1116-Q6-2247)

MAA General Contributed Paper Session on Algebra, I

1:00 PM – 3:55 PM **Room 212, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University

Bem Cayco, San Jose State University

Timothy Comar, Benedictine University

T. James Reid, University of Mississippi

1:00PM ► (1180) *When are finite projective planes magic?*
David A Nash* and **Jonathan Needleman**, Le Moyne College (1116-VA-1891)

1:15PM (1181) *Monotone Catenary Degree In Numerical Monoids.*
Jenna Nicole Zomback, SUNY Geneseo, **Cameron Wright***, Carleton College, and **Daniel Gonzalez**, Florida International University (1116-VA-2577)

1:30PM (1182) *On Factorable Rings.*
Andrew J. Hetzel*, Tennessee Tech University, and **Ashley M. Lawson**, University of Kentucky (1116-VA-1037)

1:45PM (1183) *I*J=-K.*
James Joe McCarry, Laredo Community College (1116-VA-1192)

2:00PM (1184) *Initial Ideals of Phylogenetic Secant Ideals.*
Colby Long, North Carolina State University (1116-VA-1276)

2:15PM (1185) *The word problem for positively presented semigroups and inverse semigroups.*
Muhammad Inam, University of Nebraska-Lincoln (1116-VA-1387)

2:30PM (1186) *An upper bound for absolute length of Coxeter group elements.*
Brian Drake* and **Evan Peters**, Grand Valley State University (1116-VA-1418)

2:45PM (1187) *Involution Posets of Non-Crystallographic Coxeter Groups.*
Abigail C Bishop, Iona College (1116-VA-1539)

3:00PM (1188) *Ascending chain condition in composite Hurwitz rings.* Preliminary report.
Dong Kyu Kim*, Kyungpook Nationl University, and **Jung Wook Lim**, Kyungpook National University (1116-VA-1697)

3:15PM (1189) *Invariant Forms on Minuscule Representations.* Preliminary report.
Erica Shannon, University of Colorado Boulder (1116-VA-1829)

3:30PM (1190) *C-ideals, Cartan subalgebras, and the covering-avoidance property in Leibniz algebras.* Preliminary report.
Bethany Turner, North Carolina State University (1116-VA-1899)

3:45PM (1191) *Submonoids of the Formal Power Series.* Preliminary report.
Furuzan Ozbek*, Auburn University, **Edgar Enochs**, University of Kentucky, and **Overtoun Jenda**, Auburn University (1116-VA-1933)

MAA General Contributed Paper Session on Analysis, I

1:00 PM – 3:10 PM **Room 617, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

1:00PM (1192) *Quasiconformal Mappings and Equilateral Triangles.*
Colleen Ackermann*, University of Illinois at Urbana-Champaign, **Peter Haïssinsky**, Université de Provence, and **Aimo Hinkkanen**, University of Illinois at Urbana-Champaign (1116-VB-1089)

1:15PM (1193) *Evolution Semigroups for Well-Posed, Non-Autonomous Evolution Families.* Preliminary report.
Austin Scirratt*, Louisiana State University, **Ladorian Latin**, Franklin University, and **Frank Neubrander**, Louisiana State University (1116-VB-1091)

1:30PM (1194) *Orbital stability of standing-wave solutions to the non-linear Schroedinger equation in dimension one.* Preliminary report.
Daniele Garrisi, Inha University (1116-VB-1483)

1:45PM (1195) *Property (wL) and the Reciprocal Dunford-Pettis Property in projective tensor products.*
Ioana Ghenciu, University of Wisconsin-River Falls (1116-VB-1609)

2:00PM (1196) *Simple connectivity and the chaotic behavior of operators on a space of harmonic functions.*
Leonardo Pinheiro*, Rhode Island College, **Gokul Kadel**, Cameron University, and **Kit Chan**, Bowling Green State University (1116-VB-1613)

2:15PM (1197) *Chaotic Differentiation Operators and Simple Connectivity.*
Gokul R Kadel, Cameron University (1116-VB-1708)

2:30PM (1198) *A radial uniqueness theorem in higher dimensions.* Preliminary report.
Michael C. Fulkerson, University of Central Oklahoma (1116-VB-1793)

2:45PM (1199) *On a First Order Rational System of Difference Equations with Non-Constant Coefficients.*
Yevgeniy Kostrov*, Xavier University of Louisiana, and **Zachary Kudlak**, Monmouth University (1116-VB-2343)

3:00PM (1200) *Chaos in a Wider Context.* Preliminary report.
C. P. Money, University of Louisville (1116-VB-2045)

MAA General Contributed Paper Session on Interdisciplinary Topics in Mathematics, II

1:00 PM – 2:40 PM **Room 618, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University

Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

► 1:00PM (1201) *Undergraduate Research in Mathematical Biology with limited Faculty, Students, and Resources.* **James A. Vance**, The University of Virginia's College at Wise (1116-VH-162)

► 1:15PM (1202) *Strategies for teaching cryptography.* Preliminary report. **Javad Namazi**, Fairleigh Dickinson University (1116-VH-2735)

► 1:30PM (1203) *Unsteady boundary-layer flow of nanofluid over a flat plate.* **Anilkumar Devarapu***, **Zephyrinus C Okonkwo** and **Marrisa Merrell**, Albany State University (1116-VH-2925)

► 1:45PM (1204) *Enzyme diffusion through a degrading blood clot.* **Brittany Bannish**, University of Central Oklahoma (1116-VH-533)

► 2:00PM (1205) *Using Mathematics to Aid in the Registration of Robotic Systems.* **Mili I Shah**, Loyola University Maryland (1116-VH-722)

► 2:15PM (1206) *Protein Adsorption in Porous Membranes.* **Anastasia Bridner Wilson**, Clemson University (1116-VH-805)

► 2:30PM (1207) *A Sparse Coding Model of the Hippocampal Dentate Gyrus.* **William Severa***, **James Bradley Aimone** and **Ojas Parekh**, Sandia National Laboratories (1116-VH-958)

MAA General Contributed Paper Session on Mathematics and Technology

1:00 PM – 3:25 PM **Yakima 2, Yakima Level One, Washington State Conference Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

► 1:00PM (1208) *STEM Apprentices in the Modern Classroom: Using Technology to Bring Ancient Teaching Techniques into the Modern World.* **Heather Pierce**, Emmanuel College (1116-VK-2092)

► 1:15PM (1209) *Updating the WeBWorK Problem Library.* Preliminary report. **Jeff Holt***, University of Virginia, and **John Jones**, Arizona State University (1116-VK-1339)

► 1:30PM (1210) *A One-To-One iPad Initiative in Precalculus.* Preliminary report. **Caitlin Phifer**, Merrimack College (1116-VK-1774)

► 1:45PM (1211) *Goals and Conflicts in a Computer-Centered Mathematics Class.* **Geillan Dahab Aly**, University of Arizona (1116-VK-1876)

► 2:00PM (1212) *Using technology to foster large scale undergraduate research collaborations.* **Jason Parsley**, Wake Forest University, and **Joseph Rusinko***, Hobart and William Smith Colleges (1116-VK-2267)

2:15PM (1213) *Multiple geometry views in GeoGebra through the calculus sequence.* **Edward D. Kim**, University of Wisconsin-La Crosse (1116-VK-2400)

► 2:30PM (1214) *A LaTeX package to generate Moodle quizzes: moodle.sty.* **Anders O.F. Hendrickson**, Saint Norbert College (1116-VK-2408)

► 2:45PM (1215) *Using technology to enhance student learning in general education mathematics courses.* Preliminary report. **Petre I Ghenciu***, University of Wisconsin-Stout, and **Alexandru G Atim**, Benedict College (1116-VK-2564)

► 3:00PM (1216) *Animations! Riemann Surfaces and Interactive Computer Animations.* **Paul R McCreary**, The Evergreen State College - Tacoma (1116-VK-2744)

3:15PM (1217) *Promote communication with students by using a text phone in a multi variable calculus classroom.* Preliminary report. **Myungchul Kim**, Suffolk County Community College (1116-VK-771)

MAA General Contributed Paper Session on Modeling and Applications, II

1:00 PM – 3:25 PM **Room 214, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

► 1:00PM (1218) *Using Modeling and a Community Based Participatory Research Strategy to Stop the Spread of Palmer Amaranth in Iowa.* Preliminary report. **Molly Monk***, **Teig Loge**, **Park Ellis Mikels** and **Maggie Long**, Simpson College (1116-VM-1614)

► 1:15PM (1219) *Impact of kidney structural architecture on oxygen transport: A mathematical model.* **Brendan C. Fry**, University of Colorado Boulder (1116-VM-1623)

1:30PM (1220) *Modeling Adsorption Kinetics (Bio-remediation of Heavy Metal Contaminated Water).* **Chris McCarthy**, Borough of Manhattan Community College, City University of New York (1116-VM-1676)

► 1:45PM (1221) *Modeling Effects of Regulatory T Cells in Antitumor Laser Immunotherapy.* **Bryan A Dawkins*** and **Sean M Laverty**, University of Central Oklahoma (1116-VM-1701)

2:00PM (1222) *A central pattern generator-driven integrative multi-scale model of lamprey locomotion with sensory feedback.* **Christina L. Hamlet***, Tulane University, **Eric D. Tytell**, Tufts University, and **Lisa J. Fauci**, Tulane University (1116-VM-1748)

► 2:15PM (1223) *Dynamics of Vector-borne Relapsing Diseases.* **Cody A Palmer**, Univeristy of Montana, Missoula (1116-VM-1819)

► 2:30PM (1224) *Dispersal-Induced Global Extinction in Two-Patch Model under the Allee Effect.* **Margaret Elizabeth Swift***, **Leah Shaw** and **Junping Shi**, The College of William & Mary (1116-VM-2000)

► 2:45PM (1225) *An Extensible Mathematical Model of Glucose Metabolism.* **Caleb L Adams**, Radford University (1116-VM-1861)

► 3:00PM (1226) *Modeling in vitro studies of anthrax spore and macrophage interactions.* Preliminary report. **Megan O Powell**, University of St. Francis (1116-VM-1951)

► 3:15PM (1227) *Short-Term vs Long-Term Strategy in the Game of Monopoly.* Preliminary report. **Mitchell Eithun**, **McKenzie Lamb*** and **Andrea Young**, Ripon College (1116-VM-1956)

MAA General Contributed Paper Session on Probability and Statistics, II

1:00 PM – 3:55 PM **Room 213, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University

Bem Cayco, San Jose State University

Timothy Comar, Benedictine University

T. James Reid, University of Mississippi

1:00PM (1228) *Almost periodic random sequences in probability.* Preliminary report. **Paul H Bezandry**, Howard University (1116-VP-1744)

1:15PM (1229) *An extended Lindley Poisson distribution with applications.* **Mavis Pararai***, Indiana University of Pennsylvania, **Broderick Olusegun Oluyede**, Georgia Southern University, and **Gayan Warahena Liyanage**, Central Michigan University (1116-VP-1756)

► 1:30PM (1230) *Avoidance Coupling of Simple Random Walks: Graph Conditions.* Preliminary report. **Ewa J Infeld**, Dartmouth College (1116-VP-1900)

1:45PM (1231) *A Comparative Study of Structural Equation Models vs. Alternative Models for Multivariate Longitudinal Data.* **Budhinath Padhy***, University of Hartford, and **Gemechis Djira**, South Dakota State University, Brookings, SD (1116-VP-1972)

► 2:00PM (1232) *Statistical analysis of a case-control Statistical Analysis of a Case-Control Alzheimer's Disease: a Retrospective Approach with Sucient Dimension Reduction.* **Rebecca Rachan***, North Central College, **Subodh Selukar**, University of North Carolina, Chapel Hill, **Trevor Adriaanse**, Bucknell University, and **Meshach Hopkins**, University of Maryland, Baltimore County (1116-VP-2065)

► 2:15PM (1233) *Using simulation to understand the Central Limit Theorem for Proportion.* Preliminary report. **Ann E Moskol**, Rhode Island College (1116-VP-2070)

► 2:30PM (1234) *Probabilistic Analysis of Polyovulation.* **Tiffany N. Kolba**, Valparaiso University (1116-VP-2103)

2:45PM (1235) *Mixing Times for Markov Chains on Lattices via Weak Limits.* Preliminary report. **Mathew Titus**, Oregon State University (1116-VP-2150)

► 3:00PM (1236) *A Statistical Study to determine the criteria for winning in Mixed Martial Arts for the Ultimate Fighting Championship (UFC).* Preliminary report. **Victor Villalpando**, The University of Texas Rio Grande Valley (1116-VP-2176)

► 3:15PM (1237) *Age-Specific Variations in Cancer Mortality rates: A Functional Data Approach.* **Keshav Pokhrel***, University of Michigan-Dearborn, and **Chris Tsokos**, University of South Florida (1116-VP-2277)

3:30PM (1238) *Bootstrapping Time Series Models.* Preliminary report. **Mosisa G Aga**, Auburn University Montgomery (1116-VP-2311)

► 3:45PM (1239) *Adaptations to curvature based denoising.* **James Matuk**, Duquense University (1116-VP-2315)

SIAM Minisymposium on K-8 Applied Mathematics Outreach Activities

1:00 PM – 4:10 PM **Room 3A, Washington State Convention Center**

Organizers: **Rachel Levy**, Harvey Mudd College
Suzanne Lenhart, University of Tennessee

1:00PM ► (1240) *Mathematical Modeling in Elementary Grades: Outreach activities from the IMMERSION program.*
Rachel Levy, Harvey Mudd College (1116-97-581)

1:35PM ► (1241) *NIMBIoS activities connecting math and science in middle school.*
Suzanne Lenhart*, U of Tennessee and NIMBioS, **Kelly Sturner**, National Institute for Mathematical and Biological Synthesis, and **Virginia Parkman**, U of Tennessee and NIMBioS (1116-92-1361)

2:10PM ► (1242) *"Energizing Students"- a STEM program targeted toward Hispanic middle school students.*
Elizabeth (Betsy) G Yanik, Emporia State University (1116-97-1592)

2:45PM (1243) *Integrated Math and Physics with Roller Coaster Design for Middle School Students.*
Katie R Fowler, Clarkson University (1116-97-567)

3:20PM ► (1244) *Quantitative Lying: data literacy and applied mathematics.*
Katherine Socha, Park School of Baltimore (1116-97-1516)

3:50PM Discussion: Outreach ideas from the audience

AMS Committee on Education Panel Discussion

1:00 PM – 2:30 PM **Skagit 2, Skagit Lower Level, Washington State Conference Center**

What is a Mathematics PhD?

MAA Panel Discussion

1:00 PM – 2:20 PM **Room 609, Washington State Convention Center**

Interdisciplinary modeling experiences for undergraduates.

Organizers: **Amanda Beecher**, Ramapo College of New Jersey
Chris Arney, United States Military Academy

Panelists: **Heidi Berger**, Simpson College
Jessica Libertini, Virginia Military Institute
Gary Olson, Universiry of Colorado Denver
Robert Wooster, College of Wooster

MAA Committee on Professional Development Panel Discussion

1:00 PM – 2:20 PM **Room 612, Washington State Convention Center**

Mid-career faculty: Charting the next half of your career.

Organizer: **Jenna P. Carpenter**, Louisiana Tech University

Panelists: **Jonathan K. Hodge**, Grand Valley State University
Judith Covington, Louisiana State University at Shreveport
Annalisa Crannell, Franklin and Marshall College
Brigitte Lahme, Sonoma State University
Ronald Taylor, Berry College

Joint Committee on Women Panel Discussion

1:00 PM – 2:30 PM **Room 611, Washington State Convention Center**

Success in graduate school (and the rest of your life).

Organizers: **Patricia Hale**, California State Polytechnic University, Pomona
Magnhild Lien, California State University, Northridge
Bernd Sturmfels, University of California at Berkeley

Panelists: **Sara Billey**, University of Washington, Seattle
Anastasia Chavez, University of California at Berkeley
Courtney Gibbons, Hamilton College
Abbe Herzig, SUNY at Albany
Candice Price, Sam Houston State University
Ami Radunskaya, Pomona College

Summer Program for Women in Mathematics (SPWM)Reunion

1:00 PM – 3:00 PM **Room 3B, Washington State Convention Center**

MAA Invited Address

2:00 PM – 2:50 PM **Ballroom 6A, Washington State Convention Center**

► (1245) *Studying mathematics learning and improving mathematics teaching: building careers of integrated scholarship and practice.*
Joan Ferrini-Mundy, National Science Foundation (1116-A0-2993)

MAA Poster Session on Projects Supported by the NSF Division of Undergraduate Education

2:00 PM – 4:00 PM **Hall 4F, 4th Floor, Washington State Convention Center**

Organizer: **Jon Scott**, Montgomery College

2:00PM (1246) *Collaborative Research: Data-Driven Applications Inspiring Upper-Division Mathematics.*
Heather Moon*, St. Mary's College of Maryland, **Tom Asaki**, Washington State University, **Chris Camfield**, Hendrix College, and **Marie Snipes**, Kenyon College

2:00PM (1247) *Native American-based Mathematics Materials for Integration into Undergraduate Courses.*
Charles Funkhouser*, **Harriet C. Edwards**, California State University Fullerton, and **Miles Pfahl**, Turtle Mountain Community College

2:00PM (1248) *STEM Real World Applications of Mathematics.*
Darren A. Narayan*, Rochester Institute of Technology, and **Joy Lind**, University of Sioux Falls

2:00PM (1249) *Transforming Linear Algebra Education with GeoGebra Applets.*
James D. Factor* and **Susan Pustejovsky**, Alverno College

2:00PM (1250) *WeBWorK: Improving Student Success in Mathematics.*
John Travis*, Mississippi College, **Arnold Pizer**, **Michael Gage**, **Vicki Roth**, University of Rochester, **J. Michael Pearson** and **Linda Brady**, MAA

2:00PM (1251) *Progress through Calculus.*
David Bressoud*, Macalester College, **Jess Ellis**, Colorado State University, **Sean Larsen**, Portland State University, and **Chris Rasmussen**, San Diego State University

2:00PM (1252) *A Common Vision for the Undergraduate Mathematics Program in 2025.*
Karen Saxe*, Macalester College, and **Linda Brady**, MAA

2:00PM (1253) *NJ Partnership for Excellence in Middle School Mathematics.*
Amy Cohen*, **Michael Weingart**, **Mike Beals**, **Joan Bennett**, **Carolyn Maher**, Rutgers University, and **John Coleman**, Toms River Schools

2:00PM (1254) *Collaborative Research: Maplets for Calculus.*
Philip B. Yasskin*, Texas A&M University, **Douglas B. . Meade**, University of South Carolina, **Matthew Barry**, Texas A&M Engineering Extension Service, **Don Van Huyck**, **Dmitriy Shatalov**, Texas A&M University, **Parth Sarin** and **Michael Sprintson**, A&M Consolidated High School

2:00PM (1255) *Progress report on the effectiveness of a summer STEM enrichment program for college freshmen at a liberal arts college.*
Maria Siopsis* and **Angelia Gibson**, Maryville College

2:00PM (1256) *EAGER: Understanding and Improving Collegiate Persistence and STEM Opportunities for Developmental Mathematics Students.*
Edgar Fuller*, **Jessica Deshler** and **Marcela Mera Trujillo**, West Virginia University

2:00PM (1257) *Second SIAM-NSF Workshop: Modeling Across the Curriculum.*
Peter Turner*, Clarkson University, and **James Crowley**, SIAM

2:00PM (1258) *Supporting Pedagogical Innovation for a Generation of Transformation via Inquiry-Based Learning in Mathematics (SPIGOT).*
Stan Yoshinobu*, California Polytechnic State University, San Luis Obispo, **Carol Schumacher**, Kenyon College, **Matthew Jones**, California State University, Dominguez Hills, and **Sandra L. Laursen**, University of Colorado

2:00PM (1259) *Motivating First-Year Calculus with Robotics.*
Jason Cantarella* and **Harrison Chapman**, University of Georgia

2:00PM (1260) *Recruiting STEM Majors into Teacher Education: URI's Robert Noyce Teacher Scholarship Program.*
Ed Lamagna*, **Anne M. Seitsinger**, **David Byrd**, **Cornelis de Groot**, **Bryan Dewsbury**, **Jay Fogleman**, **Joan Peckham** and **Kathy Peno**, University of Rhode Island

2:00PM (1261) *Collaborative Research: Maplets for Calculus.*
Douglas B. Meade*, University of South Carolina, **Philip B. Yasskin**, Texas A&M University, and **Robert Petrulis**, EPRE Consulting LLC

2:00PM (1262) *Paradigms in Physics: Representations of Partial Derivatives.*
Tevian Dray*, **Corinne A. Manogue**, **Elizabeth Gire**, **Emily H. van Zee** and **David Roundy**, Oregon State University

2:00PM (1263) *Integrating Technology-Rich Instruction of Urban Students into the Secondary Education-Mathematics Curriculum.*
Courtney Nagle* and **Jodie Styers**, Penn State Erie, The Behrend College

2:00PM (1264) *NSF STEM Scholarship and Mentoring Program.*
Courtney Nagle, Penn State Erie, The Behrend College

2:00PM (1265) *Collaborative Research: Updating the WeBWorK National Problem Library.*
John Jones*, Arizona State University, and **Jeff Holt**, University of Virginia

2:00PM (1266) *Transforming Students' Mathematical Experiences: Advancing Quality Teaching with Reliability at Scale.*
Ann Edwards*, **Anthony Bryk**, **Alicia Grunow**, Carnegie Foundation for the Advancement of Teaching, and **James Stigler**, UCLA

2:00PM (1267) *Graduating More Women in Computer Science and Mathematics: an NSF S-STEM Project at Western Washington University.*
David Hartenstine* and **Perry Fizzano**, Western Washington University

2:00PM (1268) *Collaborative Research: Teaching Inquiry-oriented Mathematics: Establishing Supports.*
Karen A. Keene*, North Carolina State University, **Estrella Johnson**, Virginia Polytechnic Institute and State University, **Christine Andrews-Larson**, Florida State University, **William Hall**, North Carolina State University, **George Kuster**, Virginia Polytechnic Institute and State University, and **Muhummed Haider**, Florida State University

2:00PM (1269) *The Arlington Undergraduate Research-based Achievement for STEM (AURAS).*
Richard Chandler*, **James A. Mendoza Epperson**, **Lynn Peterson**, **Ramon Lopez**, **Kevin Schug** and **Carter Tiernan**, University of Texas-Arlington

2:00PM (1270) *Transforming Instruction in Undergraduate Mathematics via Primary Historical Sources.*
Dominic Klyve*, Central Washington University, **Janet Barnett**, Colorado State University-Pueblo, **Kathleen Clark**, Florida State University, **Jerry Lodder**, New Mexico State University, **Daniel Otero**, Xavier University, **Diana White**, University of Colorado Denver, and **Nicholas Scoville**, Ursinus College

2:00PM (1271) *Navajo Nation Math Circles Project.*
Bob Klein, Ohio University

► 2:00PM (1272) *Using volume to prove Tucker's Lemma in 2-dimensions.*
Beauttie A Kuture*, Pomona College, **Oscar F Leong**, Swarthmore College, and **Christopher A Loa**, University of Tennessee, Knoxville

2:00PM (1273) *NSF S-STEM Program at Shepherd: Academic Performance Enhancement and Career Preparation for STEM Students.*
Zhijun Wang* and **Qing Wang**, Shepherd University, Shepherdstown, WV 25443

2:00PM (1274) *MPWR II: Mentoring Partnerships for Women in RUME.*
Jess Ellis, Colorado State University

2:00PM (1275) *Developing an Assessment Tool to Measure Student Understanding of Multivariable Calculus Concepts.*
Monica VanDieren*, Robert Morris University, **Deborah Moore-Russo**, State University of New York at Buffalo, and **Paul Seeburger**, Monroe Community College

2:00PM (1276) *Collaborative Research: Improving Conceptual Understanding of Multivariable Calculus Through Visualization Using CalcPlot3D.*
Paul Seeburger*, Monroe Community College, **Monica VanDieren**, Robert Morris University, and **Deborah Moore-Russo**, State University of New York at Buffalo

2:00PM (1277) *Simulations and Understanding p-value in Intro Stats at a Community College.*
Alia Criddle Maw, Salt Lake Community College

2:00PM (1278) *Simulation methods and standards-based grading in an introductory statistics course overhaul.*
Jeffrey Sykes, Ouachita Baptist University

2:00PM (1279) *A simple data-gathering exercise for introduction to statistics in Pre-algebra to Business Math and all those other classes in between.*
Crystine Chipman, Chandler-Gilbert Community College

2:00PM (1280) *Project UPLIFT: Universal Portability of Learning Increased by Fun Teaching.*
John J. Weber III*, Georgia Perimeter College, **Lawrence M. Lesser**, University of Texas at El Paso, and **Dennis K. Pearl**, The Ohio State University

2:00PM (1281) *PREP: MAA's Professional Development Program.*
Nancy Hastings*, Dickinson College, **Barbara Edwards**, Oregon State University, **Nathaniel Dean**, Texas State University San Marcos, **Virginia Buchanan**, Hiram College, **Mike Brilleslyper**, United States Air Force Academy, **Jenna Carpenter**, Louisiana Tech University, and **Jon Scott**, Montgomery College

AMS Invited Address

2:15 PM – 3:05 PM **Ballroom 6BC, Washington State Convention Center**

(1282) *Chaotic billiards and vibrations of drums.*
Steve Zelditch, Northwestern University (1116-58-892)

MAA Panel Discussion

2:35 PM – 3:55 PM **Room 609, Washington State Convention Center**

Is online inquiry-based learning (IBL) possible?

Organizers: **Padraig McLoughlin**, Kutztown University of Pennsylvania

Perry Y.C. Lee, Kutztown University of Pennsylvania

MAA Committee on Minority Participation and the MAA Office of Minority Participation Panel Discussion

2:35 PM – 3:55 PM **Room 612, Washington State Convention Center**

Summer Research Programs.

Organizers: **Lloyd E. Douglas**, Independent Consultant

William A. Hawkins,Jr., MAA and University of the District of Columbia

Robert Megginson, University of Michigan

MAA Social Hour

3:15 PM – 4:15 PM **Room 608, Washington State Convention Center**

Find a research collaborator.

Organizers: **Jacob A. White**, Texas A&B University

Timothy Goldberg, Lenoir-Rhyne University

AMS Retiring Presidential Address

3:20 PM – 4:10 PM **Ballroom 6BC, Washington State Convention Center**

► (1283) *Conjugacy classes and group representations.* Preliminary report. **David Vogan**, Massachusetts Institute of Technology (1116-22-44)

Project NExT Session

3:30 PM – 4:20 PM **Room 4C-2, Washington State Convention Center**

How to successfully flip Your classroom.

Joint Prize Session

4:25 PM – 5:25 PM **Ballroom 6BC, Washington State Convention Center**

SIGMAA on Quantitative Literacy and SIGMAA on Statistics Education Joint Reception

5:30 PM – 6:00 PM **Yakima 1, Yakima Level One, Washington State Conference Center**

Radical Dash Activity

5:30 PM – 6:30 PM **Tahoma 5, Tahoma Level Three, Washington State Conference Center**

MAA Special Presentation: Poetry+Art+Math.

5:30 PM – 7:00 PM **Room 608, Washington State Convention Center**

Organizers: **Gizem Karaali**, Pomona College

Lawrence M. Lesser, University of Texas at El Paso

Douglas Norton, Villanova University

SIGMAA on Undergraduate Research (UR SIGMAA)Business Meeting

5:30 PM – 6:30 PM **Room 607, Washington State Convention Center**

All are invited to the first meeting of the MAA's newest SIGMAA!

SIGMAA on the Philosophy of Mathematics (POM SIGMAA)Reception

5:30 PM – 5:50 PM **Room 617, Washington State Convention Center**

Joint Prize Session Reception

5:30 PM – 6:30 PM **East Lobby, 6th Floor, Washington State Convention Center**

MAA Two-Year College Reception

5:45 PM – 7:00 PM **Willow, 2nd Floor, Sheraton Seattle Hotel**

SIGMAA on Statistics Education Business Meeting

6:00 PM – 6:45 PM **Yakima 1, Yakima Level One, Washington State Conference Center**

Presenter: **Patti Frazer Lock**, St. Lawrence University

SIGMAA on Mathematical and Computational Biology Reception and Business Meeting

6:00 PM – 6:50 PM **Room 304, Washington State Convention Center**

Organizer: **Maeve McCarthy**, Murray State University

SIGMAA on Quantitative Literacy (SIGMAA QL)Business Meeting

6:00 PM – 6:45 PM **Yakima 2, Yakima Level One, Washington State Conference Center**

SIGMAA on the Philosophy of Mathematics (POM SIGMAA) Business Meeting

6:00 PM – 6:20 PM **Room 617, Washington State Convention Center**

SIGMAA on the Philosophy of Mathematics (POM SIGMAA) Guest Lecture

6:30 PM – 7:20 PM **Room 617, Washington State Convention Center**

6:30PM ► (1284) *Is school mathematics "real" mathematics?* Preliminary report. **Bonnie Gold**, Monmouth University (1116-00-2437)

SIGMAA On Statistics Education Guest Lecture

6:50 PM – 7:40 PM **Yakima 1, Yakima Level One, Washington State Conference Center**

► (1285) *Big data, experiments, and resampling at Google.* **Tim Hesterburg**, Google

SIGMAA on Mathematical and Computational Biology Guest Lecture

7:00 PM – 7:50 PM **Room 304, Washington State Convention Center**

Organizer: **Maeve McCarthy**, Murray State University

► (1286) *Using mathematics and computation to address problems in cell biology.* **Leah Edelstein-Keshet**, Dept of Mathematics, University of British Columbia (1116-92-2931)

Friday, January 8

Joint Meetings Registration

7:30 AM – 4:00 PM **Atrium Lobby, 4th Floor, Washington State Convention Center**

Email Center

7:30 AM – 9:00 PM **Atrium Lobby, 4th Floor, Washington State Convention Center**

MAA Session on Inquiry-Based Teaching and Learning, II

7:40 AM – 10:55 AM **Room 619, Washington State Convention Center**

Organizers: **Brian Katz**, Augustana College

Victor Piercey, Ferris State University

7:40AM (1287) *How wide is the river? Teaching through Problem Solving: A case study.* **Tuck Choy Francis Chow**, Zayed University, UAE (1116-J5-1122)

8:00AM (1288) *Active Calculus: An Activity-Driven, Student-Centered Approach.* **May Mei**, Denison University (1116-J5-2317)

8:20AM ► (1289) *Teaching an IBL course for the first time: successes, challenges and lessons learned.* Preliminary report. **Ekaterina Lioutikova**, University of Saint Joseph (1116-J5-675)

8:40AM (1290) *Teaching Graph Theory Course Using Modified Inquiry-Based Method.* **Yun Lu**, Kutztown University of PA (1116-J5-2208)

9:00AM (1291) *Getting Better at Using Inquiry-Based Learning.* Preliminary report. **Frederick M Butler**, York College of Pennsylvania (1116-J5-748)

9:20AM (1292) *Towards an Inquiry-Based, Writing-Intensive Number Theory Course.* **Adrian P. Gentle**, University of Southern Indiana (1116-J5-2555)

9:40AM ► (1293) *A Lab-Style Proof and Problem Solving Course.* **Talitha M Washington**, Howard University (1116-J5-2792)

10:00AM ► (1294) *Jumping In: The switch to lecture-free inquiry-based calculus.* **Heather A. Lewis**, Nazareth College (1116-J5-1685)

10:20AM (1295) *A Departmental Transition From Lecture To IBL In Calculus.* **Cheri Boyd**, **C. Yousuf George***, **Nicole Juersivich**, **Matt Koetz** and **Heather Ames Lewis**, Nazareth College (1116-J5-2656)

10:40AM (1296) *A Model for Expanding Active Learning Regionally: The Greater Upstate New York Inquiry-Based Learning Consortium.* **Patrick X Rault***, State University of New York, College at Geneseo, **Ryan Gantner**, St. John Fisher College, and **C Yousuf George**, Nazareth College (1116-J5-1285)

AMS Session on General Topics, I

7:45 AM – 10:55 AM **Chelan 5, Chelan Level Two, Washington State Conference Center**

► 7:45AM (1297) *Text-Mining and Topic Modeling the Wall Street Journal to Find Market Inefficiencies.*
Jeremy Tillay*, Rice University, **Adela Yang**, Bowdoin College, **Yilun Chen** and **Xiudi Li**, Hong Kong University of Science and Technology (1116-00-298)

► 8:00AM (1298) *Math-Aware Search Interfaces for Digital Mathematical Libraries (DML).*
Petr Sojka* and **Michal Růžička**, Faculty of Informatics, Masaryk University, Botanická 68a, 602 00 Brno, Czech Republic (1116-00-1713)

► 8:15AM (1299) *Big Data Visualization Tools and Algorithms to Build Predictive Models.* Preliminary report.
Ahlam E Tannouri*, Mathematics Department, Morgan State University, and **Sam Tannouri**, Computr Science Department, Morgan State University (1116-00-2898)

► 8:30AM (1300) *Notices of the American Mathematical Society.*
Frank Morgan, Williams College (1116-00-406)

► 8:45AM (1301) *MIDAS: Mathematical Information in the Digital Age of Science.*
Patrick D. F. Ion*, U Michigan & Math Reviews / AMS, Ann Arbor MI, USA, **Olaf Teschke**, zbMATH, Berlin, Germany, and **Stephen M. Watt**, University of Waterloo, Waterloo ON, Canada (1116-00-2114)

► 9:00AM (1302) *Creating Mathematical Knowledge Networks.*
Fabian Müller, FIZ Karlsruhe/zbMATH (1116-00-2248)

9:15AM (1303) *Extending Anticliques in Borel Graphs.* Preliminary report.
Francis Adams, University of Florida (1116-03-1720)

9:30AM (1304) *Non-Classical Mathematics, Forward and In Reverse.*
Maarten McKubre-Jordens, University of Canterbury, Christchurch, New Zealand. (1116-03-1193)

9:45AM (1305) *Transfer of the Ramsey Property between Classes.* Preliminary report.
Lynn Scow, Vassar College (1116-03-2068)

10:00AM (1306) *Cardinal Characteristics Above the Continuum.* Preliminary report.
Luke Stephen Serafin, Carnegie Mellon University (1116-03-2429)

10:15AM (1307) *Tree representations from very large cardinals.*
Scott S Cramer, Rutgers University (1116-03-2057)

10:45AM (1308) *Additive vs. Multiplicative Near-linearity in Open Induction.*
Mojtaba Moniri, Department of Mathematics, Western Illinois University (1116-03-2900)

AMS-MAA-SIAM Special Session on Research in Mathematics by Undergraduates and Students in Post-Baccalaureate Programs, II

8:00 AM – 10:50 AM **Tahoma 3, Tahoma Level Three, Washington State Conference Center**

Organizers: **Darren A. Narayan**, Rochester Institute of Technology
Jobby Jacob, Rochester Institute of Technology
Tamas Forgacs, California State University, Fresno
Ugur Abdulla, Florida Institute of Technology

► 8:00AM (1309) *Number Theory on Square-tiled Surfaces II.* Preliminary report.
Elizabeth McGrady*, **Rose Goueth**, **Alyssa Kaplan**, **Claire Kerper** and **Gillian Tisdale**, Smith College (1116-51-1240)

► 8:30AM (1310) *Pinpointing unknown objects by their reflected light rays.* Preliminary report.
Catrice Chong*, **Cheryl Holmes**, **MyVan Vo** and **Lauren White**, Smith College (1116-51-1385)

► 9:00AM (1311) *Further results on generalized splines.*
Lindsay Dever*, **Holly Mandel**, **Elise Reed**, **Stephanie Webster**, **Julia Gibson** and **Meredith Wilde**, Smith College (1116-05-2727)

► 9:30AM (1312) *Number Theory on Square-tiled Surfaces I.* Preliminary report.
Ga Yee Park*, **Vivian Li**, **Rebecca Roberts** and **Lisa Wang**, Smith College (1116-51-1237)

► 10:00AM (1313) *Rings of small rank over a Dedekind domain and their ideals.*
Evan M. O'Dorney, Cambridge University (1116-13-1962)

10:30AM (1314) *Correlation Functions of Schur Processes.*
Amol Aggarwal, Harvard University (1116-05-2155)

AMS-AWM Special Session on Commutative Algebra, I

8:00 AM – 10:50 AM **Room 603, Washington State Convention Center**

Organizers: **Karen Smith**, University of Michigan, Ann Arbor
Emily Witt, University of Utah
Irena Swanson, Reed College

8:00AM ► (1315) *Enumeration of Double Cosets in Symmetric Groups and Beyond.* **Sara C. Billey***, University of Washington, **Matjaz Konvalinka**, University of Ljubljana, and **Frederick Matsen**, Fred Hutchinson Cancer Research Center (1116-05-2035)

8:30AM ► (1316) *Constructing ideals with high Castelnuovo-Mumford regularity.* **Brooke S. Ullery**, University of Utah (1116-13-704)

9:00AM (1317) *Conjectures on Symbolic Powers.* Preliminary report. **Louiza Fouli***, New Mexico State University, **Paolo Mantero**, University of Arkansas, and **Yu Xie**, Penn State, Altoona (1116-13-1581)

9:30AM (1318) *Dimensions of Formal Fiber Rings.* Preliminary report. **Sarah Fleming**, Williams College, **Lena Ji**, Columbia University, **Susan Loepp***, **Peter McDonald**, **Nina Pande**, Williams College, and **David Schwein**, Brown University (1116-13-1023)

10:00AM (1319) *A ring without a Boij-Soederberg theory.* Preliminary report. **Courtney R. Gibbons***, Hamilton College, **Luchezar Avramov** and **Roger Wiegand**, University of Nebraska-Lincoln (1116-13-1967)

10:30AM (1320) *Polynomials in rigidity theory: special positions of frameworks.* Preliminary report. **Ruimin Cai**, Seattle, WA, **James Farre**, University of Utah, **Jessica Sidman***, **Audrey St. John**, Mount Holyoke College, **Louis Theran**, Aalto University, and **Xilin Yu**, Mount Holyoke College (1116-13-1445)

AMS Special Session on Algebraic and Topological Methods in Combinatorics, I

8:00 AM – 10:50 AM **Room 204, Washington State Convention Center**

Organizers: **Andrew Berget**, Western Washington University
Steven Klee, Seattle University
Isabella Novik, University of Washington, Seattle

8:00AM (1321) *Connections between weighted partitions and graph associahedra.* Preliminary report. **Rafael S. Gonzalez D'Leon**, University of Kentucky, and **Michelle L. Wachs***, University of Miami (1116-05-2827)

8:30AM (1322) *Delta Conjectures and ordered set partition statistics.* **James Haglund**, University of Pennsylvania, **Jeffrey Remmel**, **Brendon Rhoades***, University of California, San Diego, and **Andrew Timothy Wilson**, University of Pennsylvania (1116-05-870)

9:00AM (1323) *Poset Associahedra.* **Satyan L Devadoss***, Williams College; Harvey Mudd College, and **Stefan Forcey**, University of Akron (1116-52-171)

9:30AM (1324) *Order congruence lattices are shellable.* **Jay Schweig**, Oklahoma State University, and **Russ Woodroofe***, Mississippi State University (1116-05-1795)

10:00AM (1325) *Counterexamples to the topological Tverberg conjecture.* **Florian Frick**, Cornell University (1116-52-1047)

10:30AM (1326) *Combinatorics and Smith normal form.* Preliminary report. **Richard P. Stanley**, University of Miami (1116-05-378)

AMS Special Session on Arithmetic Dynamics, II

8:00 AM – 10:50 AM **Room 604, Washington State Convention Center**

Organizers: **Matthew Baker**, Georgia Institute of Technology
Joseph Silverman, Brown University

8:00AM (1327) *Discriminants of iterated quadratic extensions.* **T. Alden Gassert**, University of Colorado Boulder (1116-11-1804)

8:30AM (1328) *Characterizing cyclic quartic extensions by automorphism polynomials.* Preliminary report. **Michelle A Manes***, University of Hawaii at Manoa, and **Katherine E Stange**, University of Colorado at Boulder (1116-11-1349)

9:00AM (1329) *Eventually stable rational functions.* **Rafe Jones***, Carleton college, and **Alon Levy**, KTH Royal Institute of Technology (1116-11-1181)

9:30AM (1330) *Complex dynamics of birational surface maps defined over number fields.* **Mattias Jonsson** and **Paul Reschke***, University of Michigan (1116-37-695)

10:00AM (1331) *The average number of integral points in orbits.* **Wade Hindes**, CUNY Graduate Center (1116-11-593)

10:30AM (1332) *Uniform boundedness for positive dimensional varieties.* **Jason Bell**, University of Waterloo, **Dragos Ghioca**, University of British Columbia, and **Thomas Tucker***, University of Rochester (1116-11-1392)

AMS Special Session on Classification Problems in Operator Algebras, I

8:00 AM – 10:50 AM **Room 400, Washington State Convention Center**

Organizers: **Marcel Bischoff**, Vanderbilt University

Ben Hayes, Vanderbilt University

8:00AM (1333) *Cartan subalgebras of groupoid C*-algebras.*
Jon Brown, University of Dayton, **Gabriel Nagy**, **Sarah A. Reznikoff***, Kansas State University, **Aidan Sims**, University of Wollongong, and **Dana Williams**, Dartmouth College (1116-46-2823)

9:00AM (1334) *Wavelets, KMS states, and separable representations for higher-rank graphs.*
Carla Farsi, **Elizabeth Gillaspy***, University of Colorado - Boulder, **Sooran Kang**, University of Otago, and **Judith A. Packer**, University of Colorado - Boulder (1116-46-2681)

9:30AM (1335) *Free graph operator algebras and laws of loops.*
Michael Hartglass, UC Riverside (1116-46-1152)

10:00AM (1336) *Subfactors, Hecke pairs, and approximation properties.*
Arnaud Brothier, Vanderbilt University (1116-46-724)

10:30AM (1337) *Convex Sets Associated to C*-Algebras.*
Scott A. Atkinson, University of Virginia (1116-47-1737)

AMS Special Session on Difference Equations and Applications

8:00 AM – 10:50 AM **Skagit 3, Skagit Lower Level, Washington State Conference Center**

Organizer: **Michael A. Radin**, Rochester Institute of Technology

8:00AM ► (1338) *Triangular maps and multi-species hierarchical competition models with the Allee effect.* Preliminary report.
Saber n. Elaydi, Trinity University (1116-39-1050)

8:30AM (1339) *Dynamics of nonlinear discrete discontinuous population model.*
Vlajko L Kocic*, Xavier University of Louisiana, New Orleans, LA 70125, **Raegan J Higgins**, Texas Tech University, Lubbock, TX 79409, **Candace M Kent**, Virginia Commonwealth University, Richmond, VA 23284, and **Yevgeniy Kostrov**, Xavier University of Louisiana, New Orleans, LA 70125 (1116-39-585)

9:00AM (1340) *Periodic and Non-Periodic Solutions and Multistability in a Second-Order Ricker Equation with Periodic Coefficients.* Preliminary report.
Nika Lazaryan* and **Hassan Sedaghat**, Virginia Commonwealth University (1116-39-1177)

9:30AM (1341) *Piecewise-Defined Difference Equations with Every Solution Eventually Periodic: Open Problem.*
Candace M. Kent, Virginia Commonwealth University (1116-39-1496)

10:00AM (1342) *Exponential Stability And Instability In Multiple Delays Difference Equations.*
Youssef Naim Raffoul, University of Dayton (1116-39-594)

10:30AM ► (1343) *Comparison Theorems for Discrete Caputo Fractional Equations.*
Allan C. Peterson*, University of Nebraska-Lincoln, **Bioguo Jia**, Zhongshan University, and **Erbe Lynn**, University of Nebraska-Lincoln (1116-39-1857)

AMS Special Session on Equations of Fluid Motion, I

8:00 AM – 10:50 AM **Skagit 4, Skagit Lower Level, Washington State Conference Center**

Organizers: **Elaine Cozzi**, Oregon State University
Radu Dascaliuc, Oregon State University
James P. Kelliher, University of California Riverside

8:00AM (1344) *The 2D magnetohydrodynamic (MHD) equations with partial dissipation.*
Jiahong Wu, Oklahoma State University (1116-35-466)

8:30AM (1345) *Data Assimilation algorithm for 3D Benard convection in porous media employing only temperature measurements.*
Aseel Farhat, University of Virginia, **Evelyn M. Lunasin***, United States Naval Academy, and **Edriss S. Titi**, Texas A&M University (1116-35-1749)

9:00AM (1346) *On persistence of regularity for the non-dissipative viscous MG equation.*
Walter Rusin, Department of Mathematics, Oklahoma State University (1116-35-2253)

9:30AM ► (1347) *Regularity in time along the coarse scale flow for the incompressible Euler equations.*
Philip Isett, MIT (1116-35-1618)

10:00AM (1348) *Regularity criteria for the Navier-Stokes equations.*
Zachary Bradshaw*, University of British Columbia, and **Zoran Grujic**, University of Virginia (1116-35-346)

10:30AM (1349) *An active scalar model for the Earth's fluid core.*
Susan Friedlander*, USC, and **Anthony Suen**, HKIE (1116-76-645)

AMS Special Session on Geometric and Categorical Methods in Representation Theory, I

8:00 AM – 10:50 AM **Rooms 307/308, Washington State Convention Center**

Organizers: **Anthony Licata**, Australian National University
Julia Pevtsova, Universityof Washington, Seattle

8:00AM (1350) *Geometry of the varieties of Borel subalgebras in Lie algebras of Cartan types.* Preliminary report.
Zongzhu Lin*, Kansas State University, and **Ke Ou**, East China Normal University (1116-17-1656)

8:30AM (1351) *Parity sheaves on the affine Grassmannian and the Langlands dual Springer resolution.*
Laura J Rider*, Massachusetts Institute of Technology, and **Pramod Achar**, Louisiana State University (1116-22-2332)

9:00AM (1352) *Current algebras, Khovanov-Rozansky homology, and annular link invariants.*
Hoel Queffelec, CNRS, and **David E. V. Rose***, University of Southern California (1116-81-1372)

9:30AM (1353) *Lusztig slices and truncated shifted Yangians.*
Joel Kamnitzer, University of Toronto, **Peter Tingley**, Loyola University Chicago, **Ben Webster**, University of Chicago, **Alex Weekes**, University of Toronto, and **Oded Yacobi***, University of Sydney (1116-20-1652)

10:00AM (1354) *Representations of Khovanov-Lauda-Rouquier algebras of affine Lie type.*
Robert Muth* and **Alexander Kleshchev**, University of Oregon (1116-16-2321)

10:30AM (1355) *The graded Lie structure of Hochschild cohomology.* Preliminary report.
Lauren Grimley, Texas A&M University, **Cris Negron**, Louisiana State University, **Van C Nguyen**, Northeastern University, and **Sarah Witherspoon***, Texas A&M University (1116-16-1305)

AMS Special Session on Global Harmonic Analysis, I

8:00 AM – 10:50 AM **Room 610, Washington State Convention Center**

Organizers: **Steven Zelditch**, Northwestern University
Hart Smith, University of Washington, Seattle
Chris Sogge, Johns Hopkins University

9:00AM (1356) *L^p norms of eigenfunctions and Kakeya-Nikodym averages.*
Matthew D Blair, University of New Mexico (1116-35-258)

9:30AM (1357) *Small scale quantum ergodicity and applications.*
Hamid Hezari*, UC Irvine, and **Gabriel Riviere**, Universit'e Lille 1 (1116-35-956)

► 10:00AM (1358) *Small scale quantum ergodicity in negatively curved manifolds.*
Xiaolong Han, Australian National University (1116-58-1103)

10:30AM (1359) *Logarithmic growth of nodal domains in negative curvature.*
Steve Zelditch, Northwestern University (1116-58-2986)

AMS Special Session on Higher Genus Curves and Fibrations of Higher Genus Curves in Mathematical Physics and Arithmetic Geometry, I

8:00 AM – 10:50 AM **Room 310, Washington State Convention Center**

Organizers: **Andreas Malmendier**, Utah State University, Logan
Tony Shaska, Oakland University, Rochester

8:00AM (1360) *Mirror symmetry and K3 surface zeta functions.*
Ursula Whitcher, University of Wisconsin-Eau Claire (1116-14-2382)

8:30AM (1361) *Arithmetic Mirror Symmetry of K3 Surfaces and Hypergeometric Functions.*
Charles Doran, University of Alberta, **Tyler Kelly**, University of Cambridge, **Adriana Salerno***, Bates College, **Steven Sperber**, University of Minnesota, **John Voight**, Dartmouth College, and **Ursula Whitcher**, University of Wisconsin, Eau Claire (1116-11-1550)

9:00AM (1362) *Generalized hypergeometric function identities from superelliptic curves and their associated Kummer varieties.* Preliminary report.
Adrian Clingher, University of Missouri, St. Louis, **Charles Doran***, University of Alberta and University of Maryland, and **Andreas Malmendier**, Utah State University (1116-14-1788)

9:30AM (1363) *Elliptic curves over function fields and algebraic groups.* Preliminary report.
David R Morrison, University of California, Santa Barbara (1116-14-1991)

10:00AM (1364) *Slopes of families of curves.*
Anand Patel, Boston College (1116-14-2110)

10:30AM (1365) *Maximal Group Actions on Compact Oriented Surfaces.* Preliminary report.
Valerie Peterson, University of Portand, **Jacob Russell**, CUNY Graduate Center, and **Aaron Wootton***, University of Portland (1116-14-1082)

AMS Special Session on Knots in Washington (State), III

8:00 AM – 10:50 AM **Room 201, Washington State Convention Center**

Organizers: **Allison Henrich**, Seattle University
Sam Nelson, Claremont McKenna College
Jozef Przytycki, George Washington University

Radmila Sazdanovic, North Carolina State University, Raleigh

8:00AM ► (1366) *DNA unlinking.* **Mariel Vazquez**, Mathematics Department, UC Davis (1116-92-2700)

8:30AM (1367) *The topology of the Jones polynomial.* **Anh T Tran**, The University of Texas at Dallas, Richardson, TX (1116-57-1106)

9:00AM ► (1368) *Invariants of random knots using Chebyshev billiard table diagrams.* Preliminary report. **Moshe Cohen**, Technion - Israel Institute of Technology (1116-57-1155)

9:30AM (1369) *Stable Concordance Genus of Knots.* **M Kate Kearney**, Gonzaga University (1116-57-1041)

10:00AM (1370) *Deformation and Extension of Fibrations of Spheres by Great Circles.* **Patricia Cahn***, Max Planck Institute for Mathematics, **Herman Gluck**, University of Pennsylvania, and **Haggai Nuchi**, University of Toronto (1116-57-1746)

10:30AM (1371) *Signature and alternating tangle decompositions.* Preliminary report. **Oliver Dasbach**, Louisiana State University, and **Adam Lowrance***, Vassar College (1116-57-665)

AMS Special Session on Mathematics in Natural Resource Modeling, I

8:00 AM – 10:50 AM **Room 4C-4, Washington State Convention Center**

Organizers: **Catherine A. Roberts**, College of the Holy Cross

Shandelle M. Henson, Andrews University

8:00AM ► (1372) *Potential Quantitative Meanings of Resilience.* **Katherine J. Meyer**, University of Minnesota (1116-37-147)

8:30AM ► (1373) *Short term climatic rescue of an endangered species? Insights from integral operators.* **Sebastian J. Schreiber***, University of California, Davis, **Andrea Pickart**, U.S. Fish and Wildlife Service, **Annie Eicher**, H.T. Harvey and Associates, and **Jennifer Wheeler**, Bureau of Land Managment (1116-92-445)

9:00AM ► (1374) *A fundamental modeling framework for spatio-temporal population dynamics.* **Ryan Norris**, University of Guelph, **Julia Earl**, Oklahoma State University, **Paula Federico**, Capital University, **Christine Sample***, Emmanuel College, **Ruscena Wiederholt**, The University of Arizona, **Jay Diffendorfer**, USGS Geosciences and Environmental Change Science Center, and **John Fryxell**, University of Guelph (1116-92-222)

9:30AM ► (1375) *Management of Diaprepes Root Weevil.* Preliminary report. **Christina J Edholm***, University of Nebraska-Lincoln, **Chris Guiver**, University of Exeter, **Richard Rebarber**, **Brigitte Tenhumberg**, University of Nebraska-Lincoln, **Stephanie Lloyd**, University of Exeter, **Yu Jin**, University of Nebraska-Lincoln, **Jim Powell**, Utah State University, and **Stuart Townley**, University of Exeter (1116-92-487)

10:00AM ► (1376) *A continuous energy-based model for the migration of species in a network.* Preliminary report. **Kevin Long**, Texas Tech Universtiy, **Joanna A. Bieri***, University of Redlands, **Chandani Dissanayake**, Texas Tech University, **Richard A. Erickson** and **Wayne E. Thogmartin**, USGS (1116-92-185)

10:30AM ► (1377) *Combining Models and Experiments to Understand How Evolution Affects Insect Outbreaks.* Preliminary report. **David Paez**, Department of Ecology & Evolution, University of Chicago, **Vanja Dukic**, Department of Applied Mathematics, University of Colorado, **Jonathan Dushoff**, Department of Biology, McMaster University, **Arietta Fleming-Davies** and **Greg Dwyer***, Department of Ecology & Evolution, University of Chicago (1116-92-501)

AMS Special Session on Partial Differential Equations in Complex Analysis, I

8:00 AM – 10:50 AM **Room 401, Washington State Convention Center**

Organizers: **Debraj Chakrabarti**, Central Michigan University

Yunus Zeytuncu, University of Michigan, Dearborn

8:00AM (1378) *Nonexistence of smooth Levi-flat hypersurface with positive normal bundle in compact Kähler manifolds of dimension* ≥ 3. **Severine Biard**, Texas A&M University (1116-32-410)

8:30AM (1379) *On Cauchy Integrals and the Szegő projection.* Preliminary report. **Loredana Lanzani***, Syracuse University, and **Elias M. Stein**, Princeton University (1116-32-1075)

9:00AM (1380) *Compressed Sensing and CR Mappings.* Preliminary report. **Dusty Grundmeier**, Harvard University (1116-32-1017)

9:30AM (1381) *Super-level sets of the Bergman kernel on tube domains.* Preliminary report. **David E. Barrett**, University of Michigan, Ann Arbor, and **Purvi Gupta***, University of Western Ontario (1116-32-1610)

10:00AM (1382) *Negative curvature in several complex variables.*
Andrew Zimmer, University of Chicago (1116-32-727)

10:30AM (1383) *Supports of Continuous Solutions to complex Monge-Ampère equation and Pluriregularity.* Preliminary report.
Muhamed A Alan, Syracuse University (1116-32-2149)

AMS Special Session on Pseudorandomness and Its Applications, III

8:00 AM – 10:40 AM **Room 606, Washington State Convention Center**

Organizers: **Timothy Gowers**, University of Cambridge
Jozsef Solymosi, University of British Columbia

8:00AM (1384) *Polynomial configurations in fractal sets.*
Izabella Laba, UBC (1116-42-1064)

9:00AM (1385) *Corners in dense subsets of primes via transference principle.*
Tatchai Titichetrakun, University of British Columbia (1116-05-607)

9:30AM (1386) *Configurations in dense subsets of P^d.*
Brian D Cook, University of Wisconsin-Madison, **Akos Magyar***, University of Georgia, and **Tatchai Titichetrakun**, University of British Columbia (1116-05-2199)

10:00AM (1387) *Pseudorandomness in the the Green-Tao theorem.*
David Conlon, University of Oxford, **Jacob Fox**, Stanford University, and **Yufei Zhao***, University of Oxford (1116-05-833)

AMS Special Session on Quantum Walks, Quantum Markov Chains, Quantum Computation and Related Topics, II

8:00 AM – 10:50 AM **Room 602, Washington State Convention Center**

Organizers: **Chaobin Liu**, Bowie State University
Takyua Machida, Japan Sociey for the Promotion of Science
Salvador E. Venegas-Andraca, Technológico de Monterrey, Mexico
Nelson Petulante, Bowie State University

8:00AM (1388) *Localization for periodic unitary transition operators.* Preliminary report.
Tatsuya Tate, Tohoku University (1116-46-515)

8:30AM (1389) *Dirac quantum cellular automaton from split-step quantum walk.* Preliminary report.
Arindam Mallick and **C. M. Chandrashekar***, The Institute of Mathematical Sciences (1116-81-2787)

9:00AM (1390) *Quantum Walks with Entangled Coins and Walkers in Superposition.*
Salvador Elias Venegas-Andraca, Tecnologico de Monterrey, Escuela de Ingenieria y Ciencias (1116-81-1012)

9:30AM (1391) *Stability of quantum filters driven by Poisson and Wiener processes in presence of measurement imperfections.*
Nina H Amini, CNRS researcher/CentraleSupelec (1116-93-1755)

10:00AM ► (1392) *Suitable bases for discrete-time quantum walks.*
Martin Stefanak*, **Iva Bezdekova** and **Igor Jex**, Czech Technical University in Prague (1116-81-837)

10:30AM (1393) *Quantum Simulations and Quantum Measurements via Quantum Walks.*
Peng Xue, Department of Physics, Southeast University, Nanjing 211189, P. R. China (1116-81-2867)

AMS Special Session on Special Functions and q-Series, I

8:00 AM – 10:50 AM **Chelan 2, Chelan Level Two, Washington State Conference Center**

Organizers: **Richard Askey**, University of Wisconsin, Madison
Mourad E. H. Ismail, University of Central Florida and King Saud University, Riyadh
Erik Koelink, Radboud University, Nijmegen, The Netherlands

8:00AM (1394) *Some work of Mizan Rahman.* Preliminary report.
Richard Askey, University of Wisconsin-Madison (1116-33-717)

8:30AM ► (1395) *Urn models and the Darboux process.*
F Alberto Grunbaum, Math Dept UC Berkeley (1116-60-647)

9:00AM (1396) *Fractional Revival in Spin Chains and Orthogonal Polynomials.*
Vincent X Genest, MIT, **Luc Vinet***, CRM, Université de Montréal, and **Alexei Zhedanov**, CRM (1116-33-947)

9:30AM (1397) *Partitions associated with the mock theta functions $\omega(q)$ and $\nu(q)$.*
George E Andrews, Pennsylvania State University (1116-33-571)

10:00AM ► (1398) *Special and limiting values of the Weber function and Dedekind η.*
Neil M Bickford*, University of California, Los Angeles, and **Ralph William Gosper**, Los Altos Hills, California (1116-33-2241)

10:30AM ► (1399) *Refinements of the Rogers-Ramanujan identities.*
Kathleen O'Hara, Blacksburg, VA 24060, and **Dennis Stanton***, School of Mathematics, University of Minnesota, Minneapolis MN 55455 (1116-05-858)

AMS Special Session on Water Waves, I

8:00 AM – 10:50 AM **Skagit 5, Skagit Lower Level, Washington State Conference Center**

Organizers: **John Carter**, Seattle University
Bernard Deconinck, University of Washington, Seattle
Katie Oliveras, Seattle University

8:00AM (1400) *Stability of Waves with Vorticity.*
Katie L Oliveras*, Seattle University, and **Vishal Vasan**, International Centre for Theoretical Sciences (ICTS) (1116-35-1293)

8:30AM (1401) *Linear instability for a model of wind-generated gravity waves.* Preliminary report.
Vishal Vasan*, International Centre for Theoretical Sciences, Tata Institute of Fundamental Research, **Diane Henderson**, Department of Mathematics, Pennsylvania State University, and **Harvey Segur**, Department of Applied Mathematics, University of Colorado-Boulder (1116-35-1379)

9:00AM (1402) *Instabilities in shallow water models.*
Vera Mikyoung Hur, University of Illinois at Urbana-Champaign (1116-35-2079)

9:30AM (1403) *Nondegeneracy and Stability of Periodic Standing Waves in Fractional NLS Equations.* Preliminary report.
Kyle Claassen and **Mathew A. Johnson***, University of Kansas (1116-35-1719)

10:00AM (1404) *Traveling Wave Solutions of Nonlinear Dispersive Wave Equations: Existence, Stability, and Analytic Dependence.*
David P. Nicholls*, University of Illinois at Chicago, and **Benjamin Akers**, Air Force Institute of Technology (1116-35-1102)

10:30AM (1405) *Subharmonic stability of standing waves and traveling waves.*
Jon Wilkening, University of California, Berkeley (1116-76-2238)

AMS Session on Associative and Nonassociative Algebra and Rings, II

8:00 AM – 10:40 AM **Chelan 4, Chelan Level Two, Washington State Conference Center**

8:00AM (1406) *Irreducible representations of Yokonuma-type Hecke algebras.* Preliminary report.
Ojas Dave* and **J Matthew Douglass**, University of North Texas (1116-16-636)

8:15AM (1407) *Parameter space of quantum Drinfeld Hecke algebras in low dimension.*
Christine Uhl, University of North Texas (1116-16-1020)

8:30AM ► (1408) *Endomorphisms of Quantized Weyl Algebras and Their Simple Localizations.* Preliminary report.
Xin Tang, Department of Math & Computer Science, Fayetteville State University (1116-16-1493)

8:45AM (1409) *Representations of Hecke Algebras on Quotients of Path Algebras.*
Alexander Diaz-Lopez* and **Matthew John Dyer**, University of Notre Dame (1116-16-71)

9:00AM (1410) *Incidence-like algebras.* Preliminary report.
David C Meyer*, University of Missouri, **Miodrag Iovanov**, University of Iowa, **Gerard Koffi**, Creighton University, and **Alex Sistko**, University of Iowa (1116-16-2201)

9:15AM (1411) *GK dimension of modules over noncommutative algebras.*
Ashish Gupta, Inidian Institute of Science Education and Research Bhopal (1116-16-1671)

9:30AM (1412) *Iterated Ore extension of dimension 5.* Preliminary report.
Susan Elle, UCSD (1116-16-1969)

9:45AM (1413) *The double of representations of Cohomological Hall algebras.*
Xinli Xiao, Kansas State University (1116-16-2091)

10:00AM ► (1414) *Neighbors, Generic Sets and Buchberger Hypersurfaces.* Preliminary report.
James J Madden*, Louisiana State University, and **Trevor McGuire**, North Dakota State University (1116-13-804)

10:15AM (1415) *Tame Representations of the Quantum Double.*
John E. Foster, Walla Walla University (1116-16-1352)

10:30AM (1416) *Knörrer periodicity for noncommutative matrix factorizations.* Preliminary report.
Andrew B. Conner, Saint Mary's College of California (1116-16-2324)

AMS Session on Combinatorics and Graph Theory, II

8:00 AM – 10:55 AM **Room 605, Washington State Convention Center**

8:00AM (1417) *Lozenge tilings of halved hexagons with defects.*
Ranjan Rohatgi, Indiana University (1116-05-179)

8:15AM (1418) *Constructing Strongly Regular Graphs Using Finite Geometry.*
Liz Lane-Harvard, University of Central Oklahoma (1116-05-156)

8:30AM ► (1419) *Embeddings of Computable Planar Graphs.*
Oscar Levin and **Taylor McMillan***, University of Northern Colorado (1116-03-1936)

8:45AM ► (1420) *Ranks of matrices with few distinct entries.*
Boris Bukh, Carnegie Mellon University (1116-05-343)

9:00AM ► (1421) *Total Acquisition in Diameter 2 Graphs and Tournaments.* Preliminary report.
Rose McCarty*, Georgia Institute of Technology, **Becky Eastham**, University of Wisconsin-Madison, **Paul Han**, Dartmouth College, **Bill Kay**, Emory University, and **David Spencer**, University of North Carolina at Chapel Hill (1116-05-2495)

9:15AM ► (1422) *Hausdorff dimension of generalized Fibonacci word fractals.*
Tyler Hoffman* and **Benjamin Steinhurst**, McDaniel College (1116-51-2911)

9:30AM ► (1423) *Generating Tetrahedra from a Monotonic series.* Preliminary report.
Derege H Mussa, University of Texas at Dallas (1116-51-231)

9:45AM (1424) *Relationship between the energy of a directed graph and the energy of its underlying graph.*
Nafiseh Jahanbakht*, Oklahoma State University, and **Kourosh Tavakoli**, Oklahoma City University (1116-05-2864)

10:00AM ► (1425) *Prime Power Graphs and Prime Product Graphs.* Preliminary report.
J. Laison, Willamette University, **Y. Li**, Portland, OR, **J. Schreiner-McGraw**, Philomath, OR, **C. Starr***, Willamette University, and **A. Walker**, Albuquerque, NM (1116-05-603)

10:15AM (1426) *The Space of Biorders on Some Solvable Groups.* Preliminary report.
Kelli M Karcher, Virginia Tech (1116-06-2151)

10:30AM (1427) *Sequences of Quiver Mutations on Surfaces.*
Eric Bucher, Louisiana State University (1116-05-2979)

10:45AM (1428) *Bipartite distance-regular graphs with exactly two irreducible T-modules with endpoint 2.*
Mark S. MacLean*, Seattle University, and **Stefko Miklavic**, University of Primorska, Slovenia (1116-05-344)

AMS Session on Computer Science, Information, Control Theory, and Economics, I

8:00 AM – 10:55 AM **Skagit 1, Skagit Lower Level, Washington State Conference Center**

8:00AM ► (1429) *Automorphism group of binary MacDonald codes.* Preliminary report.
Pani Seneviratne, Texas A&M University Commerce (1116-94-732)

8:15AM ► (1430) *Meta-Graphs and Gamification.* Preliminary report.
James Edward Mihalisin, Raleigh, NC (1116-94-2386)

8:30AM ► (1431) *Can an Unstable Control System Be Stabilized By Timing Noise?*
Dylan R Poulsen, Washington College (1116-93-721)

8:45AM (1432) *Persistent Homology on Grassmann manifolds for Analysis of Hyperspectral Movies.*
Sofya Chepushtanova, Wilkes University (1116-58-2446)

9:00AM (1433) *ShapeFit: Exact location recovery from corrupted pairwise directions.*
Paul E Hand*, Rice University, **Choongbum Lee** and **Vladislav Voroninski**, Massachusetts Institute of Technology (1116-68-2783)

9:15AM ► (1434) *Ionospheric Weather Forecasting Using a Climatology-Augmented Ensemble Kalman Filter.* Preliminary report.
Juan Durazo*, **Eric Kostelich** and **Alex Mahalov**, Arizona State University (1116-93-2205)

9:30AM (1435) *Invariance of the Sprague-Grundy Function for Variants of Wythoff's Game.*
Madeleine Weinstein, Harvey Mudd College (1116-91-267)

9:45AM (1436) *The relationship between revealed preference and the slutsky matrix.*
Yuhki Hosoya, Department of Economics, Kanto-Gakuin University (1116-91-286)

10:00AM (1437) *Persistent Homology based thresholding method and applications.*
Yu-Min Chung* and **Sarah Day**, College of William and Mary (1116-68-1458)

10:15AM ► (1438) *Fast, uniform, and compact scalar multiplication for elliptic curves and genus 2 Jacobians with applications to signature schemes.* Preliminary report.
Ping Ngai Chung*, University of Chicago, **Craig Costello**, Microsoft Research, and **Benjamin Smith**, École Polytechnique and INRIA (1116-11-1345)

10:30AM ► (1439) *Cooperation in Finite Populations: Being Alone Helps.*
Anh V. Nguyen, Texas Christian University, **Jasmeet S. Saini***, **Jan Rychtar** and **Jonathan T. Rowell**, University of North Carolina, Greensboro (1116-91-1219)

10:45AM ► (1440) *The Truncated Levy Flight Model: A Comparative Analysis of its Utility in Modeling the Standard and Poor's 500 and the Ghana Stock Exchange.* Preliminary report.
Emmanuel Ncheuguim*, Saginaw Valley State Unversity, **Joseph Ofori-Dankwa**, Saginaw Valley State University, and **Seth Appiah-Kubi**, Pentecost University College, Sowutoom, Ghana (1116-91-1422)

AMS Session on Ordinary Differential Equations and Special Functions, I

8:00 AM – 10:55 AM **Room 616, Washington State Convention Center**

8:00AM (1441) *Almost automorphic solutions of discrete delayed neutral system.*
Murat Adivar* and **Can Koyuncuoglu**, Izmir University of Economics (1116-39-669)

8:15AM (1442) *Stability conditions for linear neutral delay differential equations.* Preliminary report.
Catherine Payne* and **R. Fabiano**, University of North Carolina-Greensboro (1116-39-2527)

► 8:30AM (1443) *Polyhyperbolic Cardinal Splines.* Preliminary report.
Jeff Ledford, Virginia Commonwealth University (1116-41-1244)

8:45AM (1444) *Lyapunov-type inequalities for fractional order differential equations with Caputo and Riemann-Liouville derivatives of order* α $(3 < \alpha \leq 4)$.
Nimisha S. Pathak, Southern Illinois University, Carbondale (1116-45-2137)

9:00AM (1445) *More results on the trichotomy character of a second-order rational difference equation with period-two coefficients.*
Carol H Gibbons, Salve Regina University, **Senada Kalabusic**, Zmaja od Bosne, and **Carol B Overdeep***, Saint Martin's University (1116-39-973)

► 9:15AM (1446) *On Monotonic Solutions of Systems of Nonlinear Differential Equations.*
Lianwen Wang, University of Central Missouri (1116-34-2886)

9:30AM (1447) *Solving problems on the semi-infinite domain using rational Bernoulli functions.*
Velinda R. Calvert* and **Moshen Razzaghi**, Mississippi State University (1116-34-2914)

► 9:45AM (1448) *Solutions of First Order Functional Differential Equations with Linear Delay and Advance Arguments, with Boundary Conditions, Using the Continuation Method.*
Duane Chin-Quee*, Indian River State College, and **G.T. Bhaskar**, Florida Institute of Technology (1116-34-1740)

10:00AM (1449) *Comparison of smallest eigenvalues for certain fifth order boundary value problems.*
Charles Nelms Jr., Baylor University (1116-34-968)

10:15AM (1450) *Approximate solution for the fractional integro-differential equations with fractional Taylor method.*
Vidhya KrishnasamySaraswathy* and **Razzaghi Mohsen**, Mississippi State University (1116-41-2949)

► 10:30AM (1451) *Vibration Cloaking and suppression model.*
Taoufik Meklachi*, Drexel University, and **Daniel Onofrei**, University of Houston (1116-34-1271)

10:45AM (1452) *Remarks on Almost Periodic Differential Equations.* Preliminary report.
Zhivko S. Athanassov, Institute of Mathematics, Bulgarian Academy of Sciences (1116-34-366)

AMS Session on Real and Complex Analysis, I

8:00 AM – 10:55 AM **Room 615, Washington State Convention Center**

8:00AM (1453) *Multilinear dyadic operators and their commutators.*
Ishwari Jang Kunwar, Georgia Institute of Technology, Atlanta, GA (1116-43-2572)

8:15AM (1454) *Fourier Series for Singular Measures.*
John E. Herr* and **Eric S. Weber**, Iowa State University (1116-46-867)

8:30AM (1455) *Weak Convergence to a Solution of the Dilation Equation for Measures.*
Sarah Dumnich* and **Robert Neel**, Lehigh University (1116-28-1416)

8:45AM (1456) *Convolution of A Harmonic Square Map Preserving Directional Convexity.*
Michael Dorff, **Samaneh G. Hamidi***, Brigham Young University, **Bo-Yong Long**, Anhui University, and **Jay M. Jahangiri**, Kent State University (1116-30-2460)

9:00AM (1457) *Minkowski's Inequality with One-Form.*
Xiao-Xiong Gan, Morgan State University (1116-28-440)

► 9:15AM (1458) *On the "degree of emptiness of empty sets": An interpretation of "latent dimension".* Preliminary report.
Shuang Shen, Department of Mathematics, The Chinese University of Hong Kong (1116-28-2216)

9:30AM (1459) *Discrete measures with dense jumps induced by Sturmian Dirichlet series.*
DoYong Kwon, Chonnam National University (1116-26-1382)

9:45AM (1460) *A characterization of rectifiable measures in Euclidean space.*
Jonas Azzam*, Universitat Autónoma de Barcelona, and **Xavier Tolsa**, Universitat Autònoma de Barcelona (1116-51-574)

10:00AM (1461) **Poisson Equation for p-Laplacian on Infinite Graphs and Existence of Solution**.
Lucio M.G. Prado, Department of Mathematics, BMCC-The City Univ. of New York (1116-31-2755)

10:15AM (1462) *Equivalence of local uniform convergence and local equicontinuity for a general symmetric diffusion semigroup.* Preliminary report.
Maxim J Goldberg, Ramapo College of NJ, and **Seonja Kim***, Quinnipiac University (1116-43-2089)

10:30AM ► (1463) *T1 theorem on non homogeneous spaces by time-frequency analysis.* Preliminary report.
Natawat Klamsakul, University of Illinois at Urbana Champaign (1116-44-458)

10:45AM (1464) *An Extension Theorem for Matrix Weighted Sobolev Space on a Lipschitz Domain.* Preliminary report.
Christopher Ryan Loga, University of Tennessee Knoxville (1116-42-187)

MAA Session on Contemplative Pedagogy and Mathematics, I

8:00 AM – 9:55 AM **Room 304, Washington State Convention Center**

Organizers: **Luke Wolcott**, Lawrence University
Justin Brody, Goucher College

8:00AM ► (1465) *Contemplating Infinity.*
Justin Brody, Goucher College (1116-C5-2308)

8:20AM ► (1466) *Do in-class mindfulness activities increase student performance?* Preliminary report.
Josh Thompson, Northern Michigan University (1116-C5-2765)

8:40AM ► (1467) *Mindfulness Across the Curriculum: From Freshmen to Seniors.*
Robbie Pinter* and **Mike Pinter**, Belmont University (1116-C5-2805)

9:00AM ► (1468) *The Mindfulness Infused Mathematics Class.*
John Mitchell, Clark College, Vancouver, WA. (1116-C5-2170)

9:20AM ► (1469) *Consciousness-Based Education: Using Transcendental Meditation to Enhance Student Learning in Mathematics Classes.*
M. Anne Dow, Maharishi University of Management (1116-C5-2487)

9:40AM ► (1470) *Geometry for the Artist: An Interdisciplinary Course Based on Consciousness.*
Catherine A. Gorini, Maharishi University of Management (1116-C5-1689)

MAA Session on Research in Undergraduate Mathematics Education, III

8:00 AM – 10:55 AM **Room 2B, Washington State Convention Center**

Organizer: **Karen A. Keene**, North Carolina State University

8:00AM ► (1471) *Classification and Prediction: What Admissions and Grades Data Tell Us About Who is Likely to Succeed in Undergraduate Mathematics Programs.* Preliminary report.
Juan Carlos Apitz, California State University, Long Beach (1116-Q5-2943)

8:20AM (1472) *A model for implementing interactive-engaged practices in calculus: effects on performance and conceptual learning.* Preliminary report.
Guadalupe I Lozano, University of Arizona (1116-Q5-2933)

8:40AM ► (1473) *Investigating the genre of mathematical proof writing at the undergraduate level.*
Kristen Lew* and **Juan Pablo Mejia-Ramos**, Rutgers, the State University of New Jersey (1116-Q5-2796)

9:00AM (1474) *Learning Assistants in Business Calculus Classes.*
Stephen Kenneth Liddle* and **Sheeva Doshireh**, George Mason University (1116-Q5-2750)

9:20AM ► (1475) *Mathematicians' Conceptual and Ideational Mathematics about Continuity of Complex-Valued Functions.*
Hortensia Soto-Johnson*, **Brent Hancock**, University of Northern Colorado, and **Michael Oehrtman**, Oklahoma State University (1116-Q5-2673)

9:40AM ► (1476) *Success in doctoral mathematics: What do faculty members expect of their students in order for them to be successful and to what do they attribute their own success?*
Emily Miller*, University of Illinois at Urbana-Champaign, and **Casey George-Jackson**, University of Louisville (1116-Q5-2669)

10:00AM ► (1477) *Listing as a Potential Connection between Sets of Outcomes and Counting Processes.*
Sarah A. Erickson* and **Elise Lockwood**, Oregon State University (1116-Q5-2520)

10:20AM ► (1478) *Toward a measure of Inquiry-Oriented instruction.*
George Kuster* and **Estrella Johnson**, Virginia Tech (1116-Q5-2444)

10:40AM ► (1479) *The Hillyer College Summer Bridge-Math Program: A Case Study for Assessing and Improving Student Academic Performance.*
Elena A. Cheser, Hillyer College at University of Hartford (1116-Q5-2742)

MAA Session on Trends in Undergraduate Mathematical Biology Education, I

8:00 AM – 10:55 AM **Room 2A, Washington State Convention Center**

Organizers: **Timothy Comar**, Benedictine University
Daniel Hrozencik, Chicago State University

8:00AM ► (1480) *Using Case Studies to Integrate Life Science content in Introductory Calculus Courses.*
Troy Day*, Queen's University, and **James Stewart**, McMaster University and University of Toronto (1116-T1-1267)

8:20AM ► (1481) *Biocalculus: Changing Minds One Derivative at a Time.*
Hannah Lea Callender*, University of Portland, and **Carrie Eaton**, Unity College (1116-T1-1351)

8:40AM ► (1482) *Integrating Mathematics, Biology, Physics and Psychology to Target At-Risk Students.* Preliminary report.
Jeff Pullen*, **Katie Northcutt**, **Chamaree de Silva** and **Jarred Jenkins**, Mercer University (1116-T1-2331)

9:00AM (1483) *Introducing Mathematical Modeling and Improving Quantitative Skills in Collaborative Courses.*
Sarah A Hews* and **Christina Cianfrani**, School of Natural Science, Hampshire College (1116-T1-2585)

9:20AM (1484) *Pulse Vaccination Models: Dynamics and Sensitivity Analysis.*
Timothy D Comar, Benedictine University (1116-T1-1248)

9:40AM ► (1485) *Embracing the Algebraic Approach to Mathematical Biology.*
Raina S Robeva, Randolph-Macon College (1116-T1-2715)

10:00AM ► (1486) *A Course in Mathematical Biology Using Algebra and Discrete Mathematics.*
Dan Hrozencik, Chicago State University (1116-T1-2344)

10:20AM ► (1487) *Integrating research and teaching in quantitative biology: mathematical modeling of gene regulation.*
Robert A Drewell*, Biology Department, Clark University, and **Jacqueline M Dresch**, Department of Mathematics and Computer Science, Clark University (1116-T1-2454)

10:40AM (1488) *Modernizing Statistics Education via Biology Applications.*
Olcay Akman, Illinois State University (1116-T1-2753)

MAA Session on the Contributions of Minorities to Mathematics Throughout History, I

8:00 AM – 9:55 AM **Room 303, Washington State Convention Center**

Organizers: **Amy Shell-Gellasch**, Montgomery College
Lloyd Douglas, University of North Carolina

8:00AM ► (1489) *Discovering Undergraduate Mathematics in Native American Culture.*
Charles P. Funkhouser*, California State University Fullerton, **Miles R. Pfahl**, Turtle Mountain Community College, and **Harriet C. Edwards**, California State University Fullerton (1116-D1-265)

8:20AM ► (1490) *Incorporating the Contributions of Women and Minorities into Classrooms: David Blackwell, Evelyn Boyd Granville and Mary Gray.* Preliminary report.
Sarah J Greenwald, Appalachian State University (1116-D1-663)

8:40AM ► (1491) *Sonya Kovalevsky: The Rest of the Story.*
Robert L Brabenec, Wheaton College IL (1116-D1-488)

9:00AM ► (1492) *Polish Women in Mathematics During the Nazi Occupation.* Preliminary report.
Emelie A Kenney, Siena College (1116-D1-98)

9:20AM ► (1493) *"Arithmetic Simplified" (1832): The Story Behind Catharine Beecher's Most Unrecognized Work.*
Jill R. Duke, New Mexico State University (1116-D1-1287)

9:40AM ► (1494) *The making of Benjamin Banneker.*
Satish C. Bhatnagar, University of Nevada Las Vegas (1116-D1-1078)

MAA Session on the Development and Adoption of Open Educational Resources for Teaching and Learning, I

8:00 AM – 10:55 AM **Room 620, Washington State Convention Center**

Organizers: **Benjamin Atchison**, Framingham State University
Jeremy Russell, The College of New Jersey

8:00AM ► (1495) *Using open resources to teach a freshman general education course for non-STEM majors.*
John W Watson, Arkansas Tech University (1116-E1-95)

8:20AM (1496) *Lessons from a teacher-developer collaboration on a set of open-source educational web apps.* Preliminary report.
Mary R Parker*, Austin Community College, and **Hunter Ellinger**, Austin, Texas (1116-E1-2650)

8:40AM ► (1497) *Bridging the Closed and Open: How FoxySheep Can Benefit Both Proprietary and Open Technologies for Teaching and Research.*
Robert Jacobson, Roger Williams University (1116-E1-1434)

9:00AM (1498) *Adaptive Just-In-Time WeBWorK Assignments.*
Geoff R Goehle, Western Carolina University (1116-E1-1923)

9:20AM ► (1499) *Tailoring the Text: Creating a Quality Open Educational Resource for College Algebra.*
Mark J. Morabito, Framingham State University and Framingham High School (1116-E1-2252)

9:40AM ► (1500) *A WeBWorK-MathBook XML Bridge.*
Robert A Beezer, University of Puget Sound (1116-E1-1081)

10:00AM ► (1501) *Exploring Affordable Learning Resources for College Algebra.* Preliminary report. **Marcela Chiorescu**, Georgia College (1116-E1-1241)

10:20AM ► (1502) *Using SageCell for Engaging Students.* **D Scott Dillery**, Lindsey Wilson College (1116-E1-1060)

10:40AM ► (1503) *Recycling the Book: Adventures (and Misadventures) in Transforming an Undergraduate History of Math Class Using OER.* Preliminary report. **Cheryl J. McAllister*** and **Craig W. Roberts**, Southeast Missouri State University (1116-E1-1840)

MAA Session on the Teaching and Learning of Undergraduate Ordinary Differential Equations, I

8:00 AM – 10:55 AM **Room 617, Washington State Convention Center**

Organizers: **Christopher S. Goodrich**, Creghton Preparatory School
Beverly H. West, Cornell University

8:00AM ► (1504) *Aircraft Longitudinal Oscillations.* **Catherine E Cavagnaro**, Sewanee: The University of the South (1116-S1-2573)

8:20AM ► (1505) *Reflections from Teaching Inquiry-Oriented Differential Equations.* **Keith A Nabb**, Moraine Valley Community College (1116-S1-129)

8:40AM ► (1506) *The Reformed ODE Curriculum: Students' Solution Strategies, Students' Approval of the Qualitative Approach, and the Importance of Incorporating a Writing Component.* **Samer S. Habre**, Lebanese American University (1116-S1-339)

9:00AM ► (1507) *SIMIODE - Building a Learning Community to Teach Modeling First Differential Equations.* **Brian Winkel**, Emeritus, US Military Academy & Director SIMIODE (1116-S1-376)

9:20AM ► (1508) *Classroom Module for Using ODEs to Model the AIDS Epidemic.* **L. G. dePillis**, Harvey Mudd College (1116-S1-521)

9:40AM ► (1509) *Integrating Sage into an Ordinary Differential Equations Course using MathBook XML.* **Thomas W Judson***, Stephen F. Austin State University, and **Theron Hitchman**, University of Northern Iowa (1116-S1-586)

10:00AM (1510) *Using Current/Urgent Research to Enhance Undergraduate Differential Equations.* Preliminary report. **Erich McAlister**, Fort Lewis College (1116-S1-811)

10:20AM ► (1511) *Modeling First - Techniques Just In Time.* **Eric Sullivan**, Carroll College (1116-S1-1186)

10:40AM (1512) *Using Maple to Promote Modeling in Differential Equations.* **Patrice G Tiffany*** and **Rosemary C Farley**, Manhattan College (1116-S1-1488)

MAA General Contributed Paper Session on Assorted Topics, II

8:00 AM – 10:55 AM **Room 213, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

7:45AM (1513) *Famous Mathematicians From Iran But Whom You May Not Know.* **Samaneh G. Hamidi**, Brigham Young University (1116-VW-2856)

8:00AM ► (1514) *Partial Differential Equations and Digital Image Processing.* **Mohamed Allali**, Chapman University (1116-VW-2039)

8:15AM ► (1515) *A Geometric Classification of Strategic Effects Resembling Duverger's Law.* Preliminary report. **Tomas J McIntee**, Virginia Tech (1116-VW-2263)

8:30AM ► (1516) *Exploration of some dynamics of the iteration of the complex sine function.* **Aimee M. Cloutier***, Texas Tech University, and **Jerry F. Dwyer**, George Washington University (1116-VW-2570)

8:45AM ► (1517) *Introducing Undergraduates to Research Though a One-Week Mathematics Research Camp.* Preliminary report. **William Johnston** and **Amber Russell***, Butler University (1116-VW-2610)

9:00AM ► (1518) *Compositions with Descents at Odd Plus Signs.* **Ralph P. Grimaldi**, Rose-Hulman Institute of Technology (1116-VW-283)

9:15AM ► (1519) *An Integer Sequence Motivated by Generalized Quadrangles.* **Brian G. Kronenthal**, Kutztown University of Pennsylvania (1116-VW-295)

9:30AM ► (1520) *Properties of m'th Level Triangle Numbers in Second Order Recursive Polynomials.* **Alperen S Sirin***, University of Rochester, **Maria Lema**, SUNY Buffalo State, and **Maximillian Bender**, Connecticut College (1116-VW-299)

9:45AM ► (1521) *N-Division Points of Hypocycloids.* **Nitya Mani***, Stanford University, and **Simon Rubinstein-Salzedo**, Euler Circle (1116-VW-348)

10:00AM ► (1522) *Infinitesimals, Point Nine Repeating, and One.*
Bryan Dawson, Union University (1116-VW-361)

10:15AM ► (1523) *Applications of Quadratic Reciprocity to Finite Diophantine Equations.*
Omer Yildiz, Rochester, New York (1116-VW-391)

10:30AM (1524) *Childhood Memories: Using the Inner Child to Teach Mathematics.*
J. Alan Alewine, McKendree University (1116-VW-460)

10:45AM ► (1525) *Obstacles in Implementation of a successful undergraduate research program.*
Noureen Khan, University of North Texas at Dallas (1116-VW-1651)

MAA General Contributed Paper Session on Logic and Foundations

8:00 AM – 8:55 AM **Room 212, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

8:00AM (1526) *Force to Change Large Cardinal Strength.*
Erin Kathryn Carmody, Nebraska Wesleyan University (1116-VJ-1042)

8:15AM ► (1527) *Paraconsistent Measurement of the Circle: An Invitation to Inconsistent Mathematics.*
Maarten McKubre-Jordens*, University of Canterbury, Christchurch, New Zealand., and **Zach Weber**, University of Otago, Dunedin, New Zealand (1116-VJ-1198)

8:30AM ► (1528) *Law of Non-Contradiction Generates Infinite Contradictions.* Preliminary report.
Chandra Kethi-Reddy, University of Central Florida (1116-VJ-1575)

8:45AM (1529) *Toward the Consistency Strength of Stationary Set Reflection on Small Cardinals.* Preliminary report.
Cynthia Northrup, Bellevue College (1116-VJ-2207)

MAA General Contributed Paper Session on Modeling and Applications, III

8:00 AM – 9:55 AM **Room 214, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

8:00AM ► (1530) *Numerical Investigation of Nonlinear Transport Models describing Gas Flow through Tight Porous Media.*
Iftikhar Ali* and **Nadeem A Malik**, King Fahd University of Petroleum and Minerals (1116-VM-2063)

8:15AM ► (1531) *Not so sinister after all: How mathematical models can explain the resilience of the left-handed minority.*
Mark J Panaggio*, Rose-Hulman Institute of Technology, and **Daniel M Abrams**, Northwestern University (1116-VM-2074)

8:30AM ► (1532) *On Applications of Generalized Functions in the Discontinuous Beam Bending Differential Equations.* Preliminary report.
Austin States*, **Bradley Lipscomb** and **Dimplekumar Chalishajar**, Virginia Military Institute (1116-VM-2087)

8:45AM ► (1533) *An epidemic model with exposed and treatment components.* Preliminary report.
Long Le, University of Central Arkansas (1116-VM-2102)

9:00AM ► (1534) *Implications of Logistic Equation Based Spatial and Behavioral Ebola Forecasting Models.*
Bruce Pell*, **Javier Baez**, Arizona State University, **Gerardo Chowell**, Georgia State University, **Yang Kuang**, Arizona State University, **Daozhou Gao**, University of California, and **Tin Phan**, Arizona State University (1116-VM-2209)

9:15AM ► (1535) *Ensemble Kalman Filter for Prediction of Treatment Response in Metastatic Prostate Cancer.* Preliminary report.
Bradley Michael Stiefel*, **Zach Kenyon**, **Tin Pham**, **Eric Kostelich** and **Yang Kuang**, MCTP/Arizona State University (1116-VM-2236)

9:30AM (1536) *Mathematical Models on Language Competition and Bilingualism.*
Yusuf Sofuoglu, Siirt University (1116-VM-2250)

9:45AM (1537) *On a generalized free-interface model of solid combustion.*
Laura K. Gross*, Bridgewater State University, **Jun Yu**, University of Vermont, **Yi Yang**, Emory University, and **Kewang Chen**, University of Vermont (1116-VM-2269)

MAA General Contributed Paper Session on Teaching and Learning Calculus, II

8:00 AM – 10:55 AM **Yakima 2, Yakima Level One, Washington State Conference Center**

Organizers: **Jennifer E. Beineke**, Western New England University

Bem Cayco, San Jose State University

Timothy Comar, Benedictine University

T. James Reid, University of Mississippi

8:00AM ► (1538) *Using and Creating 3D Printed Models in Calculus Teaching.*
Skyler C Simmons, Brigham Young University (1116-VR-2597)

8:15AM ► (1539) *Peer-Led Team Learning in Calculus.*
Rebecca Glover*, University of St. Thomas, **Nicholas Hammond**, **Justin Smith** and **Dalyana Guerra**, University of Rochester (1116-VR-2658)

8:30AM (1540) *Developing Deep Student Understanding of the Partial Derivative using 3D Manipulatives.*
Jason Samuels, City University of New York, **Aaron Wangberg**, Winona State University, and **Brian Fisher***, Lubbock Christian University (1116-VR-2694)

8:45AM ► (1541) *Using 3D-Printing in Teaching Multi-variable Calculus.* Preliminary report.
Ziyue Guo, Marlboro College (1116-VR-2696)

9:00AM ► (1542) *Playing with Multivariable Calculus Concepts Wearing 3D Glasses.* Preliminary report.
Paul E. Seeburger, Monroe Community College (1116-VR-2878)

9:15AM ► (1543) *Integration by the Wrong Parts.*
William C Kronholm, Whittier College (1116-VR-2961)

9:30AM ► (1544) *Helping Students Succeed in First Semester Calculus.*
Sharon S Vestal, South Dakota State University (1116-VR-452)

9:45AM ► (1545) *Breaking Free from Traditional Calculus Textbooks with Mathematica.* Preliminary report.
Matthew Cathey* and **Joseph Spivey**, Wofford College (1116-VR-474)

10:00AM ► (1546) *Reverse Engineering as a Learning Strategy in the Calculus Classroom.*
Alexander J Hahn, University of Notre Dame (1116-VR-480)

10:15AM (1547) *Three Years of Flipping Calculus at the University of Hartford.*
John K Williams* and **Larissa Schroeder**, University of Hartford (1116-VR-559)

10:30AM ► (1548) *On the Teaching of Calculus: A Deeper Look at a Derivative Sketching Activity.* Preliminary report.
Lance Burger* and **Marat Markin**, Fresno State (1116-VR-708)

10:45AM ► (1549) *A Surprise Among the Trig Substitutions.* Preliminary report.
Mylan Redfern* and **David Betounes**, University of Texas, Permian Basin (1116-VR-1044)

SIAM Minisymposium on Inverse Problems and Applications, II

8:00 AM – 10:55 AM **Room 3A, Washington State Convention Center**

Organizer: **Gunther Uhlmann**, University of Washington

8:00AM (1550) *Transverse ray transform.* Preliminary report.
David V Finch*, Dept of Mathematics, Oregon State Unversity, and **Patcharee Wongsason**, Department of Math, Statistics, Computer Science Ubon Ratchathani University (1116-44-2186)

8:30AM (1551) *Spectral Estimates and Inverse Boundary Problems for Elliptic Operators.*
Katya Krupchyk, University of California, Irvine (1116-35-2759)

9:00AM (1552) *D-bar Methods for Functional Pulmonary Imaging with Electrical Impedance Tomography.*
Jennifer L Mueller, Colorado State University (1116-35-1658)

9:30AM (1553) *Inversion of the attenuated geodesic X-ray transform on simple surfaces.*
Francois S Monard, University of Michigan (1116-35-2281)

10:00AM (1554) *Photoacoustic tomography taking into account thermoelastic attenuation.* Preliminary report.
Sebastian Acosta, Baylor College of Medicine (1116-35-1921)

10:30AM ► (1555) *Computing Fourier Integral Operators with Caustics.*
Peter A Caday, Rice University (1116-35-2816)

Project NExT Workshop

8:00 AM – 6:00 PM **Room 4C-2, Washington State Convention Center**

MAA-NCTM Joint Committee on Mutual Concerns, College Board/MAA Joint Committee on Mutual Concerns Panel Discussion

8:00 AM – 9:20 AM **Room 612, Washington State Convention Center**

College calculus and the preparation gap: Identified problems and models for improvement.

Organizers: **Michael Boardman**, Pacific University

Gail Burrill, Michigan State University

David Bressoud, Macalester College

Panelists: **David Bressoud**, Macalester College

Deborah Hughes Hallett, Harvard University

Robin Cruz, College of Idaho

Dave Dwyer, University of Evansville

Chad Topaz, Macalester College

SIGMAA on Statistics Education Panel Discussion

8:00 AM – 9:20 AM **Room 609, Washington State Convention Center**

Guidelines for Statistics Education: MAA Curriculum Guide, ASA Guidelines, GAISE II, and SET.

Organizers: **Paul Frazer Lock**, St. Lawrence University

Sue Schou, Idaho State University

Randall Pruim, Calvin College

Panelists: **Patti Frazer Lock**, St. Lawrence University

Michelle Everson, Ohio State University

Chris Franklin, University of Georgia

Beth Chance, Cal Poly - San Luis Obispo

Employment Center

8:00 AM – 5:30 PM **Hall 4B, 4th Floor, Washington State Convention Center**

MAA Session on MAA-EDGE (Enhancing Diversity in Graduate Education) Pure and Applied Talks by Women Math Warriors

8:05 AM – 10:55 AM **Room 608, Washington State Convention Center**

Organizers: **Candice R. Price**, Sam Houston State University

Amy L. Buchmann, Tulane University

8:05AM ► (1556) *A Test for the Two-sample Problem using a Rank-based Approach.*
Jamye Nichelle Curry, Georgia Gwinnett College (1116-Z1-1502)

8:30AM (1557) *Temperature Effects on REM/non-REM Sleep Dynamics.*
Shelby N Wilson*, Morehouse College, **Selenne Banuelos**, California State University Channel Islands, **Janet Best**, The Ohio State University, **Gemma Huguet**, Universitat Politecnica de Catalunya, **Alicia Prieto-Langarica**, Youngstown State University, and **Pamela Pyzza**, Ohio Wesleyan University (1116-Z1-1151)

8:55AM (1558) *Boundaries of Baumslag-Solitar Groups.*
Craig Guilbault, University of Wisconsin-Milwaukee, **Christopher Mooney**, N/A, **Molly Moran***, Colorado College, and **Carrie Tirel**, University of Wisconsin-Fox Valley (1116-Z1-1071)

9:20AM ► (1559) *Evolutionary Dynamics of a Multi-trait Semelparous Model.*
Amy Veprauskas*, Interdisciplinary Program in Applied Mathematics, University of Arizona, and **J M Cushing**, Interdisciplinary Program in Applied Mathematics and Department of Mathematics, University of Arizona (1116-Z1-866)

9:45AM ► (1560) *A mathematical model of broad-spectrum antibiotic treatment of leptospirosis: the risk of antibiotic resistance.*
Laurel A Ohm, University of Minnesota, Twin Cities (1116-Z1-332)

10:10AM ► (1561) *Analysis of Retinal Images Via Dimension Reduction on Graphs.*
Karamatou A Yacoubou Djima*, Swarthmore College, **Wojciech Czaja** and **Lucia D Simonelli**, University of Maryland, College Park (1116-Z1-2549)

10:35AM ► (1562) *Intrinsic Tame Filling Functions.*
Preliminary report.
Anisah Nabilah Nu'Man, Trinity College (1116-Z1-2747)

AMS-MAA Grad School Fair

8:30 AM – 10:30 AM **Hall 4F, 4th Floor, Washington State Convention Center**

Undergrads! Take this opportunity to meet representatives from mathematical science graduate programs.

MAA Invited Address

9:00 AM – 9:50 AM **Ballroom 6BC, Washington State Convention Center**

(1563) *What makes for powerful classrooms—and what can we do, now that we know?*
Alan Schoenfeld, University of California, Berkeley (1116-A0-12)

ASL Invited Address

9:00 AM – 9:50 AM **Room 4C-1, Washington State Convention Center**

(1564) *Transseries: algebra and model theory.*
Lou van den Dries, University of Illinois (1116-03-691)

MAA Minicourse #12: Part B

9:00 AM – 11:00 AM **Tahoma 5, Tahoma Level Three, Washington State Conference Center**

Humanistic mathematics.

Presenters: **Gizem Karaali**, Pomona College

Eric Marland, Appalachian State University

MAA Minicourse #11: Part B

9:00 AM – 11:00 AM **Metropolitan B, 3rd Floor, Sheraton Seattle Hotel**

Implementing inquiry-oriented curricula for linear algebra, differential equations, and abstract algebra.

Presenters: **Estrella Johnson**, Virginia Polytechnic Institute
Karen Keene, North Carolina State University

MAA Minicourse #5: Part B

9:00 AM – 11:00 AM **Metropolitan A, 3rd Floor, Sheraton Seattle Hotel**

Teaching introductory statistics for instructors new to teaching statistics.

Presenter: **Carolyn Cuff**, Westminster College

MAA Session on Innovative and Effective Ways to Teach Linear Algebra, I

9:00 AM – 10:55 AM **Room 618, Washington State Convention Center**

Organizers: **David Strong**, Pepperdine University
Gil Strang, Massachusetts Institute of Technology
Megan Wawro, Virginia Tech

9:00AM ► (1565) *Online Linear Algebra Tools from the MAA Course Communities.* **David Strong**, Pepperdine University (1116-H1-1975)

9:20AM ► (1566) *Exploring linear algebra with technology while being crunched for time.* Preliminary report. **Mark Hughes**, Brigham Young University (1116-H1-895)

9:40AM ► (1567) *Using Matlab and Blended Learning Techniques for a Successful Linear Algebra Learning Experience.* **Christina Lee**, Oxford College of Emory University (1116-H1-2422)

10:00AM ► (1568) *Singular Value Decomposition: A thrilling inspiration in Linear Algebra.* **Naima Naheed**, Benedict College, Columbia, SC (1116-H1-1556)

10:20AM ► (1569) *Linear Algebra in the Formal World of Mathematical Thinking.* Preliminary report. **John Hannah**, University of Canterbury, **Sepideh Stewart***, University of Oklahoma, and **Mike Thomas**, University of Auckland (1116-H1-2427)

10:40AM ► (1570) *Specific Examples, Generic Elements and Restricted Dimensions - Overcoming Student Roadblocks in Linear Algebra.* **Jeffrey L. Stuart**, Pacific Lutheran University (1116-H1-995)

Student Hospitality/Information Center

9:00 AM – 5:00 PM **Skybridge, 4th Floor, Washington State Convention Center**

Exhibits and Book Sales

9:30 AM – 5:30 PM **Hall 4A, 4th Floor, Washington State Convention Center**

MAA/NCTM Joint Committee on Mutual Concerns Panel Discussion

9:35 AM – 10:55 AM **Room 612, Washington State Convention Center**

Instructional strategies that can make a difference.

Organizer: **Gail Burrill**, Michigan State University

Panelists: **Tom Dick**, Oregon State University
Diane Briars, National Council of Teachers of Mathematics
Brian Hopkins, St. Peters University
Darryl Yong, Harvey Mudd College

MAA Panel Discussion

9:35 AM – 10:55 AM **Room 609, Washington State Convention Center**

Perspectives on IBL teaching: novice, experienced and master.

Organizers: **Judith Covington**, Louisiana State University Shreveport
Theron Hitchman, University of Northern Iowa

Panelists: **Angie Hodge**, University of Nebraska Omaha
Mitchel T. Keller, Wahsington and Lee University
Carol Schumacher, Kenyon College

ASL Invited Address

10:00 AM – 10:50 AM **Room 4C-1, Washington State Convention Center**

(1571) *Differential algebra and special points conjectures.* **James Freitag**, University of California Los Angeles (1116-03-67)

AMS Invited Address

10:05 AM – 10:55 AM **Ballroom 6BC, Washington State Convention Center**

(1572) *The $SL(2,\mathbb{R})$ action on moduli space.*
Alex Eskin, University of Chicago (1116-37-14)

AMS-MAA Invited Address

11:10 AM – NOON **Ballroom 6BC, Washington State Convention Center**

► (1573) *How to Keep your Genome Secret.*
Kristin Estella Lauter, Microsoft Research (1116-11-1194)

AMS Colloquium Lectures: Lecture III

1:00 PM – 2:00 PM **Ballroom 6BC, Washington State Convention Center**

(1574) *Fourier analysis on general finite groups.*
W Timothy Gowers, University of Cambridge, UK (1116-05-1520)

ASL Invited Address

1:00 PM – 1:50 PM **Room 4C-1, Washington State Convention Center**

(1575) *Imperfect algorithms, asymptotic density, and Turing degrees.*
Carl G. Jockusch, University of Illinois at Urbana-Champaign (1116-03-66)

MAA Lecture for Students

1:00 PM – 1:50 PM **Ballroom 6A, Washington State Convention Center**

► (1576) *The fractal geometry of the Mandelbrot Set.*
Robert Devaney, Boston University (1116-A0-50)

Current Events Bulletin

1:00 PM – 4:45 PM **Room 4C-3, Washington State Convention Center**

Organizer: **David Eisenbud**, MSRI and UC Berkeley

1:00PM (1577) *What can topology tell us about the neural code?*
Carina Curto, Pennsylvania State University (1116-00-2101)

2:00PM (1578) *Laplacian growth, sandpiles and scaling limits.*
Yuval Peres, Microsoft Research and Univeristy of California, Berkeley (1116-00-2116)

3:00PM ► (1579) *Probabilistic combinatorics and the recent work of Peter Keevash.*
W Timothy Gowers, University of Cambridge, UK (1116-05-1801)

4:00PM (1580) *What are Lyapunov exponents, and why are they interesting?*
Amie Wilkinson, University of Chicago (1116-00-2121)

AMS-MAA Special Session on the History of Mathematics, IV

1:00 PM – 5:20 PM **Tahoma 3, Tahoma Level Three, Washington State Conference Center**

Organizers: **Patti Hunter**, Westmont College
Adrian Rice, Randolph-Macon College
Sloan Despeaux, Western Carolina University
Deborah Kent, Drake University

1:00PM ► (1581) *The Effectiveness of Mathematics as Applied to Science.*
Ronald E. Mickens, Clark Atlanta University (1116-01-303)

1:30PM ► (1582) *What makes a student the "best"?* Preliminary report.
Della Dumbaugh, University of Richmond (1116-01-1405)

2:00PM ► (1583) *Recognizing Ricci.* Preliminary report.
Judith R Goodstein, Visiting Associate, Einstein Papers Project, Caltech (1116-01-510)

2:30PM ► (1584) *American Women Mathematics Doctorates, 1940-1959.* Preliminary report.
Margaret A.M. Murray, University of Iowa (1116-01-526)

3:00PM ► (1585) *Polish Math House of the Interwar Period: Stefan Banach.*
Andrzej Lenard, San Diego, CA (1116-01-611)

3:30PM ► (1586) *"The first man whom you meet on the street": tracing back a well-known quotation by Hilbert.* Preliminary report.
June Barrow-Green*, The Open University, UK, and **Reinhard Siegmund-Schultze**, University of Agder, Norway (1116-01-1491)

4:00PM ► (1587) *The "patriotic duty not to nationalize science": aspects of the internationalization of mathematics in the late 19th and early 20th centuries.*
Laura E Turner, State University of New York at New Paltz (1116-01-2038)

4:30PM ► (1588) *Russian participation in the early International Congresses of Mathematicians.*
Christopher Hollings, Mathematical Institute, University of Oxford, UK (1116-01-264)

5:00PM ► (1589) *Making a Name in Mid-century Mathematics: Individuals, institutions, and the American reaction to Nicolas Bourbaki.*
Michael J. Barany, Princeton University (1116-01-228)

AMS-ASL Special Session on Surreal Numbers, II

1:00 PM – 5:50 PM **Room 602, Washington State Convention Center**

Organizers: **Philip Ehrlich**, Ohio University, Athens

Ovidiu Costin, Ohio State University, Columbus

1:00PM (1590) *Exponential-logarithmic power series fields and the surreal numbers.* **Salma Kuhlmann**, University of Konstanz (1116-06-2397)

► 2:00PM (1591) *The hypnagogic digraph, with applications to embeddings of the set-theoretic universe.* **Joel David Hamkins**, City University of New York (1116-03-41)

► 3:00PM (1592) *Number systems with simplicity hierarchies: a generalization of Conway's theory of surreal numbers II.* **Phillip Ehrlich**, Ohio University, and **Elliot Alexander Kaplan***, University of Illinois at Urbana-Champaign (1116-03-467)

► 3:30PM (1593) *Analysis on surreal numbers.* **Simon Rubinstein-Salzedo***, Euler Circle, and **Ashvin Swaminathan**, Harvard College (1116-40-329)

4:00PM (1594) *Analysis on Surreal Numbers: Functions and Integration.* **Ashvin Anand Swaminathan***, Harvard College, and **Simon Rubinstein-Salzedo**, The Euler Circle (1116-03-311)

4:30PM (1595) *Lebesgue measure and integration theory on arbitrary real closed fields.* **Tobias Kaiser**, University of Passau, Germany (1116-03-409)

5:00PM (1596) *Lengths of developments in $K((G))$.* **Julia F. Knight**, University of Notre Dame, and **Karen M. Lange***, Wellesley College (1116-03-2048)

5:30PM (1597) *Lengths of roots of polynomials in Hahn fields.* **Julia F. Knight***, University of Notre Dame, and **Karen M. Lange**, Wellesley College (1116-12-1752)

AMS-AWM Special Session on Commutative Algebra and Its Interactions with Algebraic Geometry, I

1:00 PM – 5:20 PM **Room 603, Washington State Convention Center**

Organizers: **Daniel Hernández**, University of Utah

Jack Jeffries, University of Michigan, Ann Arbor

Karl Schwede, University of Utah

1:00PM (1598) *F-thresholds of graded rings.* **Alessandro De Stefani*** and **Luis Núñez-Betancourt**, University of Virginia (1116-13-1096)

1:30PM (1599) *Lower Semi-Continuity of the F-Signature.* **Thomas Polstra**, University of Missouri-Columbia (1116-13-538)

2:00PM (1600) *Closure operations that induce big Cohen-Macaulay modules and algebras, module closures, and classification of singularities.* Preliminary report. **Rebecca R.G.**, University of Michigan (1116-13-1838)

2:30PM (1601) *Frobenius actions and a type of singularity in characteristic $p > 0$.* **Eric Canton**, University of Nebraska - Lincoln (1116-13-2005)

3:00PM (1602) *Lyubeznik numbers, connectivity, and cohomological dimension in mixed characteristic.* **Daniel J. Hernández**, University of Michigan, **Luis Núñez-Betancourt**, University of Virginia, **J. Felipe Pérez***, Georgia State University, and **Emily E. Witt**, University of Kansas (1116-13-1450)

3:30PM (1603) *Rational singularities and Uniform Symbolic Topologies.* **Robert M. Walker**, University of Michigan, Ann Arbor (1116-13-1273)

4:00PM (1604) *Derived S Systems.* **Alberto Chiecchio***, TASIS in Dorado, and **Lance E Miller**, University of Arkansas (1116-14-2619)

4:30PM (1605) *Generic vanishing and classification of irregular surfaces in positive characteristics.* **Yuan Wang**, University of Utah (1116-14-1366)

5:00PM (1606) *Subadditivity of log-Kodaira dimension.* **Sándor J Kovács***, University of Washington, and **Zsolt Patakfalvi**, Princeton University (1116-14-1507)

AMS Special Session on Algebraic Theory of Differential and Functional Equations

1:00 PM – 6:00 PM **Skagit 3, Skagit Lower Level, Washington State Conference Center**

Organizers: **Taylor Dupuy**, Hebrew University of Jerusalem and University of Vermont

Alexey Ovchinnikov, CUNY Queens College, New York

1:00PM (1607) *Differential Galois extensions.* **Anand Pillay**, University of Notre Dame (1116-34-1294)

2:00PM (1608) *On the computation of the difference-differential Galois group for a second-order linear difference equation.* **Carlos E Arreche**, North Carolina State University (1116-12-1478)

2:30PM (1609) *Calculating parameterized Picard-Vessiot group.*
Andrei Minchenko, Weizmann Institute of Science (1116-20-2483)

3:00PM (1610) *Two Bezout-type theorems for differential equations.*
Gal Binyamini, University of Toronto (1116-34-1666)

3:30PM (1611) *Around the Jouanolou-Hrushovski-Ghys Theorem.*
James E Freitag*, UCLA, and **Rahim Moosa**, University of Waterloo (1116-14-619)

► 4:00PM (1612) *The Riemannian geometry of the integers.* Preliminary report.
Alexandru Buium, University of New Mexico (1116-11-657)

5:00PM (1613) *Hyperderivatives and difference equations in function field arithmetic.*
Matthew A. Papanikolas, Texas A&M University (1116-11-1724)

5:40PM (1614) *Zeta functions of difference varieties.* Preliminary report.
Yuval Dor, Hebrew University of Jerusalem (1116-14-2246)

AMS Special Session on Algebraic and Topological Methods in Combinatorics, II

1:00 PM – 5:50 PM **Room 204, Washington State Convention Center**

Organizers: **Andrew Berget**, Western Washington University
Steven Klee, Seattle University
Isabella Novik, University of Washington, Seattle

1:00PM (1615) *Hodge Theory on Matroids.*
Eric Katz, University of Waterloo (1116-05-856)

1:30PM (1616) *Ladder ideals and tropical hyperplane arrangements with infinities.*
Alex Fink, Queen Mary University of London (1116-05-808)

2:00PM (1617) *Syzygies on Tutte polynomials of freedom matroids.*
Joseph Kung, University of North Texas (1116-05-336)

2:30PM (1618) *Relaxing the exchange axiom and Stanley's conjecture for matroid h-vectors.*
Jose Alejandro Samper, University of Washington (1116-05-2329)

3:00PM (1619) *Commutative algebra of generalized permutohedra.*
Anton Dochtermann, University of Texas at Austin (1116-05-2732)

3:30PM (1620) *Polytopal resolutions of Stanley-Reisner ideals of polytopes.*
Alexander Engstrom, Aalto University (1116-05-1949)

4:00PM (1621) *Balinski's theorem and dual graphs of curves.*
Bruno Benedetti*, U Miami, **Barbara Bolognese**, Northeastern U, and **Matteo Varbaro**, Univ. degli Studi di Genova (1116-05-1655)

4:30PM (1622) *Face enumeration and Kruskal-Katona-type theorems.*
Kai Fong Ernest Chong, Agency for Science, Technology and Research (A*STAR), Singapore (1116-05-1678)

5:00PM (1623) *Minimal balanced triangulations of sphere bundles over the circle.*
Hailun Zheng, University of Washington (1116-05-1205)

5:30PM (1624) *Recent results on face enumeration of manifolds and or pseudomanifolds.*
Ed Swartz, Cornell University (1116-05-1695)

AMS Special Session on Classification Problems in Operator Algebras, II

1:00 PM – 5:50 PM **Room 400, Washington State Convention Center**

Organizers: **Marcel Bischoff**, Vanderbilt University
Ben Hayes, Vanderbilt University

1:00PM (1625) *Model theory and the Weak Expectation Property.*
Isaac Goldbring*, University of Illinois at Chicago, and **Thomas Sinclair**, Purdue University (1116-46-592)

2:00PM (1626) *II_1 factors with non-isomorphic ultrapowers.*
Remi Boutonnet, University of California San Diego, **Ionut Chifan***, The University of Iowa, and **Adrian Ioana**, University of California San Diego (1116-46-690)

3:00PM (1627) *Singly generated planar algebras by a 3-box.*
Yunxiang Ren, Vanderbilt University (1116-47-888)

3:30PM (1628) *Bicommutant categories.*
David Penneys, University of California, Los Angeles (1116-46-455)

4:00PM (1629) *On Upper Triangular Forms in Finite von Neumann Algebras.*
Joseph C Noles, Texas A&M University (1116-47-1910)

4:30PM (1630) *Weighted Nevanlinna-Pick Interpolation over W^*-Algebras.* Preliminary report.
Jennifer R Good, University of Wisconsin - Platteville (1116-47-2678)

5:00PM (1631) *An example of factoriality under non-tracial finite free Fisher information assumptions.*
Brent A Nelson, University of California, Berkeley (1116-46-1839)

5:30PM (1632) *Noncommutative Gaussian Spaces.*
Stephen Avsec, Texas A&M University (1116-46-1902)

AMS Special Session on Early Career Female Mathematicians in Algebra and Topology

1:00 PM – 5:50 PM **Room 201, Washington State Convention Center**

Organizers: **Jocelyn Bell**, United States Military Academy, West Point

Bethany Kubik, University of Minnesota, Duluth

Candice Price, Sam Houston State University

1:00PM (1633) *Topological games.*
Jocelyn R Bell, United States Military Academy, West Point (1116-54-337)

► 1:30PM (1634) *Homotopy Critical Spectrum.* Preliminary report.
Eleanor McNair Abernethy, Univeristy of Tennessee (1116-53-253)

► 2:00PM (1635) *Determining Geometric Structures of Protein-Bound DNA using Modeling Software.* Preliminary report.
Mary Therese Padberg*, Albuquerque, New Mexico, **Isabel Darcy**, The University of Iowa, **Stephen Levene**, **Stefan Giovan**, The University of Texas at Dallas, and **Rob Scharein**, Hypnagogic Software (1116-92-1794)

2:30PM (1636) *Semidualizing DG Modules over Tensor Products.*
Hannah Altmann, University of Minnesota, Morris (1116-13-388)

3:00PM (1637) *Koszul Homology.* Preliminary report.
Denise A. Rangel Tracy*, Syracuse University, **L. Sega**, University of Missouri - Kansas City, **R. Dellaca**, U.C. Irvine, **J. Hoffmeier**, Northwest Missouri State University, **P. Thompson**, University of Nebraska- Lincoln, and **G. Sosa**, Amherst College (1116-13-1526)

3:30PM (1638) *The Intersection Algebra of Ideals.*
Sara Malec, Hood College (1116-13-955)

► 4:00PM (1639) *Could topology provide insight into brain diseases?* Preliminary report.
Leyda M. Almodovar Velazquez* and **Isabel K. Darcy**, University of Iowa (1116-55-437)

4:30PM (1640) *Topological Speedups of Odometers and Substitutions.*
Lori Alvin*, Bradley University, **Drew Ash** and **Nic Ormes**, University of Denver (1116-54-1056)

► 5:00PM (1641) *A Game of Crowns: Layered Generalized Crowns and Chromatic Number.*
Shannon Talbott, Moravian College (1116-05-740)

► 5:30PM (1642) *Realizations of phased matroids.* Preliminary report.
Amanda L Ruiz, Univeristy of San Diego (1116-05-1342)

AMS Special Session on Equations of Fluid Motion, II

1:00 PM – 5:50 PM **Skagit 4, Skagit Lower Level, Washington State Conference Center**

Organizers: **Elaine Cozzi**, Oregon State University

Radu Dascaliuc, Oregon State University

James P. Kelliher, University of California Riverside

1:00PM (1643) *Flows in Karstic Geometry.*
Xiaoming Wang, Florida State University (1116-76-1088)

1:30PM (1644) *Regularity criteria for the 3D Navier-Stokes and MHD equations.*
Alexey Cheskidov and **Mimi Dai***, University of Illinois at Chicago (1116-35-214)

2:00PM (1645) *Bose-Einstein condensation in a Kompaneets model for low density plasmas.*
Joshua Ballew, **Gautam Iyer*** and **Robert L Pego**, Carnegie Mellon University (1116-35-1553)

2:30PM (1646) *Recent progresses in boundary layer analysis.*
Gung-Min Gie, University of Louisville (1116-76-2345)

3:00PM (1647) *Quantum Spontaneous Stochasticity.*
Theodore D Drivas* and **Gregory L Eyink**, The Johns Hopkins University (1116-81-2770)

3:30PM (1648) *Onsager's Conjecture.*
Tristan Buckmaster, New York University (1116-35-358)

4:00PM (1649) *Mixing versus chemotaxis.*
Alexander Kiselev, Rice University, and **Xiaoqian Xu***, University of Wisconsin-Madison (1116-35-816)

4:30PM (1650) *On non-Darcy fluid flows in porous media.*
Luan T Hoang, Texas Tech University (1116-35-1501)

5:00PM (1651) *Analytical and Computational Results for Blow-Up Criteria for the 3D Incompressible Euler Equations Based on the Voigt Regularization.*
Adam Larios*, University of Nebraska-Lincoln, **Mark Petersen**, Los Alamos National Lab, **Edriss S Titi**, Texas A&M University and Weizmann Institute of Science, and **Beth Wingate**, Exeter University (1116-35-1329)

5:30PM (1652) *Nonlocal equations, electroconvection.*
Peter Constantin* and **Mihaela Ignatova**, Department of Mathematics, Princeton University (1116-35-1762)

AMS Special Session on Geometric and Categorical Methods in Representation Theory, II

1:00 PM – 5:50 PM **Rooms 307/308, Washington State Convention Center**

Organizers: **Anthony Licata**, Australian National University

Julia Pevtsova, Universityof Washington, Seattle

1:00PM (1653) *Rational Cohomology and Supports for Unipotent Algebraic Groups.* Preliminary report.
Eric M. Friedlander, University of Southern California (1116-20-651)

1:30PM (1654) *Support varieties for Lie superalgebras and graded group schemes.* Preliminary report.
Christopher M Drupieski*, DePaul University, and **Jonathan R Kujawa**, University of Oklahoma (1116-20-601)

2:00PM (1655) *The relative stable category of a modular group algebra.* Preliminary report.
Jon F Carlson, University of Georgia (1116-20-681)

2:30PM (1656) *Relative stable categories and their prime ideal spectra.* Preliminary report.
Shawn Baland*, University of Washington, and **Greg Stevenson**, University of Bielefeld (1116-16-2701)

3:00PM (1657) *On Support Varieties and the Humphreys Conjecture in type A.*
William Dietrich Hardesty, University of Georgia (1116-18-1881)

3:30PM (1658) *The Lie Module and its Complexity.*
Frederick R. Cohen, University of Rochester, **David J. Hemmer**, University of Buffalo, SUNY, and **Daniel K. Nakano***, University of Georgia (1116-20-855)

4:00PM (1659) *On nilpotent commuting varieties and cohomology of Frobenius kernels.*
Nham Vo Ngo, University of Arizona (1116-20-1432)

4:30PM (1660) *The Marked Brauer Algebra.*
Jonathan Kujawa* and **Benjiman Tharp**, University of Oklahoma (1116-16-846)

5:00PM (1661) *Centric linking systems and control of fixed points.*
George Glauberman, University of Chicago, and **Justin Lynd***, University of Montana (1116-20-2192)

5:30PM (1662) *Geometric Structure in Smooth Dual.*
Paul Frank Baum, Penn State (1116-22-676)

AMS Special Session on Global Harmonic Analysis, II

1:00 PM – 5:40 PM **Room 610, Washington State Convention Center**

Organizers: **Steven Zelditch**, Northwestern University

Hart Smith, University of Washington, Seattle

Chris Sogge, Johns Hopkins University

1:00PM (1663) *Doubling estimates, vanishing order and nodal sets of Steklov eigenfunctions.* Preliminary report.
Christopher Sogge, Johns Hopkins University, **Xing Wang**, Wayne State University, and **Jiuyi Zhu***, Johns Hopkins University (1116-42-132)

1:30PM (1664) *Quantum Unique Ergodicity and the number of nodal domains of eigenfunctions.*
Junehyuk Jung, KAIST Department of Mathematical Sciences (1116-53-404)

2:00PM (1665) *Growth and nodal sets of Laplace eigenfunctions on manifolds.*
Guillaume Roy-Fortin, Northwestern University (1116-58-154)

3:00PM (1666) *Conormal cycles of random nodal sets.*
Gabriel Rivière, Un iversité Lille 1 (1116-58-864)

4:00PM (1667) *Seeing Through Space Time.*
Gunther Uhlmann, University of Washington (1116-58-2985)

5:00PM (1668) *The trace of the heat kernel and regularity of potentials.*
Hart F. Smith, University of Washington (1116-58-2981)

AMS Special Session on Higher Genus Curves and Fibrations of Higher Genus Curves in Mathematical Physics and Arithmetic Geometry, II

1:00 PM – 5:20 PM **Room 310, Washington State Convention Center**

Organizers: **Andreas Malmendier**, Utah State University, Logan

Tony Shaska, Oakland University, Rochester

1:00PM (1669) *Quasi-platonic actions of some simple groups on Riemann surfaces and their dessins d'enfant.* Preliminary report.
S. Allen Broughton, Rose-Hulman Institute of Technology (1116-14-1481)

1:30PM (1670) *Picard groups of Hurwitz spaces.*
Anand Deopurkar*, Columbia University, and **Anand Patel**, Boston College (1116-14-1780)

2:00PM (1671) *Conductors and minimal discriminants of hyperelliptic curves with rational Weierstrass points.*
Padmavathi Srinivasan, Massachusetts Institute of Technology (1116-14-822)

2:30PM (1672) *Endomorphisms of Abelian Surfaces, Shimura curves, and counterexamples to the Hasse principle.* Preliminary report.
James Stankewicz, University of Bristol (1116-11-1210)

3:00PM (1673) *Equations of Riemann surfaces with automorphisms via partial flattening stratifications.* Preliminary report.
David Swinarski, Fordham University (1116-14-1127)

3:30PM (1674) *Explicit high ranks in higher genus.*
Douglas Ulmer, Georgia Tech (1116-11-1431)

4:00PM (1675) *Integral minimal models for binary forms.*
Lubjana Beshaj, Oakland University (1116-11-1279)

4:30PM ► (1676) *A catalog of genus 2 curves over Q.* Preliminary report.
Andrew R. Booker, University of Bristol, **Andrew V. Sutherland***, Massachusetts Institute of Technology, **John Voight**, Dartmouth College, and **Dan Yasaki**, University of North Carolina, Greensboro (1116-11-1514)

5:00PM (1677) *Points of bounded degree on curves.*
Aaron Levin, Michigan State University (1116-11-2568)

AMS Special Session on Mathematics in Natural Resource Modeling, II

1:00 PM – 5:20 PM **Room 4C-4, Washington State Convention Center**

Organizers: **Catherine A. Roberts**, College of the Holy Cross
Shandelle M. Henson, Andrews University

1:00PM ► (1678) *Modeling innovations for fisheries assessments and management: are there any?* Preliminary report.
James N Ianelli, Alaska Fisheries Science Center National Marine Fisheries Service (1116-92-718)

1:30PM (1679) *Marine protected areas with mobile predator and prey.*
Patrick De Leenheer, Oregon State University (1116-92-414)

2:00PM ► (1680) *Estimation of grey seal predation mortality on the three main commercial demersal species in West of Scotland and implications for stock assessments and MSY calculation.*
Vanessa Trijoulet* and **Robin M Cook**, Department of Mathematics and Statistics, University of Strathclyde, Glasgow, Scotland (1116-92-131)

2:30PM ► (1681) *Mathematical Modeling of the James Spinymussel.* Preliminary report.
Marisa P Draper, **Maranda M Pepe**, **Dylana A Wilhelm**, **Lihua Chen**, **Patrice M Ludwig**, **Christine L May** and **Anthony Tongen***, James Madison University (1116-92-776)

3:00PM (1682) *What can we learn about community dynamics and climate impacts from spatiotemporal models? A case study of freshwater fishes.*
James T Thorson, Northwest Fisheries Science Center, NMFS, NOAA (1116-92-610)

3:30PM ► (1683) *The effect of avian stage-dependent vector exposure on enzootic West Nile virus transmission.*
Suzanne L Robertson*, Virginia Commonwealth University, and **Kevin Caillouet**, St. Tammany Parish Mosquito Abatement District (1116-92-471)

4:00PM (1684) *The effects of extreme climate conditions on vertically transmitted vector-borne diseases.* Preliminary report.
Kbenesh W. Blayneh, Florida A&M University (1116-34-434)

4:30PM ► (1685) *Modeling Feral Hogs in Great Smoky Mountains National Park to Evaluate Control Efforts and Analyze the Population's Niche.*
Benjamin Levy*, **Suzanne Lenhart**, **Charles Collins**, University of Tennessee, **Rene Salinas**, Appalachian State University, **Marguerite Madden**, **Joseph Corn**, University of Georgia, and **William Stiver**, National Parks Service (1116-92-137)

5:00PM ► (1686) *Mathematics of Granular Materials and the Future of this Natural Resource.*
A. Bass Bagayogo, Université de Saint-Boniface (1116-92-450)

AMS Special Session on Moduli Spaces in Algebraic Geometry, I

1:00 PM – 5:40 PM **Room 604, Washington State Convention Center**

Organizer: **Yaim Cooper**, Harvard University

1:00PM (1687) *Families of tautological relations.*
Aaron Pixton, Massachusetts Institute of Technology (1116-14-1531)

2:00PM (1688) *Hurwitz Correspondences on* $\overline{\mathcal{M}}_{0,N}$.
Rohini Ramadas, University of Michigan (1116-14-1505)

3:00PM (1689) *Projectivity of the moduli space of stable log-varieties.*
Sándor J Kovács*, University of Washington, and **Zsolt Patakfalvi**, Princeton University (1116-14-1509)

4:00PM (1690) *Limits of plane quintics via covers of stacky curves.*
Anand Deopurkar, Columbia University (1116-14-1785)

5:00PM (1691) *Smoothability of Genus 6 Petri General Curves.* Preliminary report.
Aaron Landesman*, Harvard University, and **David Zureick-Brown**, Emory University (1116-14-492)

AMS Special Session on Number Theory and Cryptography, II

1:00 PM – 5:50 PM **Room 606, Washington State Convention Center**

Organizers: **Matilde Lalin**, University of Montreal

Michelle Manes, University of Hawaii, Honolulu

Christelle Vincent, University of Vermont

► 1:00PM (1692) *Using SageMath for Number Theory and Cryptography.*
William Arthur Stein, University of Washington (1116-11-965)

1:30PM (1693) *Comparison of scalar multiplication on real hyperelliptic curves.*
Michael J. Jacobson Jr., **Monireh Rezai Rad** and **Renate Scheidler***, University of Calgary, Canada (1116-11-1455)

2:00PM (1694) *Computing the p-torsion of Jacobians in characteristic p.*
Colin Weir, Tutte Institute (1116-11-1777)

2:30PM (1695) *A computational approach to the ABC Conjecture.* Preliminary report.
Jennifer Balakrishnan, University of Oxford, **Jennifer Berg**, University of Texas at Austin, **Alyson Deines**, CCR, **Yasemin Kara**, Cornell University, **Lily Khadjavi***, Loyola Marymount University, **Kristin Lauter**, Microsoft Research, and **Victor Scharschkin**, University of Queensland (1116-11-2204)

3:00PM (1696) *Torsion in Odd Degree.*
Abbey Bourdon* and **Paul Pollack**, University of Georgia (1116-11-1391)

3:30PM (1697) *Representations of integral Hermitian forms by sums of norms.*
Jingbo Liu, Wesleyan University (1116-11-537)

4:00PM (1698) *Quantum mock modular forms arising from eta-theta functions.*
Amanda Folsom, Amherst College, **Sharon Garthwaite**, Bucknell University, **Soon-Yi Kang**, Kangwon National University, **Holly Swisher**, Oregon State University, and **Stephanie Treneer***, Western Washington University (1116-11-1932)

4:30PM (1699) *Gaussian Hypergeometric Series and Counting Points on Families of Hypersurfaces.* Preliminary report.
Sharon M. Frechette*, College of the Holy Cross, **Matthew Papanikolas**, Texas A&M University, **Jonathan Root**, Boston University, and **M. Valentina Vega**, William Patterson University (1116-11-1846)

5:00PM (1700) *Connections between hypergeometric series, hypergeometric algebraic varieties, and supercongruences.*
Alyson Deines, Center for Communications Research, **Jenny G. Fuselier**, High Point University, **Ling Long**, Louisiana State University, **Holly Swisher***, Oregon State University, and **Fang-Ting Tu**, National Center for Theoretical Sciences, Taiwan (1116-11-925)

► 5:30PM (1701) *Divisibility sequences associated to higher dimensional algebraic groups.* Preliminary report.
Patrick Ingram, Colorado State University, **Joseph H Silverman***, Brown University, and **Katherine Stange**, University of Colorado (1116-11-237)

AMS Special Session on Partial Differential Equations in Complex Analysis, II

1:00 PM – 5:50 PM **Room 401, Washington State Convention Center**

Organizers: **Debraj Chakrabarti**, Central Michigan University

Yunus Zeytuncu, University of Michigan, Dearborn

► 1:00PM (1702) *The Bergman kernel on some Hartogs domains.*
Zhenghui Huo, University of Illinois at Urbana-Champaign (1116-32-1378)

1:30PM (1703) *Regularity of the weighted Bergman projection on the Hartogs triangle.*
Liwei Chen, The Ohio State University (1116-32-420)

2:00PM (1704) *The Bergman theory of generalized Hartogs triangles: L^p-Sobolev boundedness.*
Luke D. Edholm, The Ohio State University (1116-32-767)

2:30PM (1705) *A pointwise a-priori estimate for the $\overline{\partial}-$Neumann problem on weakly pseudoconvex domains.*
R. Michael Range, State University of New York at Albany (1116-32-672)

3:00PM (1706) *Bounded Plurisubharmonic Exhaustion Functions in $\mathbb{CP}^n$.* Preliminary report.
Phillip S Harrington, University of Arkansas (1116-32-1161)

3:30PM (1707) *Essential norm estimates for the $\overline{\partial}$-Neumann operator.*
Zeljko Cuckovic and **Sonmez Sahutoglu***, University of Toledo (1116-32-489)

4:00PM (1708) *Numerical Range of the product of a composition operator with the adjoint of a composition operator.* Preliminary report.
John H. Clifford*, University of Michigan–Dearborn, and **Michael Dabkowski**, Lawrence Technological University (1116-47-2435)

4:30PM (1709) *The Wiener Test for the Removability of the Logarithmic Singularity for the Elliptic PDEs with Measurable Coefficients and Its Consequences.*
Ugur G. Abdulla, Florida Institute of Technology (1116-35-381)

5:00PM (1710) *Positive eigenvalues of curvatures of line bundles that lie on the boundary of the Kahler cone.* Preliminary report.
Dincer Guler, Park University (1116-32-861)

5:30PM (1711) *Rectifiability of Harmonic Measure.*
Jonas Azzam*, Universitat Autónoma de Barcelona, **Steve Hofmann**, University of Missouri, **José María Martell**, Instituto de Ciencias Matemáticas (ICMAT), **Svitlana Mayboroda**, University of Minnesota, **Mihalis Mourgoglou**, **Xavier Tolsa**, Universitat Autónoma de Barcelona, and **Alexander Volberg**, Michigan State University (1116-31-572)

AMS Special Session on Problems and Challenges in Financial Engineering and Risk Management, I

1:00 PM – 5:50 PM **Chelan 2, Chelan Level Two, Washington State Conference Center**

Organizers: **Matthew Lorig**, University of Washington, Seattle
Haijun Li, Washington State University, Pullman
Hong-Ming Yin, Washington State University, Pullman

1:00PM (1712) *How Leverage Transforms a Volatility Skew: Asymptotics for Continuous and Jump Dynamics.*
Roger Lee*, University of Chicago, and **Ruming Wang**, Goldman Sachs (1116-60-2595)

1:30PM (1713) *Dynamic Conic Finance via Backward Stochastic Difference Equations.*
Tomasz R Bielecki*, **Igor Cialenco** and **Tao Chen**, Illinois Institute of Technology (1116-91-2100)

2:00PM ► (1714) *Universal portfolios in stochastic portfolio theory.* Preliminary report.
Ting Kam Leonard Wong, University of Washington (1116-60-2326)

2:30PM (1715) *Optimal Investment with Transaction Costs and Stochastic Volatility.*
Maxim Bichuch*, Johns Hopkins University, and **Ronnie Sircar**, Princeton University (1116-60-247)

3:00PM (1716) *Regularly Varying Asymptotics for Tail Risk.*
Haijun Li, Washington State University (1116-91-2978)

3:30PM (1717) *Pricing covariance swaps in Lévy driven market.*
Indranil SenGupta* and **Semere Habtemicael**, North Dakota State University (1116-60-331)

4:00PM (1718) *Rank-based markets with model uncertainty.*
Tomoyuki Ichiba, University of California, Santa Barbara (1116-60-1675)

4:30PM (1719) *Quickest detection in the Wiener disorder problem with post-change drift uncertainty.*
Heng Yang, Mathematics Department CUNY Graduate Center, **Olympia Hadjiliadis***, Hunter College and the Graduate Center, and **Michael Ludkovski**, University of California, Santa Barbara (1116-60-698)

5:00PM (1720) *Asymptotic Methods for Portfolio Optimization Problems with Stochastic Volatility.*
Jean-Pierre Fouque and **Ruimeng Hu***, University of California, Santa Barbara (1116-60-1942)

5:30PM (1721) *Regime Switching Model for Economic Crisis and Stock Selection.*
Nguyet T. Nguyen*, Youngstown State University, OH, and **Dung A. Nguyen**, Ned Davis Research Group (1116-60-1173)

AMS Special Session on Water Waves, II

1:00 PM – 5:20 PM **Skagit 5, Skagit Lower Level, Washington State Conference Center**

Organizers: **John Carter**, Seattle University
Bernard Deconinck, University of Washington, Seattle
Katie Oliveras, Seattle University

1:00PM (1722) *Frequency downshift in a viscous fluid.*
John Carter*, **Alex Govan**, Seattle University, **Diane Henderson**, Penn State University, and **Harvey Segur**, University of Colorado at Boulder (1116-76-248)

1:30PM ► (1723) *Developments and Applications of a Multilayer Shallow Water Model.* Preliminary report.
Kyle T Mandli, Columbia University (1116-65-785)

2:00PM (1724) *Stratified solitary waves.*
Robin Ming Chen, Department of Mathematics, University of Pittsburgh, **Samuel Walsh**, Department of Mathematics, University of Missouri, and **Miles H. Wheeler***, Courant Institute of Mathematical Sciences, New York University (1116-76-2835)

2:30PM ► (1725) *Extremely Steep Traveling Interfacial Waves.*
Benjamin F Akers, The Air Force Institute of Technology (1116-76-621)

3:00PM (1726) *Overhanging traveling gravity-capillary waves.*
J. Douglas Wright, Drexel University (1116-35-2272)

3:30PM (1727) *Computing Three-Dimensional Water Waves.*
Olga Trichtchenko*, **Jean-Marc Vanden-Broeck**, University College London, **Emilian Parau**, UEA, and **Paul Milewski**, University of Bath (1116-76-2233)

4:00PM ► (1728) *On the slope of steady water waves.*
Walter A. Strauss, Brown University (1116-76-976)

4:30PM (1729) *High-frequency instabilities of small amplitude water waves.*
Bernard Deconinck, Applied Mathematics, University of Washington (1116-76-208)

5:00PM (1730) *Normal forms transformations for water waves.*
Catherine Sulem, University of Toronto (1116-76-757)

MAA Invited Paper Session on What Do We Know about University Mathematics Teaching, and How Can It Help Us?

1:00 PM – 3:50 PM **Room 607, Washington State Convention Center**

Organizer: **Alan Schoenfeld**, University of California Berkeley

1:00PM ► (1731) *Carnegie's Community College Pathways: Instruction supporting productive struggle and student persistence in developmental mathematics classrooms.*
Ann Ryu Edwards, Carnegie Foundation for the Advancement of Teaching (1116-AB-1338)

1:30PM ► (1732) *An Ongoing Effort to Create Effective InquiryOriented Abstract Algebra Classrooms.*
Sean P Larsen, Portland State University (1116-AB-1557)

2:00PM ► (1733) *The LUMOS Project: What do we really learn in Undergraduate Mathematics?*
Greg Oates, University of Auckland (1116-AB-1650)

2:30PM ► (1734) *The same content, but very different lectures: The decisions collegiate mathematics instructors make and how they shape the mathematics in their classrooms.*
Alon Pinto, University of California, Berkeley (1116-AB-2920)

3:00PM ► (1735) *Advances in inquiry-oriented instruction at the post-secondary level: Student success and instructor practices.*
Chris L Rasmussen, San Diego State University (1116-AB-1101)

3:30PM ► (1736) *A Proving Supplement for an Undergraduate Real Analysis Course.*
John Selden* and **Annie Selden**, New Mexico State University (1116-97-1511)

MAA Minicourse #8: Part B

1:00 PM – 3:00 PM **Tahoma 5, Tahoma Level Three, Washington State Conference Center**

Algebraic geometry: A problem-based course.

Presenters: **Thomas Garrity**, Williams College
Ryan Brown, Georgia College

MAA Minicourse #9: Part B

1:00 PM – 3:00 PM **Metropolitan A, 3rd Floor, Sheraton Seattle Hotel**

Increasing student engagement and understanding through active learning strategies in calculus.

Presenters: **Debbie Gochenaur**, Shippensburg University
Larissa Schroeder, University of Hartford

MAA Minicourse #4: Part B

1:00 PM – 3:00 PM **Metropolitan B, 3rd Floor, Sheraton Seattle Hotel**

Teaching mathematics with sports applications.

Presenter: **Rick Cleary**, Babson College

AMS Session on Associative and Nonassociative Algebra and Rings, III

1:00 PM – 5:25 PM **Chelan 4, Chelan Level Two, Washington State Conference Center**

1:00PM (1737) *On locally semi-simple representations of quivers.*
Calin Chindris and **Daniel B Kline***, University of Missouri (1116-16-2364)

1:15PM (1738) *Matrix Algebras: Equivalent Ring Relations and Special Presentations.*
Sam Mendelson* and **Geir Agnarsson**, George Mason University (1116-16-2513)

1:30PM ► (1739) *Zero Divisor Graphs of 2×2 Upper Triangular Matrix Rings over $\mathbb{Z}_n$.*
Ethan J Gegner, Taylor University (1116-16-2535)

1:45PM (1740) *A Super Categorical View of Kashiwara's Rule for Tensor Products of Crystals.* Preliminary report.
Nick J. Davidson, University of Oregon (1116-18-2965)

2:00PM (1741) *On the ideal based zero-divisor graph of a semiring.*
Sara Shirinkam, Department of Mathematics, University of Texas at San Antonio (1116-13-1799)

2:15PM (1742) *Homomorphisms Between Standard Modules of KLR Algebras.*
David Julian Steinberg, University of Oregon (1116-16-2665)

2:30PM ► (1743) *On the images of multilinear maps of matrices over finite-dimensional division algebras.*
Cailan Chun Chun Li, University of California, Berkeley, and **Man Cheung Kevin Tsui***, University of California, Los Angeles (1116-15-2719)

2:45PM (1744) *Bounding the Degrees of Ext-Modules over Complete Intersections.*
Jason Hardin, Worcester State University (1116-13-2601)

3:00PM (1745) *Gorenstein Dimensions of Module-finite Extensions.* Preliminary report.
Pye Phyo Aung, University of the Pacific (1116-13-2608)

3:15PM (1746) *A note on Gaussian series rings.* Preliminary report.
Jung Wook Lim, Kyungpook National University (1116-13-115)

3:30PM (1747) *The minimum distance of a linear code and the α-invariant.* Preliminary report.
Mehdi Garrousian*, Universidad de los Andes, and **Stefan Tohaneanu**, University of Idaho (1116-13-416)

3:45PM (1748) *Lie derivations and Lie triple derivations of dominant upper triangular ladder matrices.*
Prakash Ghimire*, Auburn University, Auburn, AL, and **Huajun Huang**, Auburn University (1116-17-535)

4:00PM (1749) *Twisted Modules of affine Lie Algebras, Vertex Algebras, and Modular q-series.*
Corina Calinescu, NYC College of Technology, CUNY, **Antun Milas**, University at Albany, SUNY, **Michael Penn***, Colorado College, and **Christopher Sadowski**, Ursinus College (1116-17-2156)

4:15PM (1750) *Residually Small Commutative Rings.* Preliminary report.
Greg Oman, University of Colorado, and **Adam Salminen***, University of Evansville (1116-13-871)

4:30PM (1751) *Higher commutative algebra through homotopy theory.* Preliminary report.
Sanath K Devalapurkar, Torrance, California (1116-13-1534)

4:45PM (1752) *Zariski-Samuel Associated Prime Ideals.* Preliminary report.
Tracy Dawn Hamilton, California State University, Sacramento (1116-13-2031)

5:00PM (1753) *The book thickness of zero divisor graphs with genus at most one.* Preliminary report.
Thomas McKenzie, Gonzaga University (1116-13-2046)

5:15PM (1754) *Primitively generated Hopf orders in characteristic p.*
Alan Koch, Agnes Scott College (1116-11-1231)

AMS Session on Combinatorics and Graph Theory, III

1:00 PM – 5:55 PM **Room 605, Washington State Convention Center**

1:15PM ► (1755) *Sorting permutations with finite-depth stacks and symmetries of the square.* Preliminary report.
Jinseok An, Claremont Graduate University, and **Thomas Langley***, Rose-Hulman Institute of Technology (1116-05-2828)

1:30PM (1756) *Partitioning Polytope Number Sequences into Simplex Number Sequences.*
Michael A. Jackson, Grove City College (1116-05-2072)

1:45PM (1757) *Descent c-Wilf Equivalence.*
Quang T. Bach* and **Jeffrey B. Remmel**, University of California, San Diego (1116-05-2789)

2:00PM (1758) *Graphs between computable and highly computable.*
Matthew Jura, Manhattan College, **Oscar Levin***, University of Northern Colorado, and **Tyler Markkanen**, Springfield College (1116-03-2264)

2:15PM (1759) *Auslander-Reiten quiver and representation theories related to KLR-type Schur-Weyl duality.*
Se-jin Oh, Department of Mathematics, University of Oregon, Eugene, OR 97403, USA (1116-05-2134)

2:30PM (1760) *Homomorphism densities in free words.*
Joshua Cooper, University of South Carolina, and **Danny Rorabaugh***, Queen's University (1116-05-2165)

2:45PM ► (1761) *Bijections on m-level Rook Placements.*
Kenneth Barrese*, UCSD, **Nicholas Loehr**, Virginia Tech and US Naval Academy, **Jeffrey Remmel**, UCSD, and **Bruce E. Sagan**, Michigan State University (1116-05-2198)

3:00PM ► (1762) *Creating universal cycles for subsets by expanding the alphabet.*
Rebecca F Eastham*, University of Wisconsin-Madison, **Victoria Horan**, Arizona State, and **Rose McCarty**, Georgia Tech (1116-05-2255)

3:15PM Discussion

3:30PM ► (1763) *Interlace Polynomials of Certain Eulerian Graphs.*
Aihua Li* and **Christian Hyra**, Montclair State University (1116-05-2913)

3:45PM ► (1764) *Favaron's Theorem, k-dependence, and Tuza's Conjecture.*
Gregory J Puleo, Coordinated Science Lab, University of Illinois at Urbana-Champaign (1116-05-2291)

4:00PM (1765) *A generalization of α-orientations to higher genus surfaces.*
Jason T. Suagee, George Washington University (1116-05-2296)

4:15PM ► (1766) *On the 2-Large is Large conjecture. A Generalization of Van der Waerden's Theorem.* Preliminary report.
Sohail Farhangi, Virginia Polytechnic Institute and State University (1116-05-2473)

4:30PM ► (1767) *Probabilistic Thresholds for Combinatorial Structures.*
Thomas Grubb*, Michigan State University, **Paul Han**, Dartmouth College, and **Bill Kay**, Emory University (1116-05-2060)

4:45PM (1768) *On the Incidence Coloring Conjecture for Cartesian Graph Products.*
Chen Xie, University of Waterloo (1116-05-2062)

5:00PM ► (1769) *Automorphisms and Eigenvalues of Knodel graphs.* Preliminary report.
Wasin So, San Jose State University (1116-05-266)

5:15PM (1770) *A connection between Hadamard matrices, oriented hypergraphs and signed graphs.*
Nathan Reff* and **Howard Skogman**, The College at Brockport, State University of New York (1116-05-2855)

5:30PM ► (1771) *Hall precolorings with $\Delta(G)$ colors extend to proper colorings.* Preliminary report.
Jennifer Vandenbussche*, **Sarah Holliday** and **Erik Westlund**, Kennesaw State University (1116-05-2071)

5:45PM (1772) *The Parametric Frobenius Problem.*
Bobby C. Shen, Massachusetts Institute of Technology (1116-05-2008)

AMS Session on Computer Science, Information, Control Theory, and Economics, II

1:00 PM – 5:25 PM **Skagit 1, Skagit Lower Level, Washington State Conference Center**

► (1773) *Optimal Parameters in Option Pricing Model.*
Narayan Thapa, Cameron University (1116-VC-802)

1:30PM ► (1774) *The Territorial Raider Model with Strategic Movement and Multi-Group Interactions.*
Nina Galanter*, Grinnell College, Grinnell, IA, **Dennis Silva, Jr.**, Worcester Polytechnic Institute, Worcester, MA, **Jonathan Rowell**, Department of Mathematics and Statistics, The University of North Carolina at Greensboro, Greensboro, NC, and **Jan Rychtář**, Department of Mathematics and Statistics, The University of North Carolina at Greensboro, Greensboro, NC 27412, USA (1116-91-1634)

1:45PM (1775) *Searching With Lie Patterns of Infinite Length.* Preliminary report.
John K Osoinach* and **D Paul Phillips**, The University of Dallas (1116-91-2537)

2:00PM ► (1776) *The Two-Time Pad Problem: Plaintext Recovery for One-Time Pads Used Twice.* Preliminary report.
Gregory V Bard* and **Theodore McDonough**, The University of Wisconsin—Stout (1116-68-2505)

2:15PM ► (1777) *Problem Specific Primal Heuristics for Supply Chain Management in a General MIP Solving Framework.* Preliminary report.
Robert Lion Gottwald, Freie Universität Berlin, **Courtney Y. Kempton**, University of Washington, **David Y. Leffler**, Chalmers University of Technology, and **Li Qian***, Hunter College (City University of New York) (1116-90-2001)

2:30PM ► (1778) *Personalized Local Recommendations with Collaborative Filtering.* Preliminary report.
Tamar Lichter, Queens College - City University of New York, **Chelsea K Chandler***, University of Virginia, and **Monica Ribero Diaz**, Universidad de los Andes (1116-68-350)

2:45PM ► (1779) *Optimization of a Logo Recognition System.*
Haozhi Qi, Hong Kong University of Science and Technology, **Owen Richfield**, Tulane University, **Xiaohui Zeng**, Hong Kong University of Science and Technology, and **Michael Zhao***, University of Utah (1116-68-2022)

3:00PM (1780) *On the Robust Hardness of Grobner Basis Computation.*
Gwen Spencer*, Smith College, and **David Rolnick**, Massachusetts Institute of Technology (1116-68-2268)

3:15PM (1781) *Long-term secure two-round group key establishment from pairings.*
Kashi N Neupane, University of North Georgia (1116-94-2581)

3:30PM ► (1782) *A Metaheuristic for the Multidimensional Multiple Choice Knapsack Problem.* Preliminary report.
Yun Lu*, **Francis Vasko**, Kutztown University of PA, and **Kenneth Zyma**, Philadelphia, PA (1116-90-2162)

3:45PM (1783) *Formulation of Generalized Curvature Values from the Singular Value Decomposition and the use on Human Action Data.*
Robert T. Arn*, **Bruce Draper**, **Michael Kirby** and **Chris Peterson**, Colorado State University (1116-51-1347)

4:00PM ► (1784) *Brief history of optimal control theory and some recent developments.*
Isabelle Kemajou-Brown, Morgan State University (1116-49-1486)

4:15PM (1785) *Camera response function modeling for high dynamic range photography.*
Thomas Höft, University of St. Thomas (1116-45-2580)

4:30PM ► (1786) *Comparative Analysis of Matrix Manifold Means.*
Justin D. Marks, Wesleyan University (1116-15-2687)

4:45PM ► (1787) *Regularization of languages: a new mathematical framework of learning from an inconsistent source.* Preliminary report.
Timmy Ma* and **Natalia Komarova**, University of California, Irvine (1116-91-1221)

5:00PM (1788) *Collection of the mathematical publications and video records on the All-Russian mathematical portal Math-Net.Ru.*
Dmitry E Chebukov, Steklov mathematical institute of the Russian Academy of Sciences (1116-94-2664)

5:15PM ► (1789) *Automated Conjecturing for Number Theory.*
Craig Larson, Virginia Commonwealth University (1116-11-1474)

AMS Session on General Topics, II

1:00 PM – 4:55 PM **Chelan 5, Chelan Level Two, Washington State Conference Center**

1:15PM ► (1790) *The Cantor set before Cantor.* Preliminary report.
Nicholas A Scoville, Ursinus College (1116-01-415)

1:30PM (1791) *The Historical Derivatives of the Particular Value and the Particular Function in the Wave and Heat Theory.* Preliminary report.
Shigeru Masuda, Ex. Long-Term Researcher in RIMS, Kyoto University (1116-01-1617)

1:45PM ► (1792) *Charles Babbage and the Difference Engine 1.*
Paul R. Bouthellier, University of Pittsburgh-Titusville (1116-01-49)

2:00PM ► (1793) *An investigation of the mathematical texts used by selected eighteenth and nineteenth century United States Presidents.*
Ronald L Merritt, Athens State University (1116-01-80)

2:15PM ► (1794) *Four Curves of Alexis Clairaut.* Preliminary report.
Colin B. P. McKinney, Wabash College (1116-01-2104)

2:30PM ► (1795) *Are You Smarter Than a Babylonian?* Preliminary report.
Marsha H Cardenas, University of Texas at El Paso (1116-01-2691)

2:45PM ► (1796) *Numbers and the Heights of their Happiness.*
May Mei* and **Andrew Read-McFarland**, Denison University (1116-11-2559)

3:00PM ► (1797) *On the Fixed Points of Certain Augmented Generalized Happy Functions.* Preliminary report.
B. Baker Swart, Department of Mathematics & Computer Science, The Citadel, **K. A. Beck**, Department of Mathematics & Computer Science, Saint Mary's College of California, **S. Crook**, Division of Mathematics, Engineering, & Computer Science, Loras College, **C. Eubanks-Turner**, Department of Mathematics, Loyola Marymount University, **H. G. Grundman***, Department of Mathematics, Bryn Mawr College, **M. Mei**, Department of Mathematics & Computer Science, Denison University, and **L. Zack**, Department of Mathematics & Computer Science, High Point University (1116-11-737)

3:15PM ► (1798) *Iterations for the lemniscate constant resembling the Archimedean algorithm for pi.*
Thomas J. Osler, Rowan University (1116-40-2472)

3:30PM (1799) *The spectral connection matrix for any change of basis within the classical real orthogonal polynomials.*
Jenna Reis*, Fitchburg State University, and **Tom Bella**, University of Rhode Island (1116-15-1249)

3:45PM (1800) *A Functional Equation On Groups With An Involution Related To Quadratic Polynomials.*
Heather Hunt Elfen*, Robert Morris University, **Thomas Riedel** and **Prasanna Sahoo**, University of Louisville (1116-39-1781)

4:00PM ► (1801) *Asymptotic laws for knot diagrams.*
Harrison C Chapman, University of Georgia (1116-05-1452)

4:15PM (1802) *Amalgamation Classes with ∃-Closures and a Conjecture of Moss'.*
Justin Brody, Goucher College (1116-03-2515)

4:30PM ► (1803) *Symmetries of Quartic Polynomials.*
Michael Robert Keenan* and **Chad Awtrey**, Elon University (1116-12-1035)

4:45PM ► (1804) *Discovering Geometric and Topological and Physical Properties by Analytic Curvatures Properties on Convex Hyper-Surfaces from Spheres and Ellipsoids as A Starting Point.* Preliminary report.
Lina Wu*, Borough of Manhattan Community College-The City University of New York, and **Ye Li**, Central Michigan University (1116-53-868)

AMS Session on Numerical Analysis, II

1:00 PM – 5:10 PM **Room 615, Washington State Convention Center**

1:15PM (1805) *Solution of Time-Dependent Nonlinear PDE Through Component-Wise Approximation of Matrix Functions.* **James V Lambers**, The University of Southern Mississippi (1116-65-1291)

► 1:30PM (1806) *A compact fourth-order L-stable scheme for reaction-diffusion systems with nonsmooth data.* **Harish P. Bhatt*** and **Abdul Q. M. Khaliq**, Middle Tennessee State University (1116-65-1470)

1:45PM (1807) *An Application of Multicomplex Algebras for Numerical Optimization.* **Adel Alaeddini**, Department of Mechanical Engineering, University of Texas at San Antonio, and **Sara Shirinkam***, Department of Mathematics, University of Texas at San Antonio (1116-65-1608)

2:00PM (1808) *Implementation of Anderson Acceleration to Parallel Pseudo-Spectral Method.* Preliminary report. **Ramjee P Sharma**, University of North Georgia, Gainesville, GA (1116-65-1574)

2:15PM (1809) *A simple and effective arbitrary-order shock-capturing limiter for discontinuous Galerkin methods.* **David C Seal***, United States Naval Academy, **Scott A Moe**, University of Washington, and **James A Rossmanith**, Iowa State University (1116-65-942)

2:30PM (1810) *Compressed Wannier modes for imperfect crystals and symmetry-adapted Wannier functions.* Preliminary report. **Ke Yin**, University of California Los Angeles (1116-65-2223)

2:45PM (1811) *A nonoverlapping domain decomposition method for a discontinuous Galerkin method.* **Susanne C. Brenner**, Louisiana State University, **Eun-Hee Park***, Kangwon National University, and **Li-Yeng Sung**, Louisiana State University (1116-65-2403)

3:00PM (1812) *A new modification of laplace decomposition method for nonlinear differential equations.* **Johnson A Osilagun**, University of Lagos, Nigeria (1116-65-2551)

3:15PM (1813) *Block Preconditioning for Time-Dependent Coupled Fluid Flow Problems.* **Ashley Erin Meek*** and **Victoria E Howle**, Texas Tech University (1116-65-2630)

► 3:30PM (1814) *Multilevel Dual Reordering Strategy for Nonsymmetric Matrices.* Preliminary report. **Joe F Coyle**, Monmouth University (1116-65-2752)

3:45PM (1815) *Numerical solution of fractional differential equations by multistage shifted Jacobi spectral method.* Preliminary report. **Bongsoo Jang***, Ulsan National Institute of Science and Technology, South Korea, and **Hyunju Kim**, North Greenville University (1116-65-2773)

4:00PM (1816) *The Legacy of ADI and LOD Methods and Their Applications for Solving Highly Oscillatory Wave Equations.* Preliminary report. **Qin Sheng**, Baylor University (1116-65-43)

► 4:15PM (1817) *Comparison of Numerical Solutions of Nonlinear Schrödinger Equation.* **James Patrick King*** and **Gokul R. Kadel**, Cameron University (1116-65-1014)

► 4:30PM (1818) *Unconditional Energy Stability and Optimal-Rate Error Analysis of a Second Order Mixed Finite Element Method for the Cahn-Hilliard Equation.* **Steven M Wise**, The University of Tennessee (1116-65-2838)

► 4:45PM (1819) *Resampling Pseudospectral Methods for PDEs.* Preliminary report. **Omid Khanmohamadi**, Department of Mathematics, Florida State University (1116-65-2953)

► 5:00PM (1820) *Efficient simulation of a large number of microswimmers using the fast multipole method.* Preliminary report. **Minghao Wu Rostami*** and **Sarah D Olson**, Worcester Polytechnic Institute (1116-76-1316)

AMS Session on Partial Differential Equations, I

1:00 PM – 6:10 PM **Room 616, Washington State Convention Center**

► 1:00PM (1821) *Lower Bounds of Potential Blow-Up Solutions of the Three-dimensional Navier-Stokes Equations in* $\dot{H}^{\frac{3}{2}}$. **Alexey Cheskidov** and **Karen Zaya***, University of Illinois at Chicago (1116-76-1765)

1:15PM (1822) *Adjoint system for a 3D convective flow in an active mushy layer.* Preliminary report. **Dambaru Bhatta**, The University of Texas-Rio Grande Valley (1116-76-2009)

1:30PM (1823) *Periodic Array of Partially Insulated Interface Cracks Subjected To Uniform Far Field Heat Flow.* **Noah A. Weiss**, University of Wisconsin-Stout (1116-74-623)

1:45PM (1824) *Global Classical Solutions to the Relativistic Boltzmann Equation without Angular Cut-off.* **Jin Woo Jang**, University of Pennsylvania, Department of Mathematics (1116-35-220)

2:00PM (1825) *Global regularity results for the 2D Boussinesq equations with partial dissipation.*
Dhanapati Adhikari, Marywood University (1116-35-2757)

► 2:15PM (1826) *Reaction Diffusion Equations with Fractional Laplacian.*
Tingting Huan, College of the Holy Cross (1116-35-2548)

2:30PM (1827) *On the controllability and stabilization of the linearized Dispersion Generalized Benjamin-Ono equation on a periodic domain.* Preliminary report.
Cynthia V Flores*, California State University Channel Islands, and **Derek L Smith**, University of California Santa Barbara (1116-35-2621)

2:45PM (1828) *A Mathematical Model for Frog Population Dynamics with Batrachochytrium dendrobatidis Infection.*
Vinodh Kumar Chellamuthu*, Dixie State University, **Azmy S. Ackleh**, University of Louisiana at Lafayette, **Jacoby Carter**, National Wetlands Research Center-USGS, and **Baoling Ma**, Millersville University (1116-35-759)

3:00PM (1829) *Finding the Critical Domain for Quenching Problems Using Conformal Mappings.*
W. Y. Chan, Montana Tech (1116-35-750)

► 3:15PM (1830) *Transient states in vegetation pattern model of semi-arid ecosystems.*
Masoud Yari, Texas A&M University-Corpus Christi (1116-35-2868)

3:30PM (1831) *Boundary value problem for the Helmholtz equation in a semi-infinite strip and the Riemann-Hilbert problem.*
Yuri Antipov and **Ashar Ghulam***, Department of Mathematics, Louisiana State University (1116-35-2466)

3:45PM (1832) *Positive solutions with prescribed L^2-norm for a Schrodinger-KdV system.*
John Albert, The University of Oklahoma, and **Santosh Bhattarai***, Trocaire College (1116-35-517)

► 4:00PM (1833) *Model of Rocking Structures: A Mathematical Approach.*
Julia Anderson-Lee* and **Scott Hansen**, Iowa State University (1116-35-2973)

► 4:15PM (1834) *Diffusive Nonlinear Electrodynamics.*
Wolfgang F. Ellermeier, TU Darmstadt, Dep. of Physics, Institute of Solid State Physics, Germany (1116-35-38)

4:30PM (1835) *Analytical solutions to the partial hedging of the HJB model in a stochastic volatility environment.* Preliminary report.
Michael Oyesola Okelola* and **K S Govinder**, University of KwaZulu-Natal (1116-35-319)

4:45PM (1836) *Weak solutions and blow-up for wave equations of p-Laplacian type with supercritical sources.*
Pei Pei*, Earlham College, **Mohammad Rammaha** and **Daniel Toundykov**, University of Nebraska-Lincoln (1116-35-505)

5:00PM (1837) *Existence and symmetry of maximizers for a family of Caffarelli-Kohn-Nirenberg interpolation inequalities.*
Nguyen H Lam, Department of Mathematics, University of Pittsburgh (1116-35-509)

5:15PM (1838) *On a parabolic inverse source problem arising in geochronology.*
Sedar Ngoma*, Auburn University, **Dmitry Glotov**, **Willis E. Hames**, Auburn University, AL, and **A. J Meir**, Southern Methodist University, Dallas, TX (1116-35-2944)

► 5:30PM (1839) *Modeling the change in electric potential due to lightning in a sphere.*
Beyza Aslan, University of North Florida (1116-35-2271)

► 5:45PM (1840) *When does the Elastic Torsion Problem*

$$-\Delta u = 1$$

have a solution in R^N? Preliminary report.
Qi Han, Worcester Polytechnic Institute (1116-35-539)

► 6:00PM (1841) *Multiple and nodal solutions for nonlinear equations with a nonhomogeneous differential operator and concave-convex term.*
Michail E Filippakis, University of Piraeus, Department of Digital Systems, Piraeus, Greece (1116-35-583)

MAA Session on Contemplative Pedagogy and Mathematics, II

1:00 PM – 3:55 PM **Room 304, Washington State Convention Center**

Organizers: **Luke Wolcott**, Lawrence University
Justin Brody, Goucher College

► 1:00PM (1842) *Elementary mathematics starts with the body: Abstract notions become embodied.*
Blake A. Mandell, Brown University (1116-C5-2641)

► 1:20PM (1843) *Preservice Teachers' Attitudes toward Faith and Mindfulness as an Intervention for Math Anxiety.* Preliminary report.
Shannon Schumann, Grand Canyon University (1116-C5-2377)

► 1:40PM (1844) *Weekly Reflection Assignments in Mathematics Major Courses.* Preliminary report.
Jacqueline A Jensen-Vallin, Lamar University (1116-C5-2703)

► 2:00PM (1845) *Reflective activities in Calculus: Using short writing exercises to improve metacognition and self-assessment.* Preliminary report.
Joshua Holden, Rose-Hulman Institute of Technology (1116-C5-2685)

► 2:20PM (1846) *Journaling in a freshman general education math course for non-STEM majors.*
John W Watson, Arkansas Tech University (1116-C5-93)

► 2:40PM (1847) *Inclusion of Write to Learn Activities in an Elementary Statistics Course: Are they beneficial for non-traditional students?*
Katherine G Johnson, Metropolitan State University (1116-C5-935)

► 3:00PM (1848) *Creating dialogue to address attitudes towards math in pre-service elementary teachers.* Preliminary report.
Leah Childers, Benedictine College (1116-C5-2286)

► 3:20PM (1849) *Problem-Solving, Self-Reflection, and Communication.*
M. Reba* and **M. Burr**, Clemson University (1116-C5-1802)

► 3:40PM (1850) *A curriculum of nonroutine problems: A contemplative approach to teaching the process of problem solving.*
Robert Howard London, California State University, San Bernardino (1116-C5-932)

MAA Session on Innovative and Effective Ways to Teach Linear Algebra, II

1:00 PM – 5:15 PM **Room 618, Washington State Convention Center**

Organizers: **David Strong**, Pepperdine University
Gil Strang, Massachusetts Institute of Technology
Megan Wawro, Virginia Tech

► 1:00PM (1851) *Eigenvalues and Singular Values in Theory and Practice.*
Gilbert Strang, Massachusetts Institute of Technology (1116-H1-1258)

► 1:20PM (1852) *Linear Algebra versus Conspiracy Theories.*
Yevgeniy V. Galperin, East Stroudsburg University of Pennsylvania (1116-H1-2360)

► 1:40PM (1853) *A connection between skew projections and perspective projections.*
Ton Boerkoel, DigiPen Institute of Technology (1116-H1-2945)

► 2:00PM (1854) *A New Approach of Mathematical Operations for Volume Matrices.* Preliminary report.
Mian Arif Shams Adnan*, Ball University, **Khairul Islam**, Texax A & M University - Kingsville, **Asif Shams Adnan**, Jahangirnagar University, and **M Shamsuddin**, IUBAT (1116-H1-1465)

► 2:20PM (1855) *Exploring personality profiles with matrices.*
Christopher S Shaw, Columbia College Chicago (1116-H1-745)

2:40PM Discussion

► 3:00PM (1856) *Ancient Greek Linear Algebra?* Preliminary report.
Jody Sorensen, Augsburg College (1116-H1-962)

3:20PM (1857) *A computer graphics module to reinforce basic linear algebra concepts and engage non-majors.*
Karen E Clark, The College of New Jersey (1116-H1-1566)

► 3:40PM (1858) *Technology in Introductory Linear Algebra: Projects and Pedagogy.*
Patrick R Gardner, Columbia Basin College, Pasco, Washington (1116-H1-2012)

► 4:00PM (1859) *Use of Microsoft Excel for Gauss-Jordan Elimination.* Preliminary report.
Michael D Smith, Lycoming College (1116-H1-287)

► 4:20PM (1860) *Dynamically Connecting Visual and Algebraic Representations of Linear Algebra Concepts Using GeoGebra.* Preliminary report.
James D. Factor* and **Susan F. Pustejovsky**, Alverno College, Milwaukee WI (1116-H1-2745)

► 4:40PM (1861) *Applied MATLAB Projects for Linear Algebra Students.*
Steve J Bacinski, Davenport University (1116-H1-75)

5:00PM (1862) *Exploring Linear Algebra with Mathematica Labs.*
Crista L Arangala, Elon University (1116-H1-236)

MAA Session on Inquiry-Based Teaching and Learning, III

1:00 PM – 4:55 PM **Room 619, Washington State Convention Center**

Organizers: **Brian Katz**, Augustana College
Victor Piercey, Ferris State University

► 1:00PM (1863) *Flipping Precalculus through Guided Notes.* Preliminary report.
Dywayne A Nicely*, Ohio University-Chillicothe, and **Steven Widmer**, University of North Texas (1116-J5-2303)

► 1:20PM (1864) *How Low Can We Go? Flipping in Lower Levels.* Preliminary report.
Melissa Tolley Nink, Wingate University (1116-J5-598)

1:40PM (1865) *An Inverted, Inquiry-Based, Points-Free Abstract Algebra Course.* Preliminary report.
Jonathan K Hodge, Grand Valley State University (1116-J5-413)

2:00PM ► (1866) *Lessons Learned from an Inquiry-based Precalculus MOOC.* Preliminary report. **Mark L. Daniels**, University of Texas at Austin (1116-J5-841)

2:20PM (1867) *Teaching the nth derivative test with inquiry-based Mathematica activities.* Preliminary report. **David M McClendon**, Ferris State University (1116-J5-1403)

2:40PM ► (1868) *A Technology-Assisted, Inquiry-Based Approach to Teacher Education Using GeoGebra.* **Matt Roscoe**, University of Montana (1116-J5-2631)

3:00PM (1869) *Specifications Grading in an IBL Proofs Class: Managing Student Expectations.* Preliminary report. **Carol G. Gee**, St. Edward's University (1116-J5-2862)

3:20PM (1870) *Branching out within IBL: Guides to Support Experimentation.* **sarah-marie belcastro**, MathILy (serious Mathematics Infused with Levity) (1116-J5-716)

3:40PM (1871) *Using my Imposter Syndrome to be a Better IBL Professor.* **Susan B Crook**, Loras College (1116-J5-491)

4:00PM (1872) *Discovering the Art of Mathematics: Evaluating our Student Goals.* **Volker Ecke***, **Christine von Renesse**, **Julian Fleron** and **Phillip K Hotchkiss**, Westfield State University (1116-J5-2980)

4:20PM (1873) *Utilizing IBL to Effectively Engage Youth in Mathematics.* **Angie Hodge**, University of Nebraska Omaha (1116-J5-1808)

4:40PM ► (1874) *An IBL Life: The Story of Mr. Harry Lucas, Jr.* **Randall E Cone**, Salisbury University (1116-J5-854)

MAA Session on Mathematics Experiences and Projects in Business, Industry, and Government

1:00 PM – 4:15 PM **Room 303, Washington State Convention Center**

Organizer: **Allen Butler**, Wagner Associates

1:00PM ► (1875) *DLMF Live! Tables: NIST/Antwerp Collaboration for Standard Reference Tables on Demand.* **Bonita Saunders***, **Bruce Miller**, **Marjorie McClain**, **Daniel Lozier**, **Andrew Dienstfrey**, National Institute of Standards and Technology, **Franky Backeljauw**, **Stefan Becuwe** and **Annie Cuyt**, University of Antwerp (1116-L1-2779)

1:20PM ► (1876) *Changes in the Geometry of Baltimore's Public Transit System during the 2015 Protests.* **Mark A Branson**, Stevenson University (1116-L1-918)

1:40PM ► (1877) *Scheduling the Week of Chaos.* Preliminary report. **sarah-marie belcastro***, MathILy (serious Mathematics Infused with Levity), **Max Engelstein**, University of Chicago, **Jonah Ostroff**, MathILy-Er (MathILy, Earlier) and University of Washington, and **Thomas C. Hull**, Western New England University (1116-L1-1388)

2:00PM (1878) *Mathematical Proof and Digital Camera Design.* **Daniel J Heath***, Pacific Lutheran University, and **Rob Rydberg**, Schweitzer Engineering Laboratories (1116-L1-590)

2:20PM ► (1879) *Mathematical Modeling and Analysis of a Dark Money Network.* **William P Fox***, Naval Postgraduate School, **Sean Everton** and **Chris Couch**, NPS (1116-L1-243)

2:40PM ► (1880) *"Wherehouse" Route Optimization Software for the Warehouse Picking Problem.* **Irina Seceleanu***, **Ward Heilman**, **Matthew Shipman** and **Robert Guillette**, Bridgewater State University (1116-L1-2260)

3:00PM ► (1881) *Modeling the Difficulty of Constructed-Response Items.* **James H. Fife**, Educational Testing Service (1116-L1-1124)

3:20PM ► (1882) *Categorification in the real world.* Preliminary report. **Emilie Purvine***, Pacific Northwest National Laboratory, **Michael Robinson**, American University, and **Cliff Joslyn**, Pacific Northwest National Laboratory (1116-L1-1922)

3:40PM ► (1883) *My PIC Math Experience: Teaching An Industrial Mathematics Course At A Small, Liberal Arts College.* **Ron Buckmire**, Occidental College (1116-L1-2695)

4:00PM ► (1884) *Fusion in Card Collecting Games: A Probable Outcome.* Preliminary report. **Kristen Abernathy***, **Lindsay Bradley**, **Emili Moan**, Winthrop University, and **Zoe Vernon**, Washington University in St. Louis (1116-L1-2848)

MAA Session on Mathematics and Sports, I

1:00 PM – 4:15 PM **Room 608, Washington State Convention Center**

Organizers: **Drew Pasteur**, College of Wooster

John David, Virginia Military Institute

1:00PM (1885) *Evaluation of NFL Punters.* Preliminary report.
R. Drew Pasteur*, **Emily Howerton**, **Preston Pozderac**, **Stuart Young** and **Jonathan Moore**, College of Wooster (1116-L5-1925)

1:20PM (1886) *Predicting NCAA Basketball and Football Using an Adaptive Neuro-Fuzzy Inference System.* Preliminary report.
Connor R Loken* and **John A David**, Virginia Military Institute (1116-L5-2056)

1:40PM (1887) *A New Sports Rating Methodology.*
Jeffrey W Heath*, **Trevor Brewer** and **Eric Murrell**, Centre College (1116-L5-2784)

2:00PM (1888) *An Analysis of the Basketball Endgame: When to Foul When Trailing and Leading.*
Franklin H. J. Kenter, Rice University (1116-L5-2739)

2:20PM (1889) *Motivating Student Learning Through Sports-Related Projects.*
Anne M. Triplett, University of Mount Union (1116-L5-865)

2:40PM (1890) *Getting on top of spinning: Modeling the figure skating upright spin.*
Diana S Cheng*, Towson University, and **Tetyana Berezovski**, St. Joseph's University (1116-L5-84)

3:00PM (1891) *The five star ranking system of football recruits and their future success in College and the NFL.*
Reza O. Abbasian*, **John T. Sieben** and **Amy L. Gastauer**, Texas Lutheran University (1116-L5-1051)

3:20PM (1892) *How does losing team bias affect water polo games?*
John K Mayberry, The University of the Pacific (1116-L5-456)

3:40PM (1893) *Handicapping No-Tap Bowling.* Preliminary report.
Richard Yan and **Carl Yerger***, Davidson College (1116-L5-1296)

4:00PM (1894) *Statistics, Past Champions, and the Most Important Points in Tennis.*
James R Henderson, Penn State Erie, the Behrend College (1116-L5-178)

MAA Session on New Ideas in Teaching Upper-Level Statistics Courses

1:00 PM – 2:35 PM **Yakima 1, Yakima Level One, Washington State Conference Center**

Organizers: **Patti Frazer Lock**, St. Lawrence University
Randall Pruim, Calvin College
Sue Schou, Idaho State University

1:00PM (1895) *Using Peer Consulting in Applied Statistics Courses.*
Aimee D Schwab, Xavier University (1116-M1-1245)

1:20PM (1896) *Interdisciplinary research project in Stat 2 class.*
Hyun-Joo Kim, Truman State University (1116-M1-1295)

1:40PM (1897) *Using a Practicum in a Surveys and Sampling Course.* Preliminary report.
Lisa J. Carnell, High Point University (1116-M1-503)

2:00PM (1898) *Design of Experiments: Helping Students Understand the Importance of Identifying Sources of Variability.*
Soma Roy, California Polytechnic State University, San Luis Obispo (1116-M1-2852)

2:20PM (1899) *Simulation-based inference beyond the introductory course.*
Beth Chance, Cal Poly - San Luis Obispo (1116-M1-2629)

MAA Session on Research in Undergraduate Mathematics Education, IV

1:00 PM – 4:15 PM **Room 2B, Washington State Convention Center**

Organizer: **Karen A. Keene**, North Carolina State University

1:00PM (1900) *Assessing mental math knowledge of prospective elementary pre-service teachers.*
Sayonita Ghosh Hajra*, University of Utah, and **Victoria Kofman**, Buffalo Grove, Illinois (1116-Q5-1420)

1:20PM (1901) *Initial results from an undergraduate seminar designed to address the problem of transition from school to university mathematics.* Preliminary report.
Kathleen Clark*, Florida State University, **Ingo Witzke**, University of Siegen, **Horst Struve**, University of Cologne, and **Gero Stoffels**, University of Siegen (1116-Q5-1357)

1:40PM (1902) *Instructional Coherence and Quantitative Reasoning.*
Michael A Tallman, Oklahoma State University (1116-Q5-1332)

2:00PM (1903) *Student Interpretations of Textbook Statements of the Multiplication Principle.*
Elise Lockwood*, Oregon State University, and **Branwen Schaub**, University of Portland (1116-Q5-1084)

2:20PM (1904) *Examining Student Generalizing Activity in an Accessible Combinatorial Task.*
Zackery K. Reed* and **Elise Lockwood**, Oregon State University (1116-Q5-1069)

2:40PM (1905) *The Development of Beginning Teachers' Understanding of Pythagorean Theorem from Two Internet-Based Activities.*
Aaron Brakoniecki, Boston University (1116-Q5-914)

3:00PM (1906) *Assigning Homework via Interleaved Practice.* Preliminary report.
Lori Carmack, Salisbury University (1116-Q5-907)

3:20PM ► (1907) *Using Reading Journals in Calculus.* Preliminary report.
Anneliese H. Spaeth*, Huntingdon College, and **Tara C. Davis**, Hawai'i Pacific University (1116-Q5-877)

3:40PM ► (1908) *Why Students Cannot Solve Mathematical Problems: An Exploration of College Students' Problem Solving Processes by Analyzing the Execution Behaviors of their own Global Plans for Solving the Problems.* Preliminary report.
Kedar Mani Nepal, Mercer University (1116-Q5-788)

4:00PM ► (1909) *Students' obstacles to making sense of the definite integral.*
Joseph F. Wagner, Xavier University (1116-Q5-1001)

MAA Session on Trends in Undergraduate Mathematical Biology Education, II

1:00 PM – 3:35 PM **Room 2A, Washington State Convention Center**

Organizers: **Timothy Comar**, Benedictine University
Daniel Hrozencik, Chicago State University

1:00PM ► (1910) *Mathematical modeling of competitive binding on a microarray.*
Frank H Lynch, EWU (1116-T1-2749)

1:20PM ► (1911) *Exchanging Ideas and Experiences Regarding Students' Initial Exposure to Biomathematics.*
John Wesley Cain, Harvard University Department of Mathematics (1116-T1-345)

1:40PM ► (1912) *The Use of Mathematics in EEB and Developmental Biology: A Content Analysis.* Preliminary report.
Pablo Duran, The University of Texas at Austin (1116-T1-544)

2:00PM ► (1913) *Computational labs based on research papers from science journals in a mathematical modeling course.*
Gabriella A Pinter* and **Istvan G Lauko**, University of Wisconsin Milwaukee (1116-T1-2027)

2:20PM (1914) *An example of population modeling: the California condor reintroduction project.*
Andrew M. Oster, Eastern Washington University (1116-T1-2970)

2:40PM ► (1915) *Implementing mathematical techniques in a undergraduate biology research during calculus with tropical biology study abroad bundle.* Preliminary report.
Boyko Gyurov, Georgia Gwinnett College (1116-T1-2173)

3:00PM ► (1916) *Estimating Parameters and Responding to Questions During an Outbreak: Modeling Ebola in Fall 2014.*
Meredith L. Greer, Bates College (1116-T1-2177)

3:20PM ► (1917) *Lineage – Viewed Through a C-set.*
Shabeena Ahmed, West Valley College, Saratoga, California (1116-T1-2638)

MAA Session on the Development and Adoption of Open Educational Resources for Teaching and Learning, II

1:00 PM – 3:55 PM **Room 620, Washington State Convention Center**

Organizers: **Benjamin Atchison**, Framingham State University
Jeremy Russell, The College of New Jersey

1:00PM ► (1918) *Free, peer-reviewed, open-source Calculus textbook by OpenStax.*
Edwin P Herman, University of Wisconsin-Stevens Point (1116-E1-2604)

1:20PM ► (1919) *Remixing OER to Share the Beauty & Power of Calculus.*
Sue R. VanHattum, Contra Costa College (1116-E1-1437)

1:40PM (1920) *Doubly Active Learning: Flipping Calculus using the edX Platform.* Preliminary report.
Stephen Wang, Rice University (1116-E1-2636)

2:00PM ► (1921) *Interactive Instructional Apps for Specific Calculus Concepts.*
M. Reba*, **Allen Guest** and **M. Burr**, Clemson University (1116-E1-1806)

2:20PM ► (1922) *Teaching Online Differential Equations Using OER Textbooks and WeBWorK (an OER Homework Platform).* Preliminary report.
Paul E. Seeburger, Monroe Community College (1116-E1-2423)

2:40PM (1923) *JITAR online modules to improve math preparation of engineering students.* Preliminary report.
Alina N Duca*, NC State University, Department of Mathematics, **Hatice Ozturk**, NC State University, Electrical and Computer Engineering, **Dianne Raubenheimer**, Meredith College, Raleigh, NC, **Joel Trussell**, NC State University, Electrical and Computer Engineering, and **Geoff Goehle**, West Carolina University, Mathematics and Computer Science Department (1116-E1-1818)

3:00PM ► (1924) *Case study of interoperability and reuse: WeBWorK, HTML and Moodle.* Preliminary report.
Michael E Gage, University of Rochester (1116-E1-1136)

3:20PM (1925) *"Finishing" an open textbook.*
Oscar Levin, University of Northern Colorado (1116-E1-2337)

3:40PM ► (1926) *Voting with Plickers - No Device Required!* Preliminary report.
Kimberly Jordan Burch, Indiana University of Pennsylvania (1116-E1-338)

MAA Session on the Teaching and Learning of Undergraduate Ordinary Differential Equations, II

1:00 PM – 5:30 PM **Room 617, Washington State Convention Center**

Organizers: **Christopher S. Goodrich**, Creghton Preparatory School
Beverly H. West, Cornell University

► 1:00PM (1927) *Tips, Tools, and Resources for Teaching an Active-Learning motivated Differential Equations Course.*
Karl RB Schmitt, Valparasio University (1116-S1-1747)

► 1:20PM (1928) *Teaching an Online Sophomore-Level Differential Equations Class with Mathematica Supplements.* Preliminary report.
William M Kinney, Bethel University, St. Paul, MN (1116-S1-1841)

► 1:40PM (1929) *How High Can You Jump? Modeling Jumping via Differential Equations.* Preliminary report.
Michelle L Ghrist, U.S. Air Force Academy (1116-S1-1871)

► 2:00PM (1930) *Valuable Course Components for an Online Differential Equations Course.* Preliminary report.
Paul E. Seeburger, Monroe Community College (1116-S1-1903)

► 2:20PM (1931) *Teaching Differential Equations without Computer Graphics Solutions is a Crime.*
Beverly H. West, Cornell University (1116-S1-2058)

2:40PM (1932) *Active DE with Inquiry and More.*
Therese Shelton, Southwestern University (1116-S1-2093)

► 3:00PM (1933) *Chaos Theory and Nonlinear Systems in the Differential Equations Classroom.*
Christopher S. Goodrich, Creighton Preparatory School (1116-S1-2193)

► 3:20PM (1934) *Teaching Differential Equations the SIMIODE Way.*
John B Thoo, Yuba College, Marysville, California (1116-S1-2197)

► 3:40PM (1935) *Choosing a Solution Strategy: Distinguishing between Analytic, Qualitative and Numerical Approaches.* Preliminary report.
Jana L Gevertz, The College of New Jersey (1116-S1-120)

4:00PM Informal Meeting with ODE Speakers

MAA General Contributed Paper Session on Applied Mathematics, III

1:00 PM – 5:20 PM **Room 214, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

► 1:00PM (1936) *A power series approach to stability and control.* Preliminary report.
Roger J. Thelwell, James Madison University (1116-VC-2365)

1:15PM (1937) *Deformation of a Biofilm Using an Energy Based Model.* Preliminary report.
Nathan McClanahan, Montana State University (1116-VC-2875)

1:30PM (1938) *Radii of Convergence for Power Series Expansions of Eigenfrequencies of High-Contrast Photonic Crystals.*
Robert Lipton and **Robert P Viator***, Louisiana State University (1116-VC-2392)

1:45PM (1939) *Explicit Johnson-Lindenstrauss projection of high dimensional data.*
Fiona Knoll, Clemson University (1116-VC-2409)

► 2:00PM (1940) *An Introduction to the Mathematics of Electrical Impedance Tomography.*
Melody Alsaker, Colorado State University (1116-VC-2428)

2:15PM (1941) *Modelling a Biological Membrane as a Two Phase Viscous Fluid with Curvature Elasticity.*
Ross Eric Magi*, Walla Walla University, and **James P Keener**, University of Utah (1116-VC-2439)

► 2:30PM (1942) *A Kinetic Monte Carlo model for grain boundary migration driven by curvature.* Preliminary report.
Kyle L. Golenbiewski* and **Tim P. Schulze**, University of Tennessee (1116-VC-246)

► 2:45PM (1943) *Advancements and Applications of Nonstandard Finite Difference Methods.*
Daniel Wood, The University of Texas at Arlington (1116-VC-2492)

► 3:00PM (1944) *Conditions on flocking for the 3 Zone-Model.*
Christopher Mathewson Stokes, Arizona State University (1116-VC-2590)

3:15PM (1945) *Partitioned Methods for the Evolutionary Stokes-Darcy-Transport Problem.* Preliminary report.
Michaela Kubacki*, Department of Mathematics, Middlebury College, **Vince Ervin**, Department of Mathematical Sciences, Clemson University, **William Layton**, Department of Mathematics, University of Pittsburgh, **Marina Moraiti**, Seattle, WA, **Zhiyong Si** and **Catalin Trenchea**, Department of Mathematics, University of Pittsburgh (1116-VC-2591)

► 3:30PM (1946) *The effects of host-feeding on stability of discrete-time host-parasitoid population dynamic models.*
Brooks K Emerick*, Trinity College, and **A Singh**, University of Delaware (1116-VC-2602)

► 3:45PM (1947) *A Fractal wavelet-based DE solver.* Preliminary report.
Costa Lasiy, Westminster College (1116-VC-2697)

4:00PM (1948) *Parameter identification and sensitivity analysis for a phytoplankton competition model.*
Thomas G. Stojsavljevic, University of Wisconsin-Milwaukee (1116-VC-2707)

► 4:15PM (1949) *Transport of Particulate Matter in a Biofilm-lined Hot Spring Effluent Channel.* Preliminary report.
Benjamin D. Jackson, Walla Walla University (1116-VC-2708)

► 4:30PM (1950) *Schubert variety constrained averaging on Grassmann manifolds.* Preliminary report.
Tim Marrinan*, **Michael Kirby**, **Chris Peterson**, Colorado State University, **Ignacio Santamaria**, University of Cantabria, Spain, and **Louis Scharf**, Colorado State University (1116-VC-2740)

► 4:45PM (1951) *A Mathematical Description of Flocking and Swarming Behaviors.*
Sebastien Motsch, **Alexander Reamy***, **Ryan Theisen** and **Matt Stokes**, Arizona State University (1116-VC-2741)

► 5:00PM (1952) *Virotherapy and Immunotherapy Combinations towards Cancer.* Preliminary report.
Ilyssa A Summer*, Arizona State University, and **Angela Peace**, Texas Tech University (1116-VC-2820)

5:10PM (1953) *Exponential convergence for stochastic optimal control problems.*
Jangwoon Lee*, University of Mary Washington, and **Hyung-Chun Lee**, Ajou University (1116-VC-356)

MAA General Contributed Paper Session on Linear Algebra

1:00 PM – 4:40 PM **Room 213, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University

Bem Cayco, San Jose State University

Timothy Comar, Benedictine University

T. James Reid, University of Mississippi

► 1:00PM (1954) *Constructing approximations to equiangular tight frames.* Preliminary report.
Somantika Datta and **Jesse Ernest Oldroyd***, University of Idaho (1116-VI-1310)

► 1:15PM (1955) *Multilinear polynomials of small degree evaluated on matrices over a unital algebra.*
Katherine Cordwell, University of Maryland, College Park, and **George Wang***, University of Southern California (1116-VI-139)

1:30PM Discussion

► 1:45PM (1956) *Matrix Completions for the Commutativity Equation.*
Geoffrey Buhl, California State University Channel Islands, **Elijah Cronk**, Ithaca College, **Rosa Moreno**, California State University Channel Islands, **Kirsten Morris**, Georgia College, **Dianne Pedroza**, Ripon College, and **Jack Ryan***, North Central College (1116-VI-1547)

► 2:00PM (1957) *A Matrix Completion Problem for the skew-Symmetric Equation* $AX - A^TX = 0$. Preliminary report.
Geoffrey Buhl, California State University Channel Islands, **Elijah Cronk**, Ithaca College, **Rosa Moreno**, California State University Channel Islands, **Kirsten Morris***, Georgia College & State University, **Dianne Pedroza**, Ripon College, and **Jack Ryan**, North Central College (1116-VI-1816)

2:15PM (1958) *Drawbacks of LLL Lattice Basis Reduction.*
Bal K Khadka* and **Spyros Magliveras**, Florida Atlantic University, Boca Raton, FL (1116-VI-2133)

► 2:30PM (1959) *Matroids and the minimum rank of matrix patterns.* Preliminary report.
Louis Deaett, Quinnipiac University (1116-VI-2270)

2:45PM (1960) *Fiedler-like linearizations of matrix polynomials.*
Piers Lawrence, Universite catholique de Louvain, Department of Mathematical Engineering, Louvain, Belgium, **Froilan M. Dopico**, Universidad Carlos III de Madrid, Department of Mathematics, Madrid, Spain, **Paul Van Dooren**, Universite catholique de Louvain, Department of Mathematical Engineering, Louvain, Belgium, and **Javier Perez Alvaro***, School of Mathematics, The University of Manchester, Manchester, England (1116-VI-2357)

► 3:00PM (1961) *Some optimization problems in quantum information science.*
Chi-Kwong Li, College of William and Mary (1116-VI-2544)

3:15PM ► (1962) *Using the Jacobian method to solve structured inverse eigenvalue problems.* **Keivan Hassani Monfared***, University of Calgary, and **Bryan Shader**, University of Wyoming (1116-VI-2825)

3:30PM ► (1963) *A Structured Inverse Eigenvalue Problem for Infinite Matrices.* Preliminary report. **Ehssan Khanmohammadi***, Franklin and Marshall College, and **Keivan Hassani Monfared**, University of Calgary (1116-VI-2897)

3:45PM ► (1964) *On the images of Jordan polynomials evaluated over symmetric matrices.* **Alexander Ma***, Bowdoin College, and **Jamie Oliva**, Muhlenberg College (1116-VI-395)

4:00PM ► (1965) *The Quadratic Irrationals and Ducci Matrix Sequences.* **Issac A Odegard**, University of North Dakota (1116-VI-751)

4:15PM (1966) *Spectral characterization of matchings in graphs.* **Sudipta Mallik***, Northern Arizona University, and **Keivan Hassani Monfared**, University of Calgary (1116-VI-830)

4:30PM ► (1967) *On arithmetic-harmonic-geometric mean inequalities.* **Daeshik Choi**, Southern Illinois University Edwardsville (1116-VI-140)

MAA General Contributed Paper Session on Number Theory, II

1:00 PM – 4:40 PM **Room 212, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University

Bem Cayco, San Jose State University

Timothy Comar, Benedictine University

T. James Reid, University of Mississippi

1:15PM (1968) *Explicit Bounds on Several Sums and Functions Arising in Elementary Analytic Number Theory.* **Paul A Kinlaw**, Husson University (1116-VN-2430)

1:30PM ► (1969) *Continued Fractions: Methods and Applications, including finding Epsilon Periods of Almost Periodic Functions.* **Darin Orrie Brindle**, Morgan State University Baltimore, Md. (1116-VN-988)

1:45PM ► (1970) *Hyper $m-$ary partition sequences.* Preliminary report. **Shannon R Lockard***, Bridgewater State University, and **Timothy Flowers**, Indiana University of Pennsylvania (1116-VN-2456)

2:00PM ► (1971) *A Set of Two-Color Rado Numbers for $x_1 + x_2 + \ldots + x_m + c = ax_0$.* **Don Vestal*** and **Tristin Lehmann**, South Dakota State University (1116-VN-2458)

2:15PM Discussion

2:15PM ► (1972) *Minkowski's Theorem (Geometry in the Aid of Algebra).* **Duff G Campbell**, Hendrix College (1116-VN-606)

2:30PM ► (1973) *Getting prime numbers from polynomials.* **Elijah Miguel Allen**, Savannah GA (1116-VN-2566)

2:45PM ► (1974) *Runs of Consecutive Abundant Numbers.* Preliminary report. **William C. Linderman**, King University (1116-VN-2624)

3:00PM ► (1975) *On Minimal Levels of Iwasawa Towers.* **Shawn Michael Elledge**, Arizona State University (1116-VN-2660)

3:15PM ► (1976) *Counting the Number of Pythagorean Triples in a Finite Field of Odd Characteristic.* **James M Hammer***, Cedar Crest College, and **Joshua Harrington**, Cedar Crest college (1116-VN-2746)

3:30PM ► (1977) *On the number of $\tau_{(n)}$-factors.* Preliminary report. **Reyes M Ortiz-Albino***, University of Puerto Rico-Mayaguez, and **Carlos Molina**, University of Puerto Rico-MAyaguez (1116-VN-2763)

3:45PM (1978) *Multiple harmonic sums in number theory.* Preliminary report. **Julian H Rosen**, University of Georgia (1116-VN-2884)

4:00PM (1979) *The Local Langlands Correspondence: New Examples for Small Residue Characteristic.* **Beth Romano**, Boston College (1116-VN-553)

4:15PM (1980) *On the Products $\prod_{k=1}^{n}(4k^4+1)$ and $\prod_{k=1}^{n}(k^4+4)$.* **Erhan Gurel**, Middle East Technical University, Northern Cyprus Campus (1116-VN-42)

4:30PM (1981) *Orders of reductions of elliptic curves with many and few prime factors.* **Lee Troupe**, University of Georgia (1116-VN-504)

MAA General Contributed Paper Session on Teaching and Learning Introductory Mathematics

1:00 PM – 3:55 PM **Yakima 2, Yakima Level One, Washington State Conference Center**

Organizers: **Jennifer E, Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

► 1:15PM (1982) *Preparing Elementary School Teachers: Techniques to aid Future Teachers.* **Peter L Staab**, Fitchburg State University (1116-VQ-2918)

► 1:30PM (1983) *A Recipe to Infinity.* **Skona Brittain**, SB Family School, Santa Barbara, CA (1116-VQ-1471)

► 1:45PM (1984) *Bringing College Algebra out of the Classroom.* Preliminary report. **Peter T. Olszewski**, Penn State Erie, The Behrend College (1116-VQ-1817)

► 2:00PM (1985) *Preparing Students for Calculus: Function as Process and Covariational Reasoning.* **Frank Savina***, The Charles A. Dana Center at the University of Texas at Austin, and **Stuart Boersma**, Central Washington University (1116-VQ-1897)

► 2:15PM (1986) *Why should I learn mathematics in college?* **Rodica Cazacu**, Georgia College (1116-VQ-1929)

► 2:30PM (1987) *Struggles of College Algebra Survival.* Preliminary report. **Edward D Smith**, Pima Community College (1116-VQ-196)

► 2:45PM (1988) *IMATH: Integrated Intermediate Algebra and College Level Mathematics.* **Karen Hulsebosch*** and **James Howell**, Olympic College (1116-VQ-1985)

► 3:00PM (1989) *Explorations in Course Redesign.* Preliminary report. **T. C. Kull**, Winthrop University (1116-VQ-2491)

► 3:15PM (1990) *Integrating Parallel Notes Delivery to Increase Success.* **Rachid Ait Maalem Lahcen*** and **Ram Mohapatra**, University of Central Florida (1116-VQ-2647)

3:30PM (1991) *Using Coding Examples to Teach Inverse Functions: Helping Students Connect "Abstract" Mathematical Concepts to "Real" Life.* **Jenna P. Carpenter**, Campbell University (1116-VQ-584)

► 3:45PM (1992) *Integrating Case Studies in Teaching Developmental Mathematics Courses.* **Qingxia Li**, Fisk University (1116-VQ-323)

SIAM Minisymposium on Trends in the Mathematics of Signal Processing and Imaging

1:00 PM – 5:55 PM **Room 3A, Washington State Convention Center**

Organizers: **Willi Freeden**, University of Kaiserslautern
Zuhair Nashed, University of Central Florida

1:00PM (1993) *Operators and classification in sub-band filtering.* **Palle E. T. Jorgensen**, University of Iowa (1116-41-2907)

1:30PM (1994) *Least squares regularized or constrained by L_0: relationship between their global minimizers.* Preliminary report. **Mila Nikolova**, CMLA – CNRS ENS Cachan (1116-65-2912)

2:00PM (1995) *Sampling of bandlimited functions in multi-dimensional Euclidean spaces.* **Willi J. Freeden***, Geomathematics Group, University of Kaiserslautern, and **M. Zuhair Nashed**, Department of Mathematics, University of Central Florida (1116-65-2917)

2:30PM (1996) *Multiscale basis dictionaries on graphs and their applications in signal and image processing.* **Jeff Irion** and **Naoki Saito***, Department of Mathematics, University of California, Davis (1116-42-2877)

3:00PM (1997) *Recent Advances in Duration and Bandwidth Limiting.* Preliminary report. **Joseph D Lakey***, New Mexico State University, and **Jeffrey A Hogan**, University of Newcastle, Australia (1116-94-2928)

3:30PM (1998) *Self-calibration and biconvex compressive sensing.* **Shuyang Ling***, University of California, Davis, and **Thomas Strohmer**, University of California Davis (1116-94-2901)

4:00PM (1999) *Optimal Convergence Rate Results for Linear Inverse Problems.* **Peter Elbau**, University of Vienna (1116-46-2926)

4:30PM (2000) *Signal Reconstruction from Frame and Sampling Erasures.* **Deguang Han**, University of Central Florida, **David R Larson**, **Sam L Scholze***, Texas A&M University, and **Wenchang Sun**, Nankai University (1116-42-1843)

5:00PM (2001) *Sparse recovery from saturated measurements.* **Simon Foucart***, Texas A&M University, and **Tom Needham**, University of Georgia (1116-94-2952)

5:30PM (2002) *Exact reconstruction of an evolving signal from incomplete information of its future states.* **Sui Tang**, Vanderbilt University (1116-94-2211)

NAM Granville-Brown-Haynes Session of Presentations by Recent Doctoral Recipients in the Mathematical Sciences

1:00 PM – 3:50 PM **Room 211, Washington State Convention Center**

1:00PM ► (2003) *Dynamic immunity: Mathematical models for B cell signaling pathways and chronic lymphocytic leukemia.*
Reginald L. McGee, Mathematical Biosciences Institute (1116-92-2843)

1:35PM (2004) *On the Representations of* $\mathrm{SL}_*(2,\mathcal{A})$. Preliminary report.
Syvillia A Averett, Central State University (1116-00-2940)

2:10PM (2005) *Mod 4 Representations Arising From Elliptic Curves.*
Kevin M Mugo, Purdue University (1116-11-2942)

2:45PM ► (2006) *Modeling Head-up Tilt via an Optimal Control Approach and a Non-pulsatile Cardiovascular Model.* Preliminary report.
Nakeya D Williams, United States Military Academy at West Point (1116-92-2950)

3:20PM (2007) *Gearing Up; Algorithms For Discreteness.*
Caleb J. Ashley, Morehouse College (1116-51-2975)

MAA Committee on the Mathematical Education of Teachers (COMET) Panel Discussion

1:00 PM – 2:20 PM **Room 612, Washington State Convention Center**

Learning from each other: International perspectives on the mathematical education of teachers.

Organizers: **Bonnie Gold**, Monmouth University
David C. Carothers, James Madison University

Panelists: **Tad Watanabe**, Kennesaw State University
Catherine B. Kessel, Mathematics Education Consultant, Berkeley, CA
William Schmidt, Michigan State University

MAA Subcommittee on Research by Undergraduates Panel Discussion

1:00 PM – 2:20 PM **Room 609, Washington State Convention Center**

Undergraduate research as a capstone course.

Organizers: **Aklilu Zeleke**, Michigan State University
James Solazzo, Coastal Carolina University
Michael Karls, Ball State University

Panelists: **Anant Godbole**, East Tennessee State University
Keshav Jagannathan, Coastal Carolina University
Rebecca Garcia, Sam Houston State University
Sergio Loch, Grand View University

Project NExT Session

1:00 PM – 2:15 PM **Room 4C-2, Washington State Convention Center**

Designing an original course.

ASL Invited Address

2:00 PM – 2:50 PM **Room 4C-1, Washington State Convention Center**

(2008) *Algorithmically random infinite structures.*
Bakh Khoussainov, The University of Auckland (1116-03-464)

Rocky Mountain Mathematics Consortium Board of Directors Meeting

2:15 PM – 4:00 PM **Redwood B, 2nd Floor, Sheraton Seattle Hotel**

Presentations by MAA Teaching Award Recipients

2:30 PM – 3:50 PM **Ballroom 6A, Washington State Convention Center**

Organizers: **Barbara Faires**, Westminster College
Francis Su, Harvey Mudd College

2:30PM ► (2009) *Why?*
Glen R Van Brummelen, Quest University (1116-97-1786)

3:00PM ► (2010) *"Yours was the hardest class I've ever taken—I want more".*
Tyler J Jarvis, Brigham Young University (1116-00-1824)

3:30PM ► (2011) *Becoming Blue Collar.*
Satyan L Devadoss, Williams College (1116-97-1593)

AMS Committee on Science Policy Panel Discussion

2:30 PM – 4:00 PM **Room 3B, Washington State Convention Center**

Mathematical careers beyond academia.

Moderator: **Kristin Lauter**, Microsoft Research

Panelists: **Sharon Arroyo**, Boeing

Lisa Goldberg, Aperio and University of California-Berkeley
Linda Ness, QEDelta LLC
David Saltman, Center for Communications Research
Kieran Snyder, Textio
William Stein, SageMath, Inc. and University of Washington

MAA Panel Discussion

2:35 PM – 3:55 PM **Room 609, Washington State Convention Center**

A common vision for the undergraduate mathematics program in 2025.

Organizer: **Karen Saxe**, Macalester College

Panelists: **Tara Holm**, Cornell University
Helen Burn, Highline College
Rachel Levy, Harvey Mudd College
Matthew Ando, University of Illinois Urbana-Champaign

MAA Committee on Curriculum Renewal Across the First Two Years (CRAFTY)Panel Discussion

2:35 PM – 3:55 PM **Room 612, Washington State Convention Center**

Renewing the first two years curriculum: calculus, quantitative reasoning, statistics, pre-calculus, and developmental mathematics.

Organizer: **Suzanne I. Dorée**, Augsburg College

Panelists: **Michael Axtell**, University of St. Thomas
Caren Diefenderfer, Hollins University
Patti Frazer Lock, St. Lawrence University
Rebecca Hartzler, Seattle Central College
Bruce Yoshiwara, Pierce College

MAA Session on Innovative Targeted Solutions in Teaching Introductory Statistics, III

2:40 PM – 5:15 PM **Yakima 1, Yakima Level One, Washington State Conference Center**

Organizers: **Patti Frazer Lock**, St. Lawrence University
Randall Pruim, Calvin College
Sue Schou, Idaho State University

► 2:40PM (2012) *Eliciting Bootstrapping: The Development of Students' Informal Inferential Reasoning.*
Jeffrey A. McLean, Syracuse University (1116-H5-22)

► 3:00PM (2013) *Simulation methods and standards-based grading in an introductory statistics course overhaul.* Preliminary report.
Jeffery D Sykes, Ouachita Baptist University (1116-H5-1322)

► 3:20PM (2014) *Sampling Distribution Made Easy: A Simulation Approach.*
Khairul Islam, Texas A&M University-Kingsville (1116-H5-792)

► 3:40PM (2015) *Using Plickers in Introductory Statistics.*
Kimberly A. Roth, Juniata College (1116-H5-2285)

4:00PM (2016) *Using Visualize Applets in Statway and New Math Pathways.*
Mary R Parker*, Austin Community College, and **Hunter Ellinger**, Austin, Texas (1116-H5-2464)

► 4:20PM (2017) *Technology Blended Teaching for Statistics Education.*
Tanweer Shapla, Eastern Michigan University (1116-H5-810)

► 4:40PM (2018) *The fair use of graphing calculators in an introductory statistics course.*
Wei Wei* and **Katherine Johnson**, Metropolitan State University (1116-H5-863)

► 5:00PM (2019) *Excel-based interactive activities in an introductory statistics course.*
Sheldon H Lee, Viterbo University (1116-H5-2847)

MAA Minicourse #3: Part B

3:30 PM – 5:30 PM **Metropolitan B, 3rd Floor, Sheraton Seattle Hotel**

Designing and implementing a problem-based mathematics course.

Presenters: **Gail Burrill**, Michigan State University
Bowen Kerins, Educational Development Center
Darryl Young, Harvey Mudd College

MAA Minicourse #16: Part B

3:30 PM – 5:30 PM **Metropolitan A, 3rd Floor, Sheraton Seattle Hotel**

Mobile mathematics—interactive apps for teaching and learning.

Presenters: **Lila Roberts**, Clayton State University
Andrew G. Bennett, Kansas State University

MAA Minicourse #2: Part B

3:30 PM – 5:30 PM **Tahoma 5, Tahoma Level Three, Washington State Conference Center**

Visual topics in undergraduate complex analysis.

Presenters: **Michael Brilleslyper**, U.S. Air Force Academy
Michael Dorff, Brigham Young University

ASL Contributed Paper Session, I

3:30 PM – 5:20 PM **Room 4C-1, Washington State Convention Center**

3:30PM (2020) *Some new logical zero-one laws.*
Caroline Terry, University of Illinois at Chicago (1116-00-2991)

4:00PM (2021) *Unstable theories without the strict order property.*
Gabriel Conant, University of Notre Dame (1116-00-2989)

4:30PM (2022) *Products of metric structures.*
Mary Leah Karker, Wesleyan University (1116-00-2988)

5:00PM (2023) *A local characterization of VC-minimality.*
Vince Guingona, Wesleyan University (1116-03-1031)

MAA Social Hour

4:00 PM – 5:00 PM **Room 620, Washington State Convention Center**

Managing your own course.

Organizers: **Jacob A. White**, Texas A&M University
Timothy Goldberg, Lenoir-Rhyne University

National Science Foundation: Update from the Division of Mathematical Sciences

4:00 PM – 5:30 PM **Room 205, Washington State Convention Center**

Presenters: **Elizabeth Burrows**, National Science Foundation, Division of Mathematical Sciences
Matthew Douglas, National Science Foundation, Division of Mathematical Sciences
Bruce Kitchens, National Science Foundation, Division of Mathematical Sciences
Padmanabhan Seshaiyer, National Science Foundation, Division of Mathematical Sciences
Jennifer Slimowitz Pearl, National Science Foundation, Division of Mathematical Sciences
Michael Vogelius, National Science Foundation, Division of Mathematical Sciences
Junping Wang, National Science Foundation, Division of Mathematical Sciences
Henry Warchall, National Science Foundation, Division of Mathematical Sciences

MAA General Contributed Paper Session on Teaching and Learning Developmental Mathematics

4:30 PM – 5:40 PM **Yakima 2, Yakima Level One, Washington State Conference Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

4:30PM (2024) *Using Word Problems as a Bridge to Learn Linear Equations.* Preliminary report.
Shumei C. Richman, Midlands Technical College, Columbia, SC (1116-VT-1010)

► 4:45PM (2025) *The EMERGE Summer Program at Northeastern Illinois University: Supporting Incoming Freshmen in Strengthening their Mathematical Identities and Succeeding in Mathematics Development Coursework.* Preliminary report.
Katy Bird, **Sarah Cordell** and **Joseph Hibdon***, Northeastern Illinois University (1116-VT-1870)

► 5:00PM (2026) *Ready or Not, Here We Go!: Using A Corequisite Approach to Prepare Students for College Level Math.*
Alvina J. Atkinson*, **Aris B. Winger**, **Sarah H. Park**, **Lee Ann Roberts** and **Angela Lively**, Georgia Gwinnett College (1116-VT-2906)

► 5:15PM (2027) *Developmental Mathematics Redesign.* Preliminary report.
Grazyna Badowski, University of Guam (1116-VT-2974)

► 5:30PM (2028) *Comprehensive Reform of Developmental Math at Xavier University of Louisiana.*
Vlajko L Kocic*, **Gurdial Arora**, **Andrew Klimas**, **Donna Sutson** and **Sindhu Unnithan**, Xavier University of Louisiana, New Orleans, LA 70125 (1116-VT-595)

AMS Congressional Fellowship Session

4:30 PM – 6:00 PM **Room 3B, Washington State Convention Center**

Organizer: **Samuel M. Rankin, III**, American Mathematical Society

MAA Student Poster Session

4:30 PM – 6:00 PM **Hall 4F, 4th Floor, Washington State Convention Center**

Organizer: **Joyati Debnath**, Winona State University

MAA Panel Discussion

5:00 PM – 7:00 PM **Room 609, Washington State Convention Center**

Actuarial Science: Change is the Norm!

Organizers: **Patrick Brewer**, Lebanon Valley College

Robert Buck, Slippery Rock University

Bettye Case, Florida State University

Kevin Charlwood, Washburn University

Michelle Guan, Indiana University, Northwest

Steve Paris, Florida State University

Sue Staples, Texas Christian University

Panelists: **Steve Armstrong**, Casualty Actuarial Society

Robert Buck, Slippery Rock University

Robert Fisette, Milliman

Caitlin Hendricks, Liberty Mutual

Stuart Klugman, Society of Actuaries

John Leo, Cambia Health Solutions

Steve Paris, Florida State University

SIGMAA on Mathematics Instruction Using the WEB (WEB SIGMAA) Business Meeting and Reception

5:30 PM – 6:00 PM **Room 2A, Washington State Convention Center**

SIGMAA on Mathematics Instruction Using the WEB (WEB SIGMAA) Guest Lecture

6:00 PM – 6:50 PM **Room 2A, Washington State Convention Center**

6:00PM (2029) *Streamlining assessment, feedback, and archival with auto-multiple-choice.*
Matthew Leingang, New York University (1116-00-2095)

AWM Workshop Poster Presentations and Reception

6:00 PM – 7:15 PM **Skybridge, 4th Floor, Washington State Convention Center**

Organizers: **Brenda Johnson**, Union College

Catherine Searle, Wichita State University

6:00PM (2030) *Banach-valued multilinear singular integrals.*
Francesco Di Plinio and **Yumeng Ou***, Brown University

6:00PM (2031) *On finding ghost solutions of the 2D Navier-Stokes equations.*
JING TIAN* and **Bingsheng zhang**, Texas A&M University

6:00PM (2032) *A random version of the r-fork-free theorem.*
Kirsten Hogenson* and **Ryan R Martin**, Iowa State University

6:00PM (2033) *A Dual Operation on Strongly Stable Ideals.* Preliminary report.
Katie Ansaldi*, University of Notre Dame, and **Kuei-Nuan Lin**, Penn State Greater Allegheny

► 6:00PM (2034) *The Dehn-Somerville relations and the Catalan matroid.*
A M Chavez*, University of California, Berkeley, and **N Yamzon**, San Francisco State University

6:00PM (2035) *Hurwitz Correspondences on $\mathcal{M}_{0,n}$.*
Rohini Ramadas, University of Michigan

6:00PM (2036) *Goal-Oriented A Posteriori Error Estimation for Saddle Point Problem in hp Adaptive FEM.*
Arezou Ghesmati*, **Bruno Turcksin** and **Wolfgang Bangerth**, Texas A&M University

6:00PM (2037) *Zero-one laws for edge weighted graphs.*
Caroline Terry, University of Illinois at Chicago

6:00PM (2038) *Dual Filtered Graphs.*
Rebecca Patrias* and **Pavlo Pylyavskyy**, University of Minnesota

► 6:00PM (2039) *A Stronger Solution to Smale's Seventeenth Problem for Strongly Sparse Systems.*
Kaitlyn Phillipson*, Texas A&M University, **Paula E. Burkhardt**, Pomona College, and **J. Maurice Rojas**, Texas A&M University

6:00PM (2040) *On Decomposition of the product of two key polynomials into Demazure atoms.* Preliminary report.
Anna Ying Pun, University of Pennsylvaia

6:00PM (2041) *Model-based predictions of vesicle pool size in the ribbon synapse of photoreceptor neurons.*
Wallace B Thoreson, **Matthew J Van Hook**, University of Nebraska Medical Center, **Caitlyn M Parmelee***, University of Nebraska-Lincoln, and **Carina Curto**, The Pennsylvania State University

6:00PM (2042) *K-Theoretic Demazure Atoms and Set-Valued Skyline Diagrams.* Preliminary report.
Cara Monical, University of Illinois at Urbana-Champaign

6:00PM (2043) *Almost Non-Negative Curvature On Some Fake $\mathbb{R}P^n$s.*
Priyanka Rajan, University of California, Riverside

6:00PM (2044) *Global Dynamics of a Model of Joint Hormone Treatment with Dendritic Cell Vaccine for Prostate Cancer.* Preliminary report.
Erica M Rutter* and **Yang Kuang**, Arizona State University

6:00PM (2045) *The prism tableau model for Schubert polynomials.*
Anna Weigandt* and **Alexander Yong**, University of Illinois at Urbana-Champaign

6:00PM (2046) *Reconstruction of an Evolving Signal from the Incomplete Information of Its Future States.*
Sui Tang, Vanderbilt University

6:00PM (2047) *Tensor product surfaces and linear syzygies.*
Eliana Duarte* and **Hal Schenck**, University of Illinois Urbana-Champaign

6:00PM (2048) *Coxeter-biCatalan Combinatorics.* Preliminary report.
Emily Barnard* and **Nathan Reading**, North Carolina State University

6:00PM (2049) *Some graph models in nano-science and solid state.*
Ngoc Do*, **Peter Kuchment** and **Frank Sottile**, Texas A&M University

Mathematically Bent Theater

6:00 PM – 7:00 PM **Ballroom 6A, Washington State Convention Center**

Performed by Colin Adams and the Mobiusbandaid Players.

AMS Mathematical Reviews Reception

6:00 PM – 7:00 PM **Aspen, 2nd Floor, Sheraton Seattle Hotel**

SIGMAA on Business, Industry, and Government(BIG SIGMAA)Guest Lecture

6:15 PM – 7:05 PM **Room 303, Washington State Convention Center**

6:15PM (2050) *What makes a mathematician a data scientist?*
Genetha Gray, Intel Corporation (1116-00-957)

SIGMAA on Business, Industry, and Government(BIG SIGMAA)Reception

7:05 PM – 7:45 PM **Room 303, Washington State Convention Center**

NAM Cox-Talbot Address

7:45 PM – 8:35 PM **Grand Ballroom C, 2nd Floor, Sheraton Seattle Hotel**

(2051) *Why mathematicians and statisticians are needed to create lasting social impact.* Preliminary report.
Tanya A Moore, Building Diversity in Science/Presidio Graduate School (1116-00-2803)

SIGMAA on Business, Industry, and Government (BIG SIGMAA)Business Meeting

7:45 PM – 8:15 PM **Room 303, Washington State Convention Center**

Project NExT Reception

8:00 PM – 10:00 PM **Grand Ballroom A, 2nd Floor, Sheraton Seattle Hotel**
8:00—10:00—*All Project NExT Fellows, consultants, and other friends of Project NExT are invited.*¡

Saturday, January 9

Joint Meetings Registration

7:30 AM – 2:00 PM **Atrium Lobby, 4th Floor, Washington State Convention Center**

Email Center

7:30 AM – 2:00 PM **Atrium Lobby, 4th Floor, Washington State Convention Center**

AMS-MAA-SIAM Special Session on Research in Mathematics by Undergraduates and Students in Post-Baccalaureate Programs, III

8:00 AM – 11:50 AM **Tahoma 3, Tahoma Level Three, Washington State Conference Center**

Organizers: **Darren A. Narayan**, Rochester Institute of Technology

Jobby Jacob, Rochester Institute of Technology

Tamas Forgacs, California State University, Fresno

Ugur Abdulla, Florida Institute of Technology

8:00AM ► (2052) *Simulation, visualization and control of quadcopters.* **Alexander M Baez***, **Carmen Caiseda**, Inter American University of Puerto Rico Bayamon Campus, **Padmanabhan Seshaiyer**, **Nitin Nellanki** and **Byong Kwon**, George Mason University (1116-70-2633)

8:30AM ► (2053) *Mathematical Modeling, Dynamics, and Simulation of Search and Rescue Operations through UAVs.* **Kathleen A McLane***, George Mason University, **Alexander Baez**, Interamerican University of Puerto Rico, **Padmanabhan Seshaiyer**, George Mason University, **Pradyuta Seshaiyer**, Thomas Jefferson High School for Science and Technology, **Carmen Caiseda**, Interamerican University of Puerto Rico, **Byong Kwon** and **Nithin Ellanki**, George Mason University (1116-00-2626)

9:00AM ► (2054) *Neighborhood-restricted* [≥ 3]*-Chromatic Colorings.* **James Dustin Chandler***, **Cecilia Ashlie Dorado** and **Teresa W Haynes**, East Tennessee State University (1116-03-2676)

9:30AM ► (2055) *Class 0 Bounds for Graph Pebbling.* **Daniel W Cranston**, Virginia Commonwealth University, **Luke Postle**, University of Waterloo, **Chenxiao Xue*** and **Carl Yerger**, Davidson College (1116-05-1311)

10:00AM ► (2056) *Outer Automorphisms of S_6 Acting on Combinatorial Structures.* Preliminary report. **Jason Saied*** and **Dantong Zhu**, Lafayette College (1116-20-2824)

10:30AM ► (2057) *Rings, Completions, and Strange Formal Fibers.* **Sarah M. Fleming**, Williams College, **Lena Ji**, Columbia University, **S. Loepp**, **Peter M. McDonald**, **Nina Pande***, Williams College, and **David Schwein**, Brown University (1116-13-238)

11:00AM ► (2058) *Conversations: Customer Service through Twitter Platform.* **Liyu Xia***, The University of Chicago, **Mary Marie Kemp**, Occidental College, **Md Afzal Hossain**, New York City Collage of Technology, and **Alexandra Mary Howes**, University of Cambridge (1116-62-285)

11:30AM ► (2059) *Constructive Galois Theory with Linear Algebraic Groups.* **Eric Y Chen**, University of California, Berkeley, **John T Ferrara***, Bucknell University, and **Liam M Mazurowski**, Carnegie Mellon University (1116-12-291)

AMS-AWM Special Session on Commutative Algebra, II

8:00 AM – 11:50 AM **Room 603, Washington State Convention Center**

Organizers: **Karen Smith**, University of Michigan, Ann Arbor

Emily Witt, University of Utah

Irena Swanson, Reed College

8:00AM (2060) *Rees rings and singularities of curves.* **Claudia Polini**, University of Notre Dame (1116-13-834)

8:30AM (2061) *Stabilization of Boij-Söderberg decompositions of systems of ideals.* **Sarah Mayes-Tang**, Quest University Canada (1116-13-994)

9:00AM (2062) *Interior operations on the set of ideals of a ring.* Preliminary report. **Janet Vassilev**, University of New Mexico (1116-13-1147)

9:30AM (2063) *Nilpotent matrices having a given Jordan type as maximum commuting nilpotent orbit.* **Anthony Iarrobino**, Northeastern, **Leila Khatami***, Union College, **Bart Van Steirteghem**, Medgar Evers College, City University of New York, and **Rui Zhao**, University of Missouri, Columbia (1116-15-972)

10:00AM (2064) *Uniform Bounds of Artin-Rees type for free resolutions.* **Ian Aberbach**, Department of Mathematics, University of Missouri, Columbia, **Aline Hosry**, Department of Mathematics, Faculty of Sciences II, Lebanese University, Fanar, Lebanon, and **Janet Striuli***, Department of Mathematics, Fairfield University, Fairfield, Connecticut (1116-13-1138)

10:30AM (2065) *Matrix Schubert varieties and Gaussian conditional independence models.* **Alex Fink**, Queen Mary University of London, **Jenna Rajchgot***, University of Michigan, and **Seth Sullivant**, North Carolina State University (1116-13-1853)

11:00AM (2066) *The parametric variation of A-hypergeometric functions.* **Christine Berkesch Zamaere***, University of Minnesota, **Jens Forsgård** and **Laura Felicia Matusevich**, Texas A&M University (1116-13-1299)

11:30AM ► (2067) *Algebraic Methods in Computer Vision.* **Rekha Thomas**, University of Washington (1116-14-540)

AMS Special Session on Algebraic and Topological Methods in Combinatorics, III

8:00 AM – 11:50 AM **Room 204, Washington State Convention Center**

Organizers: **Andrew Berget**, Western Washington University

Steven Klee, Seattle University

Isabella Novik, University of Washington, Seattle

8:00AM (2068) *Weighted Tree Enumeration of Cubical Complexes.*
Ghodratollah Aalipour, Kharazmi University and University of Colorado Denver, **Art Duval***, University of Texas at El Paso, and **Jeremy Martin**, University of Kansas (1116-05-1635)

8:30AM ► (2069) *Sandpiles, spanning trees, and plane duality.*
Melody Chan, Department of Mathematics, Brown University, **Darren Glass**, Department of Mathematics, Gettysburgh College, **Matthew Macauley**, Department of Mathematical Sciences, Clemson University, **David Perkinson***, Department of Mathematics, Reed College, **Caryn Werner**, Department of Mathematics, Allegheny College, and **Qiaoyu Yang**, Department of Mathematics, Reed College (1116-05-1773)

9:00AM ► (2070) *The expected jaggedness of order ideals.*
Melody Chan, Harvard University, **Shahrzad Haddadan**, Dartmouth College, **Sam Hopkins***, Massachusetts Institute of Technology, and **Luca Moci**, University Paris-Diderot Paris 7 (1116-05-386)

9:30AM (2071) *The Hurwitz action in real reflection groups.* Preliminary report.
Joel Brewster Lewis, University of Minnesota (1116-05-483)

10:00AM (2072) *Quadratic-linear duality and rational homotopy theory of chordal arrangements.*
Christin Bibby*, University of Western Ontario, and **Justin Hilburn**, University of Oregon (1116-55-1714)

10:30AM ► (2073) *Combinatorial and geometric view of the system reliability theory.*
Fatemeh Mohammadi, Technical University of Berlin (TU Berlin) (1116-05-1679)

11:00AM (2074) *A McMullen formula for the number of lattice points of generalized permutohedra.*
Federico Castillo* and **Fu Liu**, UC Davis (1116-05-1167)

11:30AM (2075) *Lattice point enumeration, mutations, and Fano lattice simplices.* Preliminary report.
Benjamin Braun*, University of Kentucky, **Robert Davis**, Michigan State University, and **Liam Solus**, IAS Austria and MIT (1116-05-495)

AMS Special Session on Analytic Function Spaces and Operators on Them

8:00 AM – 11:50 AM **Room 400, Washington State Convention Center**

Organizers: **Tim Ferguson**, University of Alabama, Tuscaloosa
Hyun Kwon, University of Alabama, Tuscaloosa

8:00AM (2076) *Common reducing subspaces of several weighted shifts with operator weights.* Preliminary report.
Caixing Gu, California Polytechnic State University, San Luis Obispo, CA 93407 (1116-47-1163)

8:30AM (2077) *Hyponormality of commuting pairs of Toeplitz operators with matrix-valued symbols.*
Raul E Curto, The University of Iowa (1116-47-1576)

9:00AM (2078) *On the Harmonic and Geometric Maximal Operators.*
Linden Anne Duffee, University of Alabama (1116-43-2283)

9:30AM (2079) *On Hilbert modules.* Preliminary report.
Ronald G Douglas, Texas A&M University (1116-47-1175)

10:00AM (2080) *A Refinement of Wolff's Theorem on the Multiplier Algebra of the Dirichlet Space.* Preliminary report.
Debendra Banjade, Coastal Carolina University, **Hyun Kwon** and **Todd Neal***, The University of Alabama (1116-30-2654)

10:30AM (2081) *Hankel Operators, Invariant Subspaces, and Cyclic Vectors in the Drury-Arveson Space.*
James Sunkes* and **Stefan Richter**, University of Tennessee, Knoxville (1116-32-204)

11:00AM (2082) *On Toeplitz operators with matrix almost periodic symbols.*
Ilya M Spitkovsky, NYUAD and William&Mary (1116-47-1225)

11:30AM (2083) *A Class of Integral Operators on Zygmund spaces of the unit disk.*
Snehalatha Ballamoole*, Mississippi State University, Starkville, Mississippi., **Thomas Len Miller** and **Vivien Glass Miller**, Mississippi State University (1116-47-2781)

AMS Special Session on Applied and Computational Topology, I

8:00 AM – 11:50 AM **Room 201, Washington State Convention Center**

Organizers: **Pawel Dlotko**, INRIA Saclay, France
Nicholas Scoville, Ursinus College
Matthew Wright, IMA University of Minnesota

8:00AM (2084) *Homology of generalized configuration spaces.* Preliminary report.
Radmila Sazdanovic, North Carolina State University (1116-57-1528)

8:30AM (2085) *Vietoris–Rips complexes of circles and ellipses.*
Michał Adamaszek, University of Copenhagen, **Henry Adams***, Colorado State University, and **Samadwara Reddy**, Duke University (1116-57-832)

► 9:00AM (2086) *Reconstructing manifolds and functions from random samples.*
Vidit Nanda, University of Pennsylvania (1116-55-1268)

9:30AM (2087) *Subsampling methods for persistent homology.*
Frederic Chazal, INRIA Saclay (1116-55-555)

► 10:00AM (2088) *Sheaf-based communication network invariants.*
Michael Robinson, American University (1116-55-109)

10:30AM (2089) *Recent results on constructible Reeb spaces and the interleaving distance.* Preliminary report.
Justin Michael Curry, Duke University (1116-55-1758)

11:00AM (2090) *Reeb Space Approximation with Guarantees.*
Elizabeth Munch*, University at Albany - SUNY, and **Bei Wang**, University of Utah (1116-55-305)

11:30AM (2091) *Rigorous validation of isolating blocks for flows and their Conley indices.*
Thomas Stephens, George Mason University (1116-57-1606)

AMS Special Session on Arithmetic Dynamics, III

8:00 AM – 11:50 AM **Room 604, Washington State Convention Center**

Organizers: **Matthew Baker**, Georgia Institute of Technology
Joseph Silverman, Brown University

8:00AM (2092) *Some applications of the Arithmetic euqidistribution theorem in Complex Dynamics.*
Hexi Ye, University of British Columbia (1116-37-418)

8:30AM (2093) *Canonical heights and preperiodic points for a special class of polynomials.* Preliminary report.
Patrick Ingram, Colorado State University (1116-11-1935)

9:00AM (2094) *Postcritical sets in moduli space.*
Sarah Koch, University of Michigan (1116-30-475)

9:30AM (2095) *The dynamical André-Oort conjecture.*
Holly Krieger, MIT (1116-37-747)

10:00AM (2096) *Automorphism Groups and Invariant Theory on PN.* Preliminary report.
Joao Alberto de Faria, Florida Institute of Technology, and **Benjamin Hutz***, Saint Louis University (1116-37-1810)

10:30AM (2097) *Genralized dynamical systems, from monoid actions to homomorphisms.* Preliminary report.
Chong Gyu Lee, Soongsil University (1116-37-835)

11:00AM (2098) *A very elementary proof of a conjecture of B. and M. Shapiro for cubic rational functions.* Preliminary report.
Bianca A Thompson*, Smith College, and **Xander Faber**, Center for Computing Sciences, Institute for Defense Analyses (1116-11-476)

11:30AM (2099) *The dynamics of Apollonian circle packings.* Preliminary report.
Sneha Chaubey, **Elena Fuchs**, University of Illinois at Urbana-Champaign, **Robert Hines** and **Katherine E Stange***, University of Colorado, Boulder (1116-11-941)

AMS Special Session on Current Areas of Interest in the Mathematical Sciences of Medieval Islam, I

8:00 AM – 11:20 AM **Skagit 3, Skagit Lower Level, Washington State Conference Center**

Organizers: **Mohammad K. Azarian**, University of Evansville
Mohammad Javaheri, Siena College
Emelie A. Kenney, Siena College

► 9:00AM (2100) *Generating the symmetries of medieval Islamic ornaments.*
B. Grunbaum, University of Washington, Seattle, WA (1116-52-1213)

► 9:30AM (2101) *Intersecting Polygons/Exploring Space in Medieval Islamic Architecture.*
Carol Bier, Center for Islamic Studies, Graduate Theological Union, Berkeley CA (1116-01-609)

► 10:00AM (2102) *Nizām al-Dīn 'Abd al-'Alī ibn Muhammad ibn Husain al-Bīrjandī, a 16th Century Polymath Genius.* Preliminary report.
Mohammad K. Azarian, University of Evansville (1116-01-779)

► 10:30AM (2103) *Intersecting Squares: Geometric Compositions of Square Kufic Calligraphy in Bibi Khanum Mosque, Samarkand.*
Mamoun Sakkal, Principal, Sakkal Design (1116-51-398)

► 11:00AM (2104) *Al-Kashi's Two Methods for Finding* $\sin 1^\circ$.
Glen R Van Brummelen, Quest University (1116-01-782)

AMS Special Session on Data-Intensive Modeling in Ecology

8:00 AM – 11:50 AM **Room 4C-4, Washington State Convention Center**

Organizers: **Nikolay Strigul**, Washington State University, Vancouver

Bala Krishnamoorthy, Washington State Unviersity, Vancouver

8:00AM (2105) *Image Classification of Plankton Data Using Convolutional Neural Networks.* **Chaoran Wei***, **Nadia Aly**, **Daniel McGibney** and **Daniel Vasiliu**, the College of William and Mary (1116-62-2842)

8:30AM (2106) *A data-intensive model forecasting forest response to climate-related stress.* **Jean F Liénard**, Washington State University (Vancouver), Department of Mathematics and Statistics (1116-92-2172)

9:00AM (2107) *Modelling Remote Sensing Data in Ecology.* Preliminary report. **Leslie New***, Washington State University, **Trish Miller**, **Adam Duerr**, **Melissa Braham**, West Virginia University, and **Todd Katzner**, U.S. Geological Survey (1116-62-2370)

9:30AM (2108) *Voxel-based assessment of sunlight distribution in forests using LiDAR data.* **Demetrios Gatziolis**, USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon (1116-92-2143)

10:00AM (2109) *Optimizing biodiversity in metagenomics via compressed sensing.* Preliminary report. **David Koslicki***, Oregon State University, and **Simon Foucart**, Texas A&M University (1116-92-2481)

10:30AM (2110) *Modelling spatio-temporal animal distributions using high-definition video surveys.* **C R Donovan***, **M L Mackenzie**, CREEM, School of Mathematics and Statistics, University of St Andrews, **A Webb**, HiDef Aerial Surveying, and **N B Erichson**, CREEM, School of Mathematics and Statistics, University of St Andrews (1116-62-2542)

11:00AM (2111) *Data-intensive modeling of forest dynamics using time inhomogeneous Markov chains.* **Nikolay S. Strigul**, Washington State University Vancouver (1116-92-2202)

11:30AM (2112) *The small data era of ecology.* **Timothée Poisot**, Université de Montréal (1116-92-2307)

AMS Special Session on Global Harmonic Analysis, III

8:00 AM – 11:40 AM **Room 610, Washington State Convention Center**

Organizers: **Steven Zelditch**, Northwestern University

Hart Smith, University of Washington, Seattle

Chris Sogge, Johns Hopkins University

9:00AM (2113) *Problems related to the concentration of eigenfunctions.* **Christopher Sogge**, Johns Hopkins University (1116-58-2984)

10:00AM (2114) *Universal Scaling Asymptotics for Spectral Projector of the Laplacian and Applications to Random Waves.* **Boris Hanin***, MIT, and **Yaiza Canzani**, Harvard (1116-53-1133)

11:00AM (2115) *L^2 restriction bounds for quantum ergodic eigenfunctions.* Preliminary report. **John A. Toth**, McGill University (1116-35-687)

AMS Special Session on Nonlinear Algebra, I

8:00 AM – 11:50 AM **Rooms 307/308, Washington State Convention Center**

Organizers: **Bernd Sturmfels**, University of California Berkeley

Rekha Thomas, University of Washington, Seattle

8:00AM (2116) *Spectrahedral Cones with rank 1 extreme rays.* Preliminary report. **Grigoriy Blekherman***, **Rainer Sinn**, Georgia Tech, and **Mauricio Velasco**, Universidad de los Andes (1116-14-1019)

8:30AM (2117) *A Lower Bound for the Determinantal Complexity of a Hypersurface.* **Jarod Alper**, Australian National University, Canberra, Australia, **Tristram Bogart***, Universidad de los Andes, Bogota, Colombia, and **Mauricio Velasco**, Universidad de los Andes, Colombia (1116-68-507)

9:00AM (2118) *Unitarily decomposable tensors.* **Ada Boralevi**, **Jan Draisma***, **Emil Horobeţ**, Eindhoven University of Technology, and **Elina Robeva**, University of California, Berkeley (1116-14-653)

9:30AM (2119) *Slack ideals and semidefinite representations of polytopes.* **João Gouveia**, University of Coimbra (1116-49-1959)

10:00AM ► (2120) *Tensor decomposition via numerical algebraic geometry.*
Jonathan D Hauenstein*, University of Notre Dame, **Alessandra Bernardi**, University of Bologna, **Noah S Daleo**, Worcester State University, and **Bernard Mourrain**, Inria Sophia Antipolis (1116-65-2797)

10:30AM ► (2121) *Maximum Likelihood Degree of Toric Models in Algebraic Statistics.* Preliminary report.
Serkan Hosten, San Francisco State University (1116-14-2328)

11:00AM (2122) *Rigid Multiview Varieties.*
Michael Joswig, TU Berlin, **Joe Kileel***, **Bernd Sturmfels**, UC Berkeley, and **André Wagner**, TU Berlin (1116-14-1439)

11:30AM (2123) *Orthogonally invariant matrix varieties.*
Hon-Leung Lee, University of Washington (1116-15-2029)

AMS Special Session on Nonlinear Waves and Coherent Structures

8:00 AM – 11:50 AM **Skagit 5, Skagit Lower Level, Washington State Conference Center**

Organizers: **Natalie Sheils**, University of Washington, Seattle
Chris Swierczewski, University of Washington, Seattle

8:00AM (2124) *Computing Solutions to the Kadomtsev-Petviashvili Equation.*
Christopher Swierczewski, University of Washington (1116-35-2163)

8:30AM (2125) *Initial-to-Interface Maps.*
Natalie Elizabeth Sheils, University of Minnesota (1116-35-862)

9:00AM (2126) *Water Waves: Reconstructing the Surface Elevation from Pressure Data.*
Katie Oliveras*, Seattle University, and **Vishal Vasan**, International Centre for Theoretical Sciences (ICTS) (1116-76-1297)

9:30AM ► (2127) *Nonlinear Waves Over Currents.*
Chris Curtis*, San Diego State University, **Katie Oliveras**, Seattle University, **Sam Shen** and **Theresa Morrison**, San Diego State University (1116-76-2136)

10:00AM (2128) *Comparison of Stability of Solutions to Hamiltonian Water Wave Models.*
Olga Trichtchenko*, University College London, **Bernard Deconinck**, University of Washington, and **Jean-Marc Vanden-Broeck**, University College London (1116-76-2230)

10:30AM (2129) *Analyzing the stability spectrum for elliptic solutions to the focusing NLS equation.*
Bernard Deconinck and **Benjamin Louis Segal***, University of Washington (1116-35-2769)

11:00AM (2130) *Gradient descent with nonlinear constraints: a dynamical systems approach.* Preliminary report.
Vishal Vasan, International Centre for Theoretical Sciences, Tata Institute of Fundamental Research (1116-34-1374)

11:30AM (2131) *Applications of Riemann–Hilbert problems.*
Thomas Trogdon, New York University (1116-65-1997)

AMS Special Session on Pseudorandomness and Its Applications, IV

8:00 AM – 11:40 AM **Room 606, Washington State Convention Center**

Organizers: **Timothy Gowers**, University of Cambridge
Jozsef Solymosi, University of British Columbia

8:00AM (2132) *Most trees are short and fat.*
Louigi Addario-Berry, McGill University (1116-60-1700)

8:30AM (2133) *Inverse Expander Mixing for Hypergraphs.*
Emma Cohen, School of Mathematics, Georgia Tech, **Dhruv Mubayi**, University of Illinois at Chicago, **Peter Ralli** and **Prasad V Tetali***, School of Mathematics, Georgia Tech (1116-05-2565)

9:00AM (2134) *The Structure and Chromatic Number of H-free Graphs.*
Bruce Reed, McGill University (1116-05-45)

9:30AM (2135) *Random greedy hypergraph processes.*
Tom Bohman, Carnegie Mellon University (1116-05-2488)

10:00AM ► (2136) *A different kind of pseudo.*
Boaz Barak, Microsoft Research and Harvard University (1116-68-96)

11:00AM (2137) *Sets of points with many collinear triples: a theorem and variations.*
Zeev Dvir, Princeton University (1116-05-244)

AMS Special Session on Quantum Walks, Quantum Markov Chains, Quantum Computation and Related Topics, III

8:00 AM – 11:50 AM **Room 602, Washington State Convention Center**

Organizers: **Chaobin Liu**, Bowie State University
Takyua Machida, Japan Sociey for the Promotion of Science
Salvador E. Venegas-Andraca, Technológico de Monterrey, Mexico
Nelson Petulante, Bowie State University

8:00AM ► (2138) *Continuous-time quantum walks over simply connected graphs, amplitudes and invariants.*
Phillip R. Dukes, University of Texas Rio Grande Valley (1116-81-983)

8:30AM (2139) *The discrete-time quaternionic quantum walk and the second weighted zeta function on a graph.*
Hideo Mitsuhashi*, Utsunomiya University, **Norio Konno**, Yokohama National University, and **Iwao Sato**, Oyama National College of Technology (1116-81-764)

9:00AM (2140) *Limit distribution of a quantum walk on a two-dimensional square lattice.*
Takuya Machida, Japan Society for the Promotion of Science (1116-81-262)

9:30AM ► (2141) *Talking Quantum: Prattle -> Chatter -> Ask -> Solve.*
Mark Furtney, D-Wave Systems, Inc (1116-03-1039)

10:00AM ► (2142) *Finding Substructures in Highly Symmetric Graphs Using Quantum Walks and an Efficient Technique for Creating Grover-Type Algorithms.*
Seth S Cottrell, New York, NY (1116-81-961)

10:30AM (2143) *Topological phases of a $\mathcal{PT}$ symmetric non-unitary quantum walk.*
Hideaki Obuse, Department of Applied Physics, Hokkaido University (1116-81-2181)

11:00AM ► (2144) *Formula Method for Bound State Problems.*
Babatunde J. Falaye, ESFM, Instituto Politécnico Nacional, UPALM, México D. F. 07738, México. (1116-81-979)

11:30AM (2145) *Entanglement rates for bipartite open systems.*
Anna Vershynina, Technical University of Munich, Germany (1116-81-513)

AMS Special Session on Random and Complex Dynamics of Reaction-Diffusion Systems, I

8:00 AM – 11:20 AM **Room 401, Washington State Convention Center**

Organizers: **Michael Anton Hoegele**, Universidad de Los Andes, Bogota, Colombia

Yuncheng You, University of South Florida, Tampa

8:00AM (2146) *The Enskog Process.*
Sergio Albeverio, University of Bonn, **Barbara Rüdiger**, Bergische Universität Wuppertal, and **Padmanabhan Sundar***, Louisiana State University (1116-60-927)

8:30AM (2147) *Optimal control of parabolic PDE systems modeling competitive populations.*
Suzanne Lenhart*, University of Tennessee, Math Dept, and NIMBioS, Knoxville TN, and **Kokum DeSilva**, University of Tennessee, Math Dept, Knoxville TN (1116-35-772)

9:00AM (2148) *The Slow Dynamics of Localized Spot Patterns for Reaction-Diffusion Systems on the Sphere.*
Michael J Ward*, Dept. of Mathematics, UBC, Vancouver, BC, and **Phillipe Trinh**, Oxford Center for Industrial and Applied Mathematics, Oxford University (1116-35-1107)

9:30AM (2149) *Structure of attractors for the reaction-diffusion systems in chemical and biological models.*
Junping Shi, Department of Mathematics, College of William and Mary (1116-35-820)

10:00AM (2150) *Nonlinear lower bounds for the fractional laplacian and applications.*
Michele Coti Zelati, University of Maryland (1116-35-800)

10:30AM (2151) *The dynamics of reaction-diffusion equations with heavy-tailed Lévy noise.*
Michael A. Högele*, Universidad de los Andes, **Arnaud Debussche**, EMS Rennes, France, and **Peter Imkeller**, Humboldt University Berlin (1116-60-1696)

11:00AM (2152) *Two Types of Nonlocal Diffusions and the Convergence to the Random/Normal Diffusion.*
Xiaoxia Xie*, Illinois Institute of Technology, **Wenxian Shen**, Auburn University, **Jinqiao Duan** and **Xiaofan Li**, Illinois Institute of Technology (1116-35-186)

AMS Special Session on Recent Advances in Orthogonal Polynomials and Special Functions, I

8:00 AM – 11:50 AM **Room 310, Washington State Convention Center**

Organizer: **Xiang-Sheng Wang**, Southeast Missouri State University, Cape Girardeau

8:00AM (2153) *Ladder Operators for Rationally-Extended Potentials Connected with Exceptional Orthogonal Polynomials and Superintegrability.*
Ian Marquette, The University of Queensland (1116-81-1703)

8:30AM (2154) *Expected number of real zeros of random orthogonal polynomials.*
Xiaoju Xie, Oklahoma State University (1116-00-1080)

9:00AM (2155) *Some Integrals of S. Ramanujan and S. Chowla.*
Bruce C Berndt, University of Illinois at Urbana-Champaign (1116-33-646)

10:00AM (2156) *Understanding Meijer G-functions.*
Richard Beals, Mathematics Department, Yale University (1116-33-454)

11:00AM (2157) *Asymptotic analysis of difference equations.* Preliminary report.
Xiang-Sheng Wang, Southeast Missouri State University (1116-41-2044)

11:30AM (2158) *Decay rates of energy functions for a system with memory.*
Ti-Jun Xiao, School of Mathematical Sciences, Fudan University, Shanghai 200433, P. R. China (1116-33-274)

AMS Special Session on Special Functions and q-Series, II

8:00 AM – 11:50 AM **Chelan 2, Chelan Level Two, Washington State Conference Center**

Organizers: **Richard Askey**, University of Wisconsin, Madison
Mourad E. H. Ismail, University of Central Florida and King Saud University, Riyadh
Erik Koelink, Radboud University, Nijmegen, The Netherlands

8:00AM (2159) *Discrete Macdonald–Mehta integrals.*
S Ole Warnaar, The University of Queensland (1116-33-426)

8:30AM (2160) *Transmutation operators acting on solutions of the system of pde's for Appell's hypergeometric F_2.* Preliminary report.
Tom H Koornwinder, Korteweg-de Vries Institute, University of Amsterdam (1116-33-847)

9:00AM (2161) *Orthogonal polynomials related to a ${}_2\psi_2$-summation formula.*
Wolter Groenevelt, Technische Universiteit Delft (1116-33-838)

9:30AM (2162) *The non-symmetric Wilson polynomials are the Bannai-Ito polynomials.*
Vincent X. Genest*, Massachusetts Institute of Technology, **Luc Vinet** and **Alexei Zhedanov**, Universite de Montreal (1116-33-1083)

10:00AM ► (2163) *An interesting connection between complex orthogonal polynomials and nonlinear coherent states.*
S. Twareque Ali, Concordia University, Montreal (1116-12-869)

10:30AM ► (2164) *Fundamental Laser Modes in Paraxial Optics: From Computer Algebra and Simulations to Experimental Observation.*
Christoph Koutschan, Johann Radon Institute for Computational and Applied Mathematics, Austrian Academy of Sciences, **Erwin Suazo**, School of Mathematical and Statistical Sciences, University of Texas of Rio Grande Valley, and **Sergei K. Suslov***, School of Mathematical and Statistical Sciences, Arizona State University (1116-35-1645)

11:00AM (2165) *New multivariate generalizations of Ramanujan's ${}_1\psi_1$ summation formula.*
Michael J Schlosser, University of Vienna (1116-33-1992)

11:30AM (2166) *A_n to A_m transformation formulas using Heine's method.*
Gaurav Bhatnagar, Indian Statistical Institute, Delhi Centre (1116-33-1228)

AMS Session on Algebraic Geometry

8:00 AM – 11:40 AM **Chelan 5, Chelan Level Two, Washington State Conference Center**

8:00AM (2167) *On the Geometry of Difference Painlevé Equations.*
Anton Dzhamay*, University of Northern Colorado, and **Tomoyuki Takenawa**, Tokyo University of Marine Science and Technology (1116-14-2800)

8:15AM (2168) *Polydegree Properties of Polynomial Automorphisms.*
Kaitlyn A. Perry, The University of Alabama (1116-14-254)

8:30AM (2169) *Quantum Kostka and the rank one problem for $\mathfrak{sl}_{2m}$.*
Natalie Hobson, University of Washington (1116-14-425)

8:45AM (2170) *On the categorification of Verma modules for $\mathfrak{sl}_2$.* Preliminary report.
Mee Seong Im*, United States Military Academy, and **Ben Cox**, College of Charleston (1116-14-799)

9:00AM (2171) *Modular equations for Lubin-Tate formal groups at chromatic level 2.*
Yifei Zhu, Northwestern University (1116-55-2934)

9:15AM (2172) *Species and non-commutative $\mathbb{P}^1$'s over non-algebraic bimodules.*
Daniel Chan, University of New South Wales, and **Adam Nyman***, Western Washington University (1116-14-107)

9:30AM (2173) *The moduli space of stable n-pointed genus zero curves is not a Mori dream space when n is at least 13.*
Jose Luis Gonzalez*, Yale University, and **Kalle Karu**, University of British Columbia (1116-14-512)

9:45AM (2174) *Counting Local Systems on Supersingular Abelian Varieties.* Preliminary report.
Brett Frankel, University of Pennsylvania (1116-14-796)

10:00AM ► (2175) *Nonnegative Polynomials and Sums of Squares Supported on Circuits.*
Timo de Wolff*, Texas A&M University, and **Sadik Iliman**, Goethe University (1116-14-2712)

10:15AM ► (2176) *Nullstellensatz for tropical polynomials.*
Kalina Mincheva, Johns Hopkins Universtiy (1116-14-2815)

10:30AM (2177) *The Picard groups of the stacks $Y_0(2)$ and $Y_0(3)$.*
Andrew Niles, College of the Holy Cross (1116-14-1479)

10:45AM (2178) *Derived geometric Satake equivalence, Springer correspondence, and small representations.* Preliminary report. **Jacob P. Matherne**, Louisiana State University (1116-14-2465)

11:00AM ► (2179) *Toric degenerations of incomplete flag varieties and their Schubert varieties.* **Daniel O. Chupin**, University of Texas at Austin (1116-14-2958)

11:15AM (2180) *Associated primes of local cohomology after adjoining indeterminates part 2: the general case.* Preliminary report. **Hannah Robbins**, Roanoke College (1116-13-250)

11:30AM (2181) *Associating Geometry to the Hopf Algebra $\mathcal{U}_q(\mathfrak{sl}_2)$.* Preliminary report. **Richard Gene Chandler*** and **Michaela Vancliff**, University of Texas at Arlington (1116-16-1365)

AMS Session on Combinatorics and Graph Theory, IV

8:00 AM – 11:55 AM **Room 605, Washington State Convention Center**

8:00AM (2182) *Structure and automorphisms of primitive coherent configurations.* **Xiaorui Sun**, Department of Computer Science, Columbia University, and **John Wilmes***, Department of Mathematics, University of Chicago (1116-05-701)

8:15AM (2183) *Color blind index in graphs of very low degree.* **Charles Suer**, Centre College (1116-05-2003)

8:30AM (2184) *3-connected $\{K_{1,3}, P_9\}$-free Graphs are Hamiltonian Connected.* **Qiuju Bian**, Shandong University of Technology, **Ronald J. Gould**, Emory University, **Paul Horn**, University of Denver, **Susan Janiszewski**, **Steven La Fleur**, Emory University, and **Paul Wrayno***, Christopher Newport University (1116-05-1914)

8:45AM (2185) *Trilateral matroids induced by n_3-configurations.* Preliminary report. **Michael W Raney**, Georgetown University (1116-05-1400)

9:00AM ► (2186) *Tilings by ribbon L n-ominoes, n odd.* Preliminary report. **Viorel Nitica**, West Chester University of Pennsylvania (1116-05-1709)

9:15AM ► (2187) *Covering Sets for Rectangles in the Lattice.* **William P. Noland***, North Central College, **Ethan Gegner**, Taylor University, and **Robert Winslow**, University of Kansas (1116-05-1895)

9:30AM (2188) *Matroids with many small circuits and many small cocircuits.* Preliminary report. **James Oxley**, **Simon Pfeil***, Louisiana State University, **Charles Semple**, University of Canterbury, and **Geoff Whittle**, Victoria University of Wellington (1116-05-1717)

9:45AM ► (2189) *Enumeration of Ribbon and Mobius Graphs.* **Virgil U Pierce**, University of Texas Rio Grande Valley (1116-05-1733)

10:00AM (2190) *K-theory and Monodromy of Schubert Curves.* **Maria Monks Gillespie**, University of California, Berkeley, and **Jake Levinson***, University of Michigan, Ann Arbor (1116-05-1830)

10:15AM (2191) *Ramsey numbers of trees and unicyclic graphs versus odd cycles and fans.* **Matthew S Brennan**, Massachusetts Institute of Technology (1116-05-1473)

10:30AM (2192) *Parking Functions and the Square Paths Conjecture.* Preliminary report. **Emily Sergel Leven**, UC San Diego (1116-05-1982)

10:45AM (2193) *Partitions simultaneously regular, distinct, and/or flat.* **William J Keith**, Michigan Technological University (1116-05-2146)

11:00AM ► (2194) *Self-dual embeddings of $K_{4m,4n}$ in pseudosurfaces.* **Steven Schluchter***, George Mason University, and **Justin Z Schroeder**, Mosaic Centre Radstock (1116-05-1463)

11:15AM ► (2195) *On the number of triples of points determining a pair of dot products.* **Steven Michael Senger**, Missouri State University (1116-05-1548)

11:30AM (2196) *Dense binary $PG(t-1,2)$-free matroids have critical number $t-1$ or t.* **Jonathan Tidor**, Massachusetts Institute of Technology (1116-05-1563)

11:45AM ► (2197) *Wilf's 'snake oil" method proves an identity in the Motzkin Triangle.* **Moa Apagodu***, Virginia Commonwealth University, **Doron Zeilberger**, Rutgers University, and **Tewodros Amdeberhan**, Tulane University (1116-05-760)

AMS Session on Dynamical Systems and Ergodic Theory, I

8:00 AM – 12:10 PM **Skagit 1, Skagit Lower Level, Washington State Conference Center**

8:00AM (2198) *Topological Entropy of Left-Invariant Magnetic Flows on 2-Step Nilmanifolds.* Preliminary report. **Jonathan Epstein**, Dartmouth College, Mathematics Department (1116-53-1961)

8:15AM ► (2199) *Spreading speeds and uniqueness of traveling waves for a reaction diffusion equation with spatio-temporal delays.* Preliminary report. **Z. Q. Xu***, Department of Mathematics, Shanhai Jiao Tong University, and **D. M. Xiao**, Department of Mathematics, Shanghai Jiao Tong University (1116-00-1674)

8:30AM ► (2200) *Dynamical properties of S-gap shifts and other shift spaces.* **Eugen A Ghenciu***, University of Wisconsin Stout, and **Simon Baker**, University of Manchester (1116-37-271)

8:45AM (2201) *Analysis of an Arctic sea ice loss model in the limit of a discontinuous albedo.* Preliminary report. **Kaitlin Hill***, Northwestern University, **Dorian S Abbot** and **Mary Silber**, University of Chicago (1116-37-1784)

9:00AM (2202) *Simple Smale flows with n-band templates (n=3,4).* **Kamal Mani Adhikari*** and **Michael Sullivan**, Southern Illinois University Carbondale (1116-37-1938)

9:15AM ► (2203) **The concept of the dividing surface in collinear Hydrogen exchange reaction.** Preliminary report. **Ali Allahem**, Qassim University, Saudi Arabia. (1116-37-335)

9:30AM ► (2204) *Dynamics in template and networks of complex quadratic maps.* **Anca Radulescu**, State University of New York at New Paltz (1116-37-560)

9:45AM (2205) *Existence and stability of relative equilibria with a dominant vortex.* **Alanna Hoyer-Leitzel***, Mount Holyoke College, and **Anna M. Barry**, University of British Columbia (1116-37-1401)

10:00AM (2206) *ON the Hausdorff dimension of unique Beta expansions.* Preliminary report. **Wenxia Li**, Dept. of Math., East China Normal University (1116-37-1461)

10:15AM (2207) *Stability of Broucke's Isosceles Triangle Orbit.* **Skyler C. Simmons**, Brigham Young University (1116-37-2592)

10:30AM ► (2208) *A Classification of the Local Dynamics of Some Real Analytic Nonhyperbolic Planar Maps.* **William T Jamieson**, Wheaton College (1116-39-1698)

10:45AM ► (2209) *Fractal dimensions of subfractals induced by sofic subshifts.* Preliminary report. **Elizabeth Sattler**, North Dakota State University (1116-37-1760)

11:00AM ► (2210) *No-slip Billiards in Dimension Two.* **Chris Cox***, Washington University in St. Louis, and **Renato Feres**, Washington University In St. Louis (1116-37-1797)

11:15AM (2211) *Population Models with Partial Migration.* **Anushaya Mohapatra***, **Haley Ohms**, **Dave Lytle** and **Patrick De Leenheer**, Oregon State University (1116-37-1850)

11:30AM (2212) *The Specification Property for Certain Classes of Linear Operators.* **James P Kelly**, Christopher Newport University (1116-37-2258)

11:45AM (2213) *Distributional Chaos in Dendritic and Circular Julia Sets.* **Nathan Averbeck*** and **Brian E. Raines**, Baylor University (1116-37-2084)

NOON (2214) *Lifting sublattices of attractors/repellers to the lattice of (pre-)Lyapunov functions.* **Dinesh Kasti*** and **William D Kalies**, Florida Atlantic University (1116-37-2016)

AMS Session on Ordinary Differential Equations and Special Functions, II

8:00 AM – 11:40 AM **Room 616, Washington State Convention Center**

8:00AM ► (2215) *The Multiplicity of Solutions for a Class of Fourth Order Differential Equations.* **Olivia Bennett**, **Daniel Brumley**, **Britney Hopkins**, **Kristi Karber** and **Thomas Milligan***, University of Central Oklahoma (1116-34-2349)

8:15AM (2216) *The Lyapunov-type inequality for third order and odd-order equations and application to the boundary value problems.* **Sougata Dhar*** and **Qingkai Kong**, Northern Illinois University, Dekalb, IL. (1116-34-400)

8:30AM (2217) *Quantum graph model of a graphyne and graphyne nanotubes.* **Ngoc Do*** and **Peter Kuchment**, Texas A&M University (1116-34-587)

8:45AM (2218) *Discrete Garnier Sysetms.* **Christopher M Ormerod**, California Institute of Technology (1116-39-2689)

9:00AM (2219) *Existence and Comparison Results for Fourth Order Discrete Eigenvalue Problems.* **Jeffrey T Neugebauer**, Eastern Kentucky University (1116-39-53)

9:15AM (2220) *Nonsymmetric Askey-Wilson polynomials and Q-polynomial distance-regular graphs.* **Jae-Ho Lee**, Tohoku University (1116-33-114)

9:30AM (2221) *Integral Representations and Composition of Generalized Mittag-Leffler Function.* **Harish Nagar***, Mewar University, Gangrar, Chittorgarh (Rajasthan) India, and **Alka Tank**, Mewar University (1116-33-766)

9:45AM (2222) *Integral Formulas and Generating Functions of Jacobi Polynomials.* **Dominic Lanphier**, Western Kentucky University (1116-33-1594)

10:00AM ► (2223) *Properties of the Zeros of the Generalized Basic Hypergeometric Polynomials.* Preliminary report. **Oksana Bihun**, University of Colorado, Colorado Springs (1116-33-2304)

10:15AM (2224) *Spectral Analysis of the Exceptional Hermite Polynomials.* Preliminary report. **Jessica Stewart Kelly**, Christopher Newport University (1116-33-2587)

10:30AM ► (2225) *Univalent solutions of a second order differential equation.* Preliminary report. **Mohammad Salmassi***, Framingham State University, and **Ed Merkes**, University of Cincinnati (1116-33-1641)

10:45AM (2226) *A Nonlinear Fractional Boundary Value Problem in Nabla Fractional Calculus.* **Julia St. Goar**, University of Nebraska-Lincoln (1116-39-2130)

11:00AM ► (2227) *Approximating Solutions of Boundary Value Problems.* **Hamid Semiyari**, university of Baltimore (1116-34-1364)

11:15AM (2228) *Trajectory Controllability of Nonlinear systems-An analytical and a Numerical Approach.* **Dimplekumar N Chalishajar**, Virginia Military Institute (VMI), VA (1116-34-1085)

11:30AM (2229) *Some Algebraic Considerations for P.* **G. Edgar Parker**, James Madison University (Emeritus) (1116-34-624)

AMS Session on Real and Complex Analysis, II

8:00 AM – 11:40 AM **Room 615, Washington State Convention Center**

8:15AM ► (2230) *Inequalities for entire functions of exponential type.* Preliminary report. **Tariq M Qazi**, Virginia State University (1116-41-1834)

8:30AM (2231) *Sphericity of a Real Hypersurface via Projective Geometry.* **Ilya Kossovskiy**, University of Vienna (1116-32-2220)

8:45AM (2232) *L^p estimate for a bi-parameter trilinear pseudo-differential operator.* **Guozhen Lu** and **Lu Zhang***, Department of Mathematics, Wayne State University (1116-42-463)

9:00AM ► (2233) *Can we generalize the limit-definition of the derivative?* Preliminary report. **Udita N Katugampola**, Department of Mathematical sciences, University of Delaware (1116-26-2653)

9:15AM (2234) *Foliations modeling nonrational toric varieties.* **Fiammetta Battaglia**, University of Florence (Italy), and **Dan J. Zaffran***, Florida Institute of Technology (1116-32-2279)

9:30AM ► (2235) *The Bohr radius for power series and analytic functions into wedge domains.* **Rosihan M Ali***, Universiti Sains Malaysia, **Roger W Barnard** and **Alexander Yu. Solynin**, Texas Tech University (1116-30-112)

9:45AM (2236) *Some Properties for the Generalized Struve Functions.* Preliminary report. **See Keong Lee*** and **Rosihan M. Ali**, Universiti Sains Malaysia (1116-30-554)

10:00AM (2237) *Non-Linear Extremal Problems in Bergman Spaces.* **Pritha Chakraborty*** and **Alexander Solynin**, Texas Tech University (1116-30-989)

10:15AM ► (2238) *Circle Packing Random Triangulations.* **Olivia Isabella Orrantia-Kotowski*** and **George Brock Williams**, Texas Tech University (1116-30-1764)

10:30AM (2239) *Bivariate Left Fractional Polynomial Monotone Approximation.* **George A Anastassiou**, University of Memphis (1116-41-33)

10:45AM (2240) *Vector-Valued Kernels of Bergman Type.* Preliminary report. **Jerry R. Muir, Jr.**, The University of Scranton (1116-32-2659)

11:00AM (2241) *Convex Combinations of Planar Harmonic Mappings Realized through Convolutions with Half-strip Mappings.* Preliminary report. **Stacey Muir**, The University of Scranton (1116-30-2554)

11:15AM (2242) *Arbitrary Compositions of Infinitely Many Analytic Complex Functions.* **Kourosh Tavakoli**, Oklahoma City University (1116-30-2839)

11:30AM (2243) *An L^2 Inequality for Polynomials.* **Mohammed A. Qazi**, Tuskegee University (1116-30-2874)

AMS Session on Undergraduate Research, I

8:00 AM – 11:55 AM **Chelan 4, Chelan Level Two, Washington State Conference Center**

8:00AM ► (2244) *Successfully Managing Distinct Research Projects.* Preliminary report. **James Michael Keane**, University of Central Oklahoma (1116-00-1554)

8:15AM ► (2245) *Phylogenetic Supertree Reconstruction Using Weighted Quartets.* Preliminary report. **Keertana Anandraj***, Wellesley College, and **Laura Brunner**, University of Wisconsin Stevens Point (1116-00-1536)

8:30AM ► (2246) *Soft Contact Lens Hydration Modeling.* Preliminary report. **Austin R Alderete**, George Mason University (1116-00-2623)

8:45AM (2247) *A graph theoretic approach to the inverse voter preference voter problem.* **Selene Chew**, Rochester Institute of Technology (1116-05-1384)

9:00AM ► (2248) *Distinguishing Numbers of 2-Trees.* Preliminary report. **Poppy Immel**, Rochester Institute of Technology (1116-05-288)

9:15AM ► (2249) *Minimal Length Maximal Green Sequences for Type $\mathbb{A}$ Quivers.* **Peter E. Dillery***, University of Virginia, **Emily E. Cormier**, Bowdoin College, and **John H. Whelan**, Vassar College (1116-05-399)

9:30AM ► (2250) *Classification of Spanning Trees by Isomorphism.* Preliminary report. **Andrew Meier*** and **Austin Mohr**, Nebraska Wesleyan University (1116-05-2793)

9:45AM ► (2251) *Study on Oddly Bipancyclic Graphs and Other N-Pancyclic Graphs.* **Lisa Joy Mueller***, California State University, Fullerton, **Oliver Sawin**, Rensselaer Polytechnic Institute, **WonHyuk "Harry" Choi**, Pomona College, and **Abdollah Khodkar**, University of West Georgia (1116-11-436)

10:00AM ► (2252) *On the Catenary Degree of Numerical Monoids Generated by a Generalized Arithmetic Sequence.* **Rachel Jade Domagalski***, Central Michigan University, **Dana Lacey**, North Central College, **James E. Pangelinan III**, University of Guam, and **Marly Cormar**, University of Florida (1116-11-1283)

10:15AM ► (2253) *Ranges of Divisor Functions.* **Colin Defant**, University of Florida (1116-11-803)

10:30AM ► (2254) *Edge-Magic Total Labelings.* **Lisa Joy Mueller***, California State University, Fullerton, **Kajal Chokshi**, Loyola University Chicago, **Nick Bohall**, University of Washington, **Jackie Emrich**, Loyola University Maryland, and **Abdollah Khodkar**, University of West Georgia (1116-11-435)

10:45AM ► (2255) *Homomorphic Encryption: Ring Learning With Errors.* **Tamalika Mukherjee**, Rochester Institute of Technology (1116-12-773)

11:00AM ► (2256) *Galois Groups of Degree 15 p-adic Polynomials.* **Chad Awtrey**, **Kristen Mazur**, **Sara Rodgers***, **Nicole Soltz** and **Jesi Weed**, Elon University (1116-12-557)

11:15AM ► (2257) *Degree 6 Polynomials and Their Solvability by Radicals.* **Chad Awtrey**, Elon University, **Robin French**, Williams High School, **Peter L Jakes*** and **Alan Russell**, Elon University (1116-12-561)

11:30AM ► (2258) *Determining Unique Hamiltonicity Using Gröbner Bases.* **Aaron Tyler Wagner***, Viterbo University, **Kainalu Barino**, Brigham Young University, **Monica Busser**, Youngstown State University, and **Vanessa Aguirre**, University of Hawaii - Hilo (1116-14-1011)

11:45AM ► (2259) *A taste of dual billiards.* **Abdullah Khan**, University of North Texas at Dallas (1116-53-2995)

MAA Session on Incorporating the History of Mathematics into Developmental Math Courses

8:00 AM – 11:35 AM **Yakima 2, Yakima Level One, Washington State Conference Center**

Organizers: **Van Herd**, University of Texas at Austin
Amy Shell-Gellasch, Montgomery College

8:00AM (2260) *Uncommon mathematics from Tikārām Dhañanjaya's Śiśubodha Taraṅgiṇī.* **Deepak Basyal**, University of Wisconsin-Marinette (1116-G1-1973)

8:20AM ► (2261) *Using Blood, Guts, and Gore to Keep their Interest.* **Meghan M De Witt**, St. Thomas Aquinas College (1116-G1-2375)

8:40AM ► (2262) *A comparison of the mathematics problems solved by eighteenth century United States Presidents with the problems solved by students in developmental mathematics courses in the twenty-first century.* **Ronald L Merritt**, Athens State University (1116-G1-81)

9:00AM ► (2263) *Who Invented College Algebra?* Preliminary report. **Susan L Schmoyer**, Worcester State University (1116-G1-1601)

9:20AM ► (2264) *Activities on using history of mathematics in a standard college algebra course.* **A. S. Elkhader**, Northern State University (1116-G1-167)

9:40AM ► (2265) *Experiences in Using HOM in Community College Prealgebra and Algebra Courses.* **John B. Thoo**, Yuba College, Marysville, California (1116-G1-431)

10:00AM ► (2266) *Physical models of the binomial expansion and completing the square.* **Amy Shell-Gellasch**, Montgomery College (1116-G1-77)

10:20AM ► (2267) *Why we shouldn't think we're smarter than ancient mathematicians!* Preliminary report. **Suzanne Sumner**, University of Mary Washington (1116-G1-1040)

10:40AM ► (2268) *Newton's Dark Secret: Using Historiographical Controversies to Introduce the Rudiments of Partial Differential Equations (PDE) into Developmental Mathematics Courses.* **Van A Herd**, University of Texas at Austin (1116-G1-930)

11:00AM ► (2269) *The Great Art: Cardano's "Ars Magna" in College Algebra and Precalculus.* Preliminary report. **Cynthia J. Huffman**, Pittsburg State University (1116-G1-92)

11:20AM ► (2270) *Greek Chords and Hindu Sines: teaching trigonometry with original sources.* **Daniel E. Otero**, Xavier University (OH) (1116-G1-1191)

MAA Session on Mathematical Modeling in the Undergraduate Classroom, I

8:00 AM – 11:55 AM **Room 607, Washington State Convention Center**

Organizers: **Jason Douma**, University of Souix Falls
Rachel Levy, Harvey Mudd College

8:00AM ► (2271) *Arms Races, Fair Voting, and the Bible: Examples from a Case Studies Oriented Modeling Course.*
Michael Olinick, Middlebury College (1116-K1-327)

8:20AM ► (2272) *Discrete sports modeling.*
Tim Chartier, Davidson College (1116-K1-1239)

8:40AM ► (2273) *Explore the world through Worldbank: using open data in Liberal Arts Math to explore the world's past and project future trends.*
Anna Varvak, Soka University of America (1116-K1-322)

9:00AM (2274) *Using challenge problems to motivate exploring models.* Preliminary report.
Paul T Taylor, Shippensburg University (1116-K1-829)

9:20AM ► (2275) *Mathematical Modeling and Applied Calculus.*
Joel Kilty* and **Alex M McAllister**, Centre College (1116-K1-2831)

9:40AM ► (2276) *Design and Implementation of an Undergraduate Mathematical Modeling Course with no College Prerequisites.*
Ricardo Cortez*, Tulane University, and **Cynthia O Anhalt**, University of Arizona (1116-K1-422)

10:00AM (2277) *Flexibility in a Mathematical Modeling class.*
Maeve Lewis McCarthy, Murray State University (1116-K1-920)

10:20AM ► (2278) *A Modeling Approach to Calculus: Using the framework of modeling in the motivation and development of calculus.* Preliminary report.
D. Brian Walton, James Madison University (1116-K1-2420)

10:40AM ► (2279) *Agent Based Modeling Across the Curriculum.*
Jennifer R. Galovich, College of St. Benedict/St. John's University (1116-K1-1448)

11:00AM (2280) *A Modeling Capstone Course.*
Ethan Berkove, Lafayette College (1116-K1-2273)

11:20AM ► (2281) *Offering individualized modeling experiences at a large university.* Preliminary report.
Sarah Iams* and **Margo Levine**, Harvard University (1116-K1-2538)

11:40AM ► (2282) *A National Mathematical Modeling Contest to Seed the STEM Pipeline.*
Leon H Seitelman, Lead Consultant, Moody's MegaMath Challenge, 2005-2015 (1116-K1-1945)

MAA Session on Mathematics and Sports, II

8:00 AM – 11:55 AM **Room 608, Washington State Convention Center**

Organizers: **Drew Pasteur**, College of Wooster
John David, Virginia Military Institute

9:00AM ► (2283) *Baseball as a General Education Mathematics Course.* Preliminary report.
William P Abrams, Longwood University (1116-L5-1532)

9:20AM ► (2284) *Touchdowns, 3 pointers, and Real-World Math.* Preliminary report.
Michael A Furuto, University of Hawai'i - West O'ahu (1116-L5-1934)

9:40AM ► (2285) *Win Expectation Values and Pete Carroll's Decision to Pass in Super Bowl 49.*
Andrew B Perry, Springfield College (1116-L5-1880)

10:00AM ► (2286) *The Measure of a Manager: Various Methods for Assessing the Ability of Baseball Managers.*
Thomas W Polaski* and **Alison P Tighe**, Winthrop University (1116-L5-1334)

10:20AM ► (2287) *Season-Long Batting Slumps In Major League Baseball.*
E Lee May, Salisbury University (1116-L5-1396)

10:40AM ► (2288) *The Bayesian Quarterback: A New Model for Rating NFL Quarterbacks.* Preliminary report.
Rolando Cardenas, Valle Verde Early College High School (1116-L5-2929)

11:00AM ► (2289) *How Infectious Was #Deflategate?*
Eric Eager, **Megan Eberle** and **James P Peirce***, University of Wisconsin - La Crosse (1116-L5-430)

11:20AM (2290) *Tennis Rankings over Time.*
Michael A Jones*, Mathematical Reviews/AMS, **Alexander Webb**, Macalester College, and **Jennifer Wilson**, Eugene Lang College, New School University (1116-L5-2461)

11:40AM ► (2291) *The Probability of Streaks in Sports, in Theory and in Practice.* Preliminary report.
Doug Drinen* and **Will Matson**, Sewanee: The University of the South (1116-L5-1274)

MAA Session on Revitalizing Complex Analysis

8:00 AM – 11:55 AM **Room 620, Washington State Convention Center**

Organizers: **Russell Howell**, Westmont College

Paul Zorn, St. Olaf College

Alan Noell, Oklahoma State University

9:00AM ► (2292) *Complex Arithmetic Boot Camp.* **Yves Nievergelt**, Eastern Washington University (1116-R1-149)

9:20AM ► (2293) *Advanced linear algebra: a call for the early introduction of complex numbers.* **Stephan Ramon Garcia**, Pomona College (1116-R1-224)

9:40AM ► (2294) *The Complex Moduli Project and Mathematica-Based Modules in Complex Analysis.* Preliminary report. **William M. Kinney**, Bethel University, St. Paul, MN (1116-R1-1852)

10:00AM ► (2295) *Animating maximum and minimum principles in complex analysis.* **Paul Zorn**, Saint Olaf College (1116-R1-2844)

10:20AM ► (2296) *Zeros of Trinomials: Visualization and Location.* Preliminary report. **Michael Brilleslyper*** and **Beth Schaubroeck**, U.S. Air Force Academy (1116-R1-1300)

10:40AM (2297) *Orthogonal Systems in the Euclidean and Lorentzian Complex Planes.* **Barbara A. Shipman***, University of Texas at Arlington, **Patrick D. Shipman**, Colorado State University, and **Stephen P. Shipman**, Louisiana State University (1116-R1-885)

11:00AM ► (2298) *Visualizing Complex Variable Functions with Mapping Diagrams: Linear Fractional Transformations.* Preliminary report. **Martin E Flashman**, Humboldt State University (1116-R1-498)

11:20AM ► (2299) *Planting Seeds: Complex Analysis Topics in the Calculus Sequence.* **Robert Sachs**, George Mason University (1116-R1-2494)

11:40AM ► (2300) *Rouchés Theorem: Projects and Pedagogy.* Preliminary report. **Russell W Howell**, Westmont College (1116-R1-2363)

MAA Session on the Teaching and Learning of Undergraduate Ordinary Differential Equations, III

8:00 AM – 11:55 AM **Room 617, Washington State Convention Center**

Organizers: **Christopher S. Goodrich**, Creghton Preparatory School

Beverly H. West, Cornell University

8:00AM (2301) *Software Tools That Do More with Less.* **Chris Rasmussen**, San Diego State University, and **Karen Allen Keene***, North Carolina State University (1116-S1-2394)

8:20AM (2302) *Similarities in a first differential equations course.* **Robert Sachs**, George Mason University (1116-S1-2498)

8:40AM ► (2303) *A Technical Writing Project for Differential Equations Students.* **Ben Vanderlei**, University of the Fraser Valley (1116-S1-2574)

9:00AM ► (2304) *Using symbolic ODE solvers' full potential to bring out your students' full potential.* **Itai Seggev**, Wolfram Research, Inc. (1116-S1-2713)

9:20AM ► (2305) *An Investigation Of The Effects of Different Pedagogical Practices in an Introductory Differential Equations Course On Teaching and Learning.* Preliminary report. **Ron Buckmire*** and **Treena Basu**, Occidental College (1116-S1-2721)

9:40AM ► (2306) *Road Rage and You! Exploring ODEs and Modeling through Traffic Models.* Preliminary report. **Zhengyi Zhou**, AT&T Reseaech, and **Angela Gallegos***, Loyola Marymount University (1116-S1-2728)

10:00AM (2307) *Modeling word propagation: a connection between ODE and linguistics.* Preliminary report. **Rachel L. Bayless***, Agnes Scott College, and **Rachelle C. DeCoste**, Wheaton College (MA) (1116-S1-2766)

10:20AM ► (2308) *Student discovery of selected topics in differential equations using modeling scenarios.* **Amy H Erickson*** and **Keith A Erickson**, Georgia Gwinnett College (1116-S1-2791)

10:40AM ► (2309) *A New Perspective on Variation of Parameters.* **Douglas B Meade***, University of South Carolina, and **William E Boyce**, Rennselear Polytechnic Institute (1116-S1-2840)

11:00AM ► (2310) *Introducing Laplace Transforms early in an applied Differential Equations course.* **Paul D. Olson**, Penn State Erie , the Behrend College (1116-S1-2876)

11:20AM Final Discussion

MAA General Contributed Paper Session on Algebra, II

8:00 AM – 11:10 AM **Room 212, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University

Bem Cayco, San Jose State University

Timothy Comar, Benedictine University

T. James Reid, University of Mississippi

8:15AM (2311) ► *On Nonnil-S-Noetherian rings.* Preliminary report.
Minjae Kwon* and **Jung Wook Lim**, Kyungpook National University (1116-VA-2239)

8:30AM (2312) *The category of graded modules of a generalized Weyl algebra.* Preliminary report.
Robert J Won, University of California, San Diego (1116-VA-2032)

8:45AM (2313) *The Lie Algebra Associated to the Filtration of $SL_n(R)$ by Congruence Subgroups.*
Jonathan E Lopez, Canisius College (1116-VA-2371)

9:00AM (2314) *Classifying the Fine Structures of Involutions Acting on Root Systems.*
Samuel Ivy, United State Military Academy (1116-VA-2768)

9:15AM (2315) *Complete classification of connected prime-cube dimensional Hopf algebras.* Preliminary report.
Van C. Nguyen*, Northeastern University, **Linhong Wang**, University of Pittsburgh, and **Xingting Wang**, Temple University (1116-VA-2818)

9:30AM (2316) *Arithmetic Differential Subgroups of Gl_n.*
Alfonso E Heras-Llanos, University of New Mexico (1116-VA-2882)

9:45AM (2317) *Finitely Constrained Groups Having Almost Maximal Hausdorff Dimension.*
Andrew Penland, Western Carolina University (1116-VA-2909)

10:00AM (2318) *The lattice of ideals of a nilpotent Leibniz algebra.*
Austin H Jones, North Carolina State University (1116-VA-2935)

10:15AM (2319) *Green Rings of Pointed, Coserial Hopf Algebras.* Preliminary report.
Kevin Gerstle, University of Iowa (1116-VA-297)

10:30AM (2320) *Rank 2 geometries as right regular bands.*
Francis Pastijn, Marquette University, and **Justin Albert***, Carthage College (1116-VA-842)

10:45AM (2321) *A Visualization of Quillen Stratification.* Preliminary report.
Jared Warner, City University New York Guttman Community College (1116-VA-938)

11:00AM (2322) *Groupoids with root systems in real vector spaces.*
Timothy D. Ferdinands, Mercer University (1116-VA-949)

MAA General Contributed Paper Session on Applied Mathematics, IV

8:00 AM – 11:10 AM **Room 214, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

8:15AM (2323) ► *Stability for Perturbations of a Steady State at the One Dimensional Case.*
Xinyao Yang, University of Missouri (1116-VC-2885)

8:30AM (2324) *Master Stability Islands for Oscillation Death in Networks of Delay-Coupled Oscillators.*
Stanley R Huddy*, Fairleigh Dickinson University, and **Jie Sun**, Clarkson University (1116-VC-2916)

8:45AM (2325) *A Mathematical Model for the Propagation of an Animal Species on a Plain.*
J. N. Ndam* and **S. Dung**, University of Jos (1116-VC-347)

9:00AM (2326) *On the Convergence of Adaptive Random Search Methods for Constrained and Multi-Objective Black-Box Optimization.* Preliminary report.
Rommel G Regis, Saint Joseph's University, Department of Mathematics (1116-VC-2879)

9:15AM (2327) ► *A Computational Model for PTSD and Cognitive Function.* Preliminary report.
Pengcheng Xiao*, Department of Mathematics, University of Evansville, and **Jianzhong Su**, Department of Mathematics, The University of Texas at Arlington (1116-VC-477)

9:30AM (2328) *Reynolds' Space Average.*
Nicholas C. Jacob, East Central University (1116-VC-478)

9:45AM (2329) *Fractional Brownian Motion and Managing Risk in Long-Term Hedging with Short-term Futures Contracts.*
Wei Cui*, The University of Alabama, and **Zhijian Wu**, The University of Nevada, Las Vegas (1116-VC-546)

10:00AM (2330) *Identification of Parameters in Mathematical Biology.* Preliminary report.
Roby R Poteau* and **Ugur G. Abdulla**, Florida Institute of Technology (1116-VC-563)

10:15AM (2331) *Applications of the partial Wiener-Hopf factorization in Dynamic Fracture Machanics.*
Aleksandr Smirnov, Louisiana State University (1116-VC-633)

10:30AM (2332) ► *Comparison of Numerical Solutions of Black-Scholes Option Pricing Model.*
Ayush L Joshi*, **Gokul R Kadel** and **Narayan Thapa**, Cameron University, Lawton, Oklahoma (1116-VC-654)

10:45AM (2333) ► *Maximizing Guaranteed Value in a Fair Division of a Cake under Piecewise-Linear Valuations.*
Brandon S Payne* and **James R Dover**, Cameron University (1116-VC-655)

11:00AM ► (2334) *Tuberculosis(TB) Disease Modeling in the US.*
Ellie Mainou*, Smith College, **Chenyue Lu** and **Olivia Justynski**, Mount Holyoke College (1116-VC-997)

MAA General Contributed Paper Session on Probability and Statistics, III

8:00 AM – 11:25 AM **Room 213, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

8:15AM (2335) *Some Statistical Tools for Data in Hilbert Spaces.* Preliminary report.
Krishna Kaphle, University of Maine at Fort Kent (1116-VP-2463)

8:30AM (2336) *Rooted triplets in species tree inference: some new results on construction and application.*
Jeffrey B Gaither, Mathematical Biosciences Institute (1116-VP-2579)

8:45AM Discussion

8:45AM (2337) *A Prediction-Based Time Series Clustering of Brain Cancer Mortality Rates in The United States.*
Doo Young Kim* and **Chris P. Tsokos**, University of South Florida (1116-VP-2353)

9:00AM (2338) *Clarifications and Caveats on Data Cloning.*
Brian R Zaharatos, University of Colorado Boulder (1116-VP-2651)

9:15AM ► (2339) *Semiparametric models for financial volatility.* Preliminary report.
Steve S. Chung*, Department of Mathematics, California State University, Fresno, and **Xu-Feng Niu**, Department of Statistics, Florida State University (1116-VP-2693)

9:30AM (2340) *Building Large Financial and Economic Networks.*
Toyin O Alli, The University of Alabama (1116-VP-284)

9:45AM (2341) *A Method for Selecting the Relevant Dimensions for Text Classification in Singular Vector Spaces.*
Dawit G Tadesse*, University of Cincinnati, and **Mark Carpenter**, Auburn University (1116-VP-364)

10:00AM (2342) *Adaptive Lasso for Linear Mixed Model Selection via Profile Log-Likelihood.*
Juming Pan, Bowling Green State University, OH, USA. (1116-VP-37)

10:15AM ► (2343) *Best linear invariant estimators using both double ranked set sampling and a modified double ranked set sampling procedures.*
Qasim M Al-Shboul*, Zayed University, and **Elies Kouider**, Ferris State University (1116-VP-389)

10:30AM (2344) *Can one make a laser out of cardboard?*
Tvrtko Tadić, University of Zagreb, Zagreb, Croatia (1116-VP-402)

10:45AM ► (2345) *Stability of a $\mathbb{C}^2$-valued Coupled System.*
Fan Ny Shum, University of Connecticut (1116-VP-568)

11:00AM ► (2346) *A Semi-Parametric Approach to Hypothesis Testing for Hormesis.*
Steven B Kim, California State University Monterey Bay (1116-VP-879)

11:15AM (2347) *Empirical non-coverage rate in interval estimation of expected response in ZIM regression.*
Khyam Paneru, University of Wisconsin-Whitewater (1116-VP-971)

MAA General Contributed Paper Session on Topology

8:00 AM – 11:10 AM **Room 303, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

8:00AM ► (2348) *Volume and Determinant Densities of Hyperbolic Rational Links.*
Mia C Smith, Williams College SMALL REU (1116-VU-1638)

8:15AM (2349) *Classification of Dessins D'Enfants of the Completely Reducible Trigonal Curves.*
Mehmet Emin Aktas, Florida State University (1116-VU-1716)

8:30AM (2350) *New Knot Invariants in an Expansion of the Colored Jones Polynomial.*
A. Overbay* and **K. Van Dinh**, Austin College (1116-VU-1848)

8:45AM (2351) *Some nontrivial model categories with trivial associated stable categories.*
Deborah Vicinsky, Wabash College (1116-VU-1924)

9:00AM (2352) *The Image of the Witten Genus.*
John E Mosley, University of Kentucky (1116-VU-2125)

9:15AM (2353) *P-spaces and intermediate rings of continuous functions.*
Will Murray, **Joshua Sack*** and **Saleem Watson**, California State University, Long Beach (1116-VU-2142)

9:30AM ► (2354) *The Applications of Region Almost Alternating Knots.*
Colin Murphy*, Seattle University, **McKenna Renn**, University of Washington, **Ra'Jene Martin**, Denison University, and **Jennifer Townsend**, Bellevue College (1116-VU-2206)

9:45AM ► (2355) *Rational knots and their canonical triangulations.*
Dean Matthew Menezes, University of Texas at Austin (1116-VU-2240)

10:00AM ► (2356) *Dijkgraaf-Witten Type Invariants of Seifert Surfaces in 3-Manifolds.* Preliminary report.
Ik Jae Lee*, Rowan University, and **David N Yetter**, Kansas State University (1116-VU-2584)

10:15AM (2357) *Pseudometrizability in the Class of Essentially Hausdorff Spaces.*
Gangadhar R Hiremath, University of North Carolina Pembroke (1116-VU-2859)

10:30AM (2358) *Determining Sliceness in 5-Stranded Pretzel Knots: The Single-Pair Case.*
Kathryn Bryant, Bryn Mawr College (1116-VU-302)

10:45AM ► (2359) *A New Characterization of Clopen Sets.* Preliminary report.
Jay Stine, Misericordia University (1116-VU-536)

11:00AM ► (2360) *Selective strong screenability and a game.*
Liljana Babinkostova* and **Marion Scheepers**, Boise State University (1116-VU-828)

SIAM Minisymposium on Graphical Models for High Dimensional Data

8:00 AM – 11:55 AM **Room 3A, Washington State Convention Center**

Organizer: **Andrea Bertozzi**, University of California, Los Angeles

8:00AM (2361) *Geometric graph-based methods for high dimensional data.*
Andrea Bertozzi, UCLA (1116-49-2632)

8:55AM (2362) *Modified Cheeger and Ratio Cut Methods Using the Ginzburg-Landau Functional for Classification of High-Dimensional Data.*
Ekaterina Merkurjev, University of California, San Diego (1116-49-2128)

9:25AM ► (2363) *Exploitation of Graphical Models to Guide Deep Representations.* Preliminary report.
Arjuna Flenner, NAVAIR (1116-49-2078)

10:00AM ► (2364) *Functional connectomics from data: Constructing probabilistic graphical models for neuronal networks.*
Eli Shlizerman, University of Washington (1116-37-1906)

10:30AM ► (2365) *A Dirichlet energy criterion for graph partitioning and image segmentation.*
Dominique Zosso*, UCLA Department of Mathematics, **Braxton Osting**, University of Utah, Department of Mathematics, and **Stanley J. Osher**, UCLA Department of Mathematics (1116-49-1560)

11:00AM (2366) *Convergence Analysis of the Graph Allen-Cahn Scheme.*
Xiyang Luo* and **Andrea L Bertozzi**, Department of Mathematics, UCLA (1116-00-1518)

11:30AM ► (2367) *Nonlocal Total Variation with Primal-Dual Algorithm for Unsupervised Hyperspectral Imagery Analysis.* Preliminary report.
Wei Zhu, UCLA, **Victoria Chayes**, Bard College, **Alexandre Tiard**, Grenoble Institute of Technology, **Stephanie Sanchez**, UCLA, **Devin Dahlberg**, University of California, San Diego, **Da Kuang***, **Andrea Bertozzi**, **Stanley Osher** and **Dominique Zosso**, UCLA (1116-65-1417)

AWM Workshop: Special Session on Algebraic Combinatorics, I

8:00 AM – 10:55 AM **Room 4C-3, Washington State Convention Center**

Organizers: **Gizem Karaali**, Pomona College
Rosa Orellana, Dartmouth College

8:00AM (2368) *On Demazure Crystals for the Quantum Affine Algebra* $U_q\left(\hat{sl}(n)\right)$.
Margaret L. Rahmoeller, Roanoke College (1116-08-234)

8:30AM (2369) *Demazure Flags, Chebyshev Polynomials, Mock and Partial Theta Functions.*
Rekha Biswal, The Institute of Mathematical Sciences, Chennai, India, **Vyjayanthi Chari**, University of California, Riverside, **Lisa Schneider***, Susquehanna University, and **Sankaran Viswanath**, The Institute of Mathematical Sciences, Chennai, India (1116-05-221)

9:00AM (2370) *From the weak Bruhat order to crystal graphs as posets.*
Patricia Hersh*, North Carolina State University, and **Cristian Lenart**, SUNY Albany (1116-05-1386)

9:30AM (2371) *Parking Functions, Sandpiles, and Gessel's Fundamental Basis.*
Angela S Hicks, Stanford University (1116-05-900)

10:00AM ► (2372) *Walking on Representation Graphs and Generalized Hyperbolic Functions.*
Georgia Benkart, University of Wisconsin-Madison (1116-05-1120)

10:30AM (2373) *A Random Walk on* S_n *generated by Random Involutions.*
Megan M Bernstein, Georgia Institute of Technology (1116-05-730)

Project NExT Workshop

8:00 AM – 6:00 PM **Room 4C-2, Washington State Convention Center**

MAA Special Presentation for High School Teachers and Students: How to Think Brilliantly and Creatively in Mathematics,a Guide for K-12 Educators and Their Students.

8:00 AM – 8:50 AM **Room 612, Washington State Convention Center**

Organizer: **Deanna Haunsperger**, Carleton College

2374—Tanton, J.— How to think brilliantly and creatively in mathematics, a guide for K-12 educators and their students.—
James Tanton, Mathematical Association of America (1116-A0-2992)

MAA Session on Inquiry-Based Teaching and Learning, IV

8:20 AM – 10:55 AM **Room 619, Washington State Convention Center**

Organizers: **Brian Katz**, Augustana College
Victor Piercey, Ferris State University

8:20AM ► (2375) *Integrating Complex Instruction to Promote Engagement in Developmental and Liberal Arts Mathematics Courses Through Groupwork.* Preliminary report. **Belin Manuel Tsinnajinnie**, Institute of American Indian Arts (1116-J5-2954)

8:40AM ► (2376) *Student mathematical connections in an inquiry-oriented introductory linear algebra class.* Preliminary report. **Spencer Payton**, Washington State University (1116-J5-2387)

9:00AM ► (2377) *Learning to Ask Questions: A Matrix Project.* Preliminary report. **Pamela Pierce*** and **Jim Hartman**, The College of Wooster (1116-J5-2497)

9:20AM ► (2378) *Introduction to Proofs in Topology and Geometry Using IBL.* Preliminary report. **David H Crombecque**, University of Southern California (1116-J5-2475)

9:40AM ► (2379) *"Build a City..." - exploring ratio and density through an urban planning board game.* Preliminary report. **Forest Fisher** and **Jared Warner***, Guttman Community College (1116-J5-1330)

10:00AM ► (2380) *Writing Original Problems in Calculus Classes.* **Vincent J. Matsko**, University of San Francisco (1116-J5-1770)

10:20AM (2381) *A Mathematical Easter Egg Hunt in IBL Proofs Course.* Preliminary report. **Audrey Malagon**, Virginia Wesleyan College (1116-J5-908)

10:40AM (2382) *Guided Inquiry in Calculus II.* Preliminary report. **Vesta Coufal**, Gonzaga U. (1116-J5-1813)

Project NExT Session

8:30 AM – 9:45 AM **Room 4C-2, Washington State Convention Center**

The early (post-PhD) years: An interactive survival guide.

AMS Invited Address

9:00 AM – 9:50 AM **Ballroom 6BC, Washington State Convention Center**

(2383) *Ancient solutions to parabolic partial differential equations.* **Panagiota Daskalopoulos**, Columbia University (1116-35-712)

ASL Invited Address

9:00 AM – 9:50 AM **Room 4C-1, Washington State Convention Center**

(2384) *Interpretations of topological spaces.* **Jindrich Zapletal**, University of Florida (1116-03-239)

MAA Minicourse #6: Part B

9:00 AM – 11:00 AM **Tahoma 5, Tahoma Level Three, Washington State Conference Center**

Getting started in the scholarship of teaching and learning.

Presenters: **Jackqueline M. Dewar**, Loyola Marymount University
Curtis D. Bennett, Loyola Marymount University

MAA Minicourse #14: Part B

9:00 AM – 11:00 AM **Metropolitan B, 3rd Floor, Sheraton Seattle Hotel**

Teaching quantitative reasoning with common sense and common knowledge.

Presenters: **Maura B. Mast**, University of Massachusetts Boston
Ethan D. Bolker, University of Massachusetts Boston

MAA Session on Mathematics and the Arts, III

9:00 AM – 11:55 AM **Room 2B, Washington State Convention Center**

Organizer: **Douglas Norton**, Villanova University

9:00AM ► (2385) *Exploration of Quotient Spaces and Group Actions with Application to Visualizing Music.* **Srividhya Balaji**, University of Oklahoma (1116-K6-644)

9:20AM ► (2386) *Pythagoras to Secor: a Mathematical Approach to Musical Temperament.*
Anil Venkatesh, Ferris State University (1116-K5-371)

9:40AM ► (2387) *Music Synthesis from Controlled Chaos.*
Matthew A Morena*, Young Harris College, and **Kevin M Short**, University of New Hampshire (1116-K5-2870)

10:00AM ► (2388) *Dynamic Chaos Game.*
L. Kerry Mitchell, Phoenix, Arizona (1116-K5-579)

10:20AM ► (2389) *Half a Menger Sponge is Better than the Whole.*
Ethan Berkove, Lafayette College (1116-K5-2276)

10:40AM ► (2390) *Drawing and Discrete Mathematics.*
Paul R McCreary and **Peter Boome***, The Evergreen State College -Tacoma (1116-K5-548)

11:00AM ► (2391) *Bit-wise Artwork.*
Susan McBurney, Western Springs, IL (1116-K6-1404)

11:20AM ► (2392) *Thinking Outside the Torus: Geometric explorations in bead crochet.*
Susan Goldstine, St. Mary's College of Maryland (1116-K5-2174)

11:40AM ► (2393) *The perspective image(s) of a square.*
Annalisa Crannell*, Franklin & Marshall College, **Marc Frantz**, Indiana University, and **Fumiko Futamura**, Southwestern University (1116-K5-1732)

MAA Committee on the Undergraduate Program in Mathematics (CUPM) and MAA Committee on Professional Development Panel Discussion

9:00 AM – 10:20 AM **Room 609, Washington State Convention Center**

Starting a new track: actuarial science, biomathematics, environmental science, climate studies.

Organizers: **Julie Barnes**, Western Carolina University
Martha Siegel, Towson University
Linda McGuire, Muhlenberg College

Panelists: **Jim Daniel**, University of Texas at Austin
Tim Comar, Benedictine University
Ben Galluzzo, Shippensburg University

NAM Panel Discussion

9:00 AM – 9:50 AM **Room 211, Washington State Convention Center**

Work hard, play hard: balancing career, hobbies, and family.

Moderator: **Duane Cooper**, Morehouse College

Panelists: **Ron Buckmire**, Occidental College
Emille Davie Lawrence, University of San Francisco
Robin Wilson, California State Polytechnic University
Mariel Vazquez, University of California at Davis

Student Hospitality/Information Center

9:00 AM – 3:00 AM **Skybridge, 4th Floor, Washington State Convention Center**

Exhibits and Book Sales

9:00 AM – NOON **Hall 4A, 4th Floor, Washington State Convention Center**

Employment Center

9:00 AM – NOON **Hall 4B, 4th Floor, Washington State Convention Center**

Special Presentation for High School Teachers and Students

9:15 AM – 10:45 AM **Room 612, Washington State Convention Center**

High school quadratics, how to think about and do everything about them brilliantly and creatively.

Organizer: **Deanna Haunsperger**, Carleton College

MAA Session on Graduate Students Teach Too: Ideas and Best Practices, I

9:40 AM – 11:55 AM **Room 304, Washington State Convention Center**

Organizer: **Samuel L. Tunstall**, Appalachian State University

9:40AM ► (2394) *Graduate Student Teacher Training and Support at Clemson.*
Meredith Burr, Clemson University (1116-F1-2637)

10:00AM ► (2395) *Curriculum development for the California Alliance for Minority Participation Summer Science Academy.*
Timmy Ma, University of California, Irvine (1116-F1-1195)

10:20AM ► (2396) *Graduate Student-Driven Development and Delivery of a GTA Training and Mentoring Program.*
Carrie Diaz Eaton, Unity College, **Ashley Rand***, Bethany Lutheran College, and **Eleanor Abernethy**, University of Tennessee (1116-F1-2426)

10:40AM ► (2397) *A framework for a graduate student teacher mentoring program.*
Emily Laura Braley, Duke University (1116-F1-2390)

11:00AM (2398) *Preparing our future colleagues: A report on the national landscape of graduate student instructor professional development programs.* Preliminary report.
Jess Ellis*, Colorado State University, **Natasha Speer**, University of Maine, and **Jack Bookman**, Duke University
(1116-F1-2352)

11:20AM (2399) *Instructional Supports for Graduate Teaching Assistant at the University of Nebraska-Lincoln.*
Nathan Wakefield* and **Allan Donsig**, University of Nebraska-Lincoln
(1116-F1-2030)

11:40AM ► (2400) *Utilizing a Teaching Symposium as a First Step in GTA Teacher Preparation.* Preliminary report.
RaKissa Manzanares* and **Gary Olson**, University of Colorado Denver
(1116-F1-1545)

ASL Invited Address

10:00 AM – 10:50 AM **Room 4C-1, Washington State Convention Center**

(2401) *Inner topological Ramsey spaces.*
Natasha Dobrinen, University of Denver
(1116-00-68)

MAA Minicourse #15: Part B

10:00 AM – NOON **Metropolitan A, 3rd Floor, Sheraton Seattle Hotel**

Teaching statistics using R and R Studio.

Presenter: **Randall Pruim**, Calvin College

NAM Business Meeting

10:00 AM – 10:50 AM **Room 211, Washington State Convention Center**

MAA Poster Session

10:00 AM – 11:55 AM **Skybridge, 4th Floor, Washington State Convention Center**

Me and My Gadgets—Teaching with Technology.

Organizers: **Tom Hagedorn**, The College of New Jersey

Karl Schmitt, Valparaiso University

Michael Scott, California State University, Monterey Bay

John Travis, Mississippi College

MAA Invited Address

10:05 AM – 10:55 AM **Ballroom 6BC, Washington State Convention Center**

(2402) *A mathematical tour through a collapsing world.*
Charles R. Hadlock, Bentley University
(1116-A0-21)

MAA Committee on the Undergraduate Program in Mathematics Panel Discussion

10:35 AM – 11:55 AM **Room 609, Washington State Convention Center**

What's beyond the curriculum?

Organizer: **Martha Siegel**, Towson University

ASL Invited Address

11:00 AM – 11:50 AM **Room 4C-1, Washington State Convention Center**

(2403) *Ramsey properties in topological dynamics.*
Dana Bartosova, Instituto de Matematica e Estatistica, Universidade de Sao Paulo
(1116-03-69)

SIGMAA on Math Circles for Students and Teachers(SIGMAA MCST) Special Presentation

11:00 AM – 11:50 AM **Room 612, Washington State Convention Center**

Math Circle Demonstration

MAA Business Meeting

11:10 AM – 11:40 AM **Ballroom 6BC, Washington State Convention Center**

AMS Business Meeting

11:45 AM – 12:15 PM **Ballroom 6BC, Washington State Convention Center**

NAM Claytor-Woodard Lecture

1:00 PM – 1:50 PM **Room 211, Washington State Convention Center**

(2404) *Analysis on non-smooth domains.*
Tatiana Toro, University of Washington
(1116-35-2830)

AMS-MAA-SIAM Special Session on Research in Mathematics by Undergraduates and Students in Post-Baccalaureate Programs, IV

1:00 PM – 5:50 PM **Tahoma 3, Tahoma Level Three, Washington State Conference Center**

Organizers: **Darren A. Narayan**, Rochester Institute of Technology

Jobby Jacob, Rochester Institute of Technology

Tamas Forgacs, California State University, Fresno

Ugur Abdulla, Florida Institute of Technology

1:00PM ► (2405) *Centrality Properties of Graphs with an Application of Functional Connectivity of the Brain.* Preliminary report. **Roger Vargas***, Williams College, **Abigail Waldron**, Presbyterian College, and **Anika Sharma**, University of Buffalo (1116-05-133)

1:30PM ► (2406) *Rankings of Cartesian Product* $(K_s - e)\Box P_n$. Preliminary report. **Kelsey Quigley***, Nazareth College, and **Sarah Renfro**, Sam Houston State University (1116-05-134)

2:00PM ► (2407) *Zarankiewicz and Bipartite Ramsey Numbers.* Preliminary report. **Alexander Neal Riasanovsky***, University of Pennsylvania, and **John Wallace**, Trinity College (1116-05-135)

2:30PM ► (2408) *The Resolution Limit for Detecting Communities in Benchmark Graphs.* Preliminary report. **Sonica Saraf***, Carnegie Mellon University, and **Natalie Wellen**, Worcester Polytechnic Institute (1116-05-151)

3:00PM ► (2409) *Inducing Alternans in Cardiac Models using Delay Differential Equations.* Preliminary report. **Justin Eastman***, Millersville University, and **Julian Sass**, University of Maryland, Baltimore County (1116-37-158)

3:30PM ► (2410) *A Generalization of Mordell to Ternary Quadratic Forms.* **Sarah Blackwell**, Saint Louis University, **Gabriel Durham**, University of Georgia, **Katherine Thompson**, Davidson College, and **Tiffany Treece***, University of Georgia (1116-11-143)

4:00PM ► (2411) *The density of primes dividing a certain non-linear recurrence sequence.* **Alexi Block Gorman**, Wellesley College, **Tyler Genao**, Florida Atlantic University, **Heesu Hwang**, Princeton University, **Noam Kantor***, Emory University, **Sarah Parsons** and **Jeremy Rouse**, Wake Forest University (1116-11-144)

4:30PM ► (2412) *An Economic-Epidemiological Model with Personal Vaccination Efficacy Memory.* **Fiona Zhang**, Hamilton High School, Chandler, Arizona, **Benjamin Morin***, Arizona State University, **Eli Fenichel**, Yale, and **Gerardo Chowell**, Atlanta, Georgia (1116-92-170)

5:00PM ► (2413) *Detecting Foot-Chases from Police Body-Worn Video.* **Qi Yang***, University of Southern California, **Alejandro Camacho**, California State University, Fullerton, **Piyali Mukherjee**, Columbia University, New York, and **Rafael Aguayo**, University of California, San Diego (1116-90-200)

5:30PM ► (2414) *Development of Clustering Algorithms for Ensemble Weather Forecasts.* **Ranil Weerackoon***, University of Nebraska, Lincoln, and **Michelle Hartono**, San Jose State University (1116-62-232)

AMS-ASL Special Session on Applications of Logic, Model Theory, and Theoretical Computer Science to Systems Biology

1:00 PM – 5:40 PM **Room 602, Washington State Convention Center**

Organizers: **James Lynch**, Clarkson University

Leo Marcus, Santa Monica, CA

1:00PM ► (2415) *Many-sorted first-order model theory as a conceptual framework for complex dynamical systems.* Preliminary report. **Solomon Feferman**, Stanford University (1116-03-1664)

2:00PM (2416) *Neural Algebra and Modelling.* **Erwin - Engeler**, ETH Zurich (1116-03-469)

3:00PM (2417) *Dependence logic and biology.* **Jouko A Vaananen**, Department of Mathematics and Statistics, University of Helsinki, Finland (1116-03-791)

4:00PM ► (2418) *Probabilistic Boolean Networks as Models of Gene Regulatory Networks.* **Ilya Shmulevich**, Institute for Systems Biology (1116-92-279)

5:00PM (2419) *Datum Logic: A Formal Executable Semantics for Experimental Evidence.* **Carolyn L Talcott**, SRI International (1116-92-1302)

AMS-AWM Special Session on Commutative Algebra and Its Interactions with Algebraic Geometry, II

1:00 PM – 5:20 PM **Room 603, Washington State Convention Center**

Organizers: **Daniel Hernández**, University of Utah

Jack Jeffries, University of Michigan, Ann Arbor

Karl Schwede, University of Utah

1:00PM (2420) *Morita Equivalence Revisited.* **Paul Frank Baum**, Penn State (1116-16-674)

1:30PM (2421) *Centers of endomorphism rings of modules.* **Haydee M Lindo**, The University of Utah and Williams college (1116-13-2407)

2:00PM (2422) *Generalized Associated Primes and Depth in the Perfect Closure.* Preliminary report. **George E Whelan**, George Mason University (1116-13-2486)

2:30PM (2423) *Finite F-type and F-abundant Modules.* **Hailong Dao** and **Tony Se***, University of Kansas (1116-13-897)

3:00PM (2424) *An optimal upper bound on the regularity of powers of edge ideals.* **Ali Alilooee***, Western Illinois University, **Arindam Banerjee**, Purdue University, **Selvi Beyarslan** and **Huy Tai Ha**, Tulane University (1116-13-1079)

3:30PM (2425) *A McKay correspondence for reflection groups.* Preliminary report. **Ragnar-Olaf Buchweitz**, University of Toronto Scarborough, **Eleonore M Faber***, University of Michigan, and **Colin Ingalls**, University of New Brunswick (1116-14-1953)

4:00PM (2426) *Resolution of singularities: new invariants in positive characteristic.* **Angelica Benito***, Instituto de Ciencias Matemáticas (ICMAT), and **Orlando E. Villamayor U.**, Universidad Autónoma de Madrid (1116-14-903)

► 4:30PM (2427) *Lower bound cluster algebras: presentation and properties.* **Greg Muller***, **Jenna Rajchgot**, University of Michigan, and **Bradley Zykoski**, University of Virginia (1116-13-2489)

► 5:00PM (2428) *Notched Arcs of Cluster Algebras from Punctured Surfaces.* Preliminary report. **Emily Gunawan**, University of Minnesota (1116-08-2411)

AMS-AAAS Special Session on Applied and Computational Topology, II

1:00 PM – 5:50 PM **Room 201, Washington State Convention Center**

Organizers: **Pawel Dlotko**, INRIA Saclay, France

Nicholas Scoville, Ursinus College

Matthew Wright, IMA University of Minnesota

► 1:00PM (2429) *The shape of data.* **Jose Perea**, Michigan State University (1116-55-123)

1:30PM (2430) *Analysis of cancer genomics data using computational topology: applications to breast cancer.* **Javier Arsuaga***, **Georgina Gonzalez**, University of California, Davis, and **Sergio Ardanza-Trevijano**, Universidad de Navarra (1116-92-1790)

► 2:00PM (2431) *Classification of breast cancer subtypes using signaling pathways and persistence homology.* **Mimi Tsuruga***, **Javier Arsuaga**, UC Davis, **Michael Steiner**, San Francisco State University, and **Nils Baas**, Norwegian University of Science and Technology (1116-92-1868)

2:30PM (2432) *A space of phylogenetic networks.* Preliminary report. **Satyan L Devadoss***, Williams College; Harvey Mudd College, and **Samantha Petti**, Georgia Tech (1116-52-168)

► 3:00PM (2433) *Combinatorial invariants for directed graphs with applications to neuroscience.* **Martina Scolamiero**, Ecole Polytechnique Federale de Lausanne (1116-55-1344)

► 3:30PM (2434) *Formal Perspectives on Hierarchical Networks.* **Sophie Raynor**, University of Aberdeen, UK (1116-55-1110)

► 4:00PM (2435) *Persistence Images: An Alternative Persistent Homology Representation.* **Lori Beth Ziegelmeier**, Macalester College (1116-55-1165)

► 4:30PM (2436) *Interactive Visualization of 2-D Persistent Homology.* **Michael Lesnick***, Columbia University, and **Matthew L. Wright**, St. Olaf College (1116-55-950)

5:00PM (2437) *A Morse-theoretic algorithm to compute persistent homology, with generators.* **Gregory Henselman**, University of Pennsylvania (1116-55-2262)

► 5:30PM (2438) *Multiscale persistence.* Preliminary report. **Greg Bell***, **Austin Lawson**, **Joshua Martin**, **James Rudzinski** and **Clifford Smyth**, University of North Carolina at Greensboro (1116-55-1754)

AMS Special Session on Advances in the Theory and Application of Reaction Diffusion Models

1:00 PM – 5:50 PM **Skagit 5, Skagit Lower Level, Washington State Conference Center**

Organizers: **Jerome Goddard, II**, Auburn University, Montgomery

Ratnasingham Shivaji, University of North Carolina, Greensboro

► 1:00PM (2439) *On the quasiconvergence property of solutions of parabolic equations on the real line.* **Peter Polacik**, University of Minnesota (1116-35-1946)

1:30PM (2440) *Existence of positive radial solutions for superlinear, semipositone problems on the exterior of a ball.* **R. Dhanya**, Universidad de Concepcion, **Quinn Morris*** and **R. Shivaji**, University of North Carolina at Greensboro (1116-35-2583)

2:00PM (2441) *Modeling the effects of U-shaped density dependent dispersal via reaction diffusion equations.* **Jerome Goddard II***, Auburn University Montgomery, and **R. Shivaji**, University of North Carolina Greensboro (1116-35-1766)

2:30PM (2442) *Existence and uniqueness of similarity solutions of a generalized heat equation arising in a model of cell migration.* **Tracy L. Stepien*** and **Hal L. Smith**, Arizona State University (1116-35-635)

3:00PM (2443) *A Two-Species Competition System with Slow Diffusion.* Preliminary report. **Georg Hetzer***, Auburn University, and **Lourdes Tello**, Universidad Politecnica de Madrid (1116-35-2014)

► 3:30PM (2444) *A priori estimates for positive solutions to second order elliptic boundary problems.* Preliminary report. **Alfonso Castro***, Harvey Mudd College, and **Rosa Pardo**, Universidad Complutense de Madrid (1116-35-1811)

4:00PM (2445) *Elliptic systems with exponential growth in dimension two.* **Maya Chhetri***, UNC Greensboro, and **Petr Girg**, University of West Bohemia (1116-35-1894)

4:30PM (2446) *Asymptotic Behavior of Solutions to Neutral and Delay Functional Differential Equations.* Preliminary report. **M. N. Nkashama**, University of Alabama at Birmingham (1116-39-2790)

5:00PM (2447) *Bifurcation and multiplicity of strong solutions for elliptic equations with nonlinear boundary conditions.* **N. Mavinga***, Swarthmore College, PA, and **M. Nkashama**, University of Alabama at Birmingham (1116-35-1974)

5:30PM (2448) *Eigencurves and Resonance.* **Stephen B Robinson*** and **Mauricio Rivas**, Wake Forest University (1116-35-1792)

AMS Special Session on Analytic Methods in Geometry

1:00 PM – 5:50 PM **Room 610, Washington State Convention Center**

Organizers: **Eric Bahuaud**, Seattle University

Dylan Helliwell, Seattle University

1:00PM (2449) *Can you hear the metric on a sphere?* **Emily B. Dryden***, Bucknell University, **Diana Macedo** and **Rosa Sena-Dias**, Instituto Superior Tecnico (1116-58-1628)

1:30PM (2450) *On the spectral geometry of orbifolds.* Preliminary report. **Elizabeth Stanhope**, Lewis & Clark College (1116-53-2191)

► 2:00PM (2451) *Canonical metrics on the Pentachoron.* **Andrea Young**, Ripon College (1116-52-1726)

2:30PM Discussion.

3:00PM (2452) *Lagrangian mean curvature flow, the Maslov class, and special lagrangians.* **Andrew A Cooper**, North Carolina State University (1116-53-1636)

3:30PM (2453) *Lower semicontinuity of the ADM mass.* **Jeffrey L Jauregui**, Union College (1116-53-1134)

4:00PM (2454) *Elliptic problems and weakly asymptotically hyperbolic manifolds.* **Paul T Allen***, Lewis & Clark College, **James Isenberg**, University of Oregon, **John M. Lee**, University of Washington, and **Iva Stavrov Allen**, Lewis & Clark College (1116-53-1006)

4:30PM Discussion.

5:00PM (2455) *Analytic torsion: generalized metric invariance.* **Phillip Andreae**, Duke University (1116-58-1882)

5:30PM (2456) *Totally geodesic maps into manifolds with no focal points.* **James Dibble**, Western Illinois University (1116-53-2047)

AMS Special Session on Current Areas of Interest in the Mathematical Sciences of Medieval Islam, II

1:00 PM – 4:40 PM **Skagit 3, Skagit Lower Level, Washington State Conference Center**

Organizers: **Mohammad K. Azarian**, University of Evansville

Mohammad Javaheri, Siena College

Emelie A. Kenney, Siena College

► 1:00PM (2457) *Geometric Techniques in Medieval Islamic Art and Architecture: From Strapwork Ornamentation to Quasicrystal Constructions.* Preliminary report. **Raymond Tennant**, Paris Sorbonne University Abu Dhabi (1116-01-1223)

► 1:30PM (2458) *Creating Medieval Islamic Ornamentation.* Preliminary report. **B Lynn Bodner**, Mathematics Department Monmouth University (1116-01-1993)

► 2:00PM (2459) *The Legacy of Al-Kashi: Why does it matter in the 21st century?* **Nuh Aydin***, Kenyon College, and **Lakhdar Hammoudi**, Ohio University-Chillicothe (1116-01-375)

► 2:30PM (2460) *Mathematics in the Medieval Islamic West: Its Relationship to Hebrew and Latin Mathematics.* Preliminary report. **Victor J. Katz**, University of the District of Columbia (1116-01-1327)

► 3:00PM (2461) *Modern math in medieval islamic architectural tilings.* **Peter J Lu**, Department of Physics, Harvard University, Cambridge MA 02138 USA (1116-01-1677)

► 4:00PM (2462) *The Arabic redaction of Euclid's Elements by al-Ṭūsī.* **Gregg De Young**, The American University in Cairo (1116-01-318)

AMS Special Session on Distribution of Zeros of Entire Functions

1:00 PM – 5:50 PM **Room 400, Washington State Convention Center**

Organizers: **Matthew Chasse**, Rochester Institute of Technology
Tamás Forgács, California State University, Fresno
Andrzej Piotrowski, University of Alaska Southeast, Juneau

1:00PM (2463) *Multiplier Sequences for the Legendre Polynomial Basis.* Preliminary report. **Matthew Chasse**, Rochester Institute of Technology, **Tamás Forgács**, California State University, Fresno, and **Andrzej Piotrowski***, University of Alaska Southeast (1116-30-2819)

1:30PM (2464) *Operator Diagonalizations of Multiplier Sequences.* **Robert D. Bates**, University of Hawaii at Manoa (1116-30-597)

2:00PM (2465) *On stability preserving properties of coefficient-wise transformations.* Preliminary report. **Lukasz Grabarek**, Matanuska-Susitna College (1116-30-2227)

► 2:30PM (2466) *Level curves of real algebraic functions and theorem of Pólya.* Preliminary report. **Stephanie Edwards***, **Sarah Hilsman** and **Anna Snyder**, Hope College (1116-30-852)

3:00PM (2467) *Zeros of finite differences of polynomials and entire functions.* **Mikhail Tyaglov***, Shanghai Jiao Tong University, **Olga Katkova**, Wheelock College, **Anna Vishnyakova**, V.N. Karazin Kharkov National University, and **Jiacheng Xia**, Shanghai Jiao Tong University (1116-30-28)

3:30PM (2468) *Majorization and the Zeros of Entire Functions.* Preliminary report. **Rajesh Pereira**, Department of Mathematics and Statistics, University of Guelph (1116-30-819)

► 4:00PM (2469) *Seperation of the zeros of q-Eulerian polynomials.* **Mirkó Visontai***, Google Inc., **Petter Brändén**, KTH (Royal Institute of Technology), Stockholm, and **Matthew Chasse**, Washington, DC (1116-05-2767)

4:30PM (2470) *Zero distribution of sequences of polynomials.* **Khang D Tran**, California State University, Fresno (1116-30-948)

5:00PM (2471) *Complex zero strip decreasing operators.* **David Alan Cardon**, Brigham Young University (1116-30-780)

5:30PM (2472) *Recent progress on the question of whether rapidly decreasing sequences are complex zero decreasing sequences.* Preliminary report. **Thomas Craven**, University of Hawaii (1116-30-1888)

AMS Special Session on Graph Products

1:00 PM – 5:50 PM **Room 204, Washington State Convention Center**

Organizers: **Richard Hammack**, Virginia Commonwealth University
Dewey Taylor, Virginia Commonwealth University

1:00PM (2473) *Symmetry Parameters for Lexicographic Graph Products.* Preliminary report. **Debra L Boutin**, Hamilton College (1116-05-1230)

1:30PM (2474) *Tiling the hypercube.* Preliminary report. **Jerrold R Griggs**, University of South Carolina, **Kevin G Milans**, West Virginia University, **David Offner***, Westminster College, and **David Stoner**, Harvard University (1116-05-1459)

► 2:00PM (2475) *Cycle bases of reduced powers of graphs.* Preliminary report. **Richard H Hammack**, Virginia Commonwealth University, and **Gregory Douglas Smith***, The College of William & Mary (1116-60-1611)

2:30PM (2476) *Products of almost locally finite graphs.* **Richard Hammack**, Virginia Commonwealth University, Richmond, VA, and **Wilfried Imrich***, Montanuniversitaet Leoben, Austria (1116-05-1137)

3:30PM (2477) *Identifying codes in the Cartesian product of a graph and K_2.* **Douglas Rall**, Furman University, and **Kirsti Wash***, Trinity College (1116-05-894)

4:00PM (2478) *Partitioning the vertex set of G to make $G\Box H$ an efficient open domination graph.* **Iztok Peterin**, University of Maribor, **Douglas Rall***, Furman University, **Tadeja Kraner Šumenjak** and **Aleksandra Tepeh**, University of Maribor (1116-05-667)

► 4:30PM (2479) *Edge-transitive products.* **Richard H. Hammack***, Virginia Commonwealth University, **Wilfried Imrich**, Montanuniversität Leoben, Leoben, Austria, and **Sandi Klavžar**, University of Ljubljana, Slovenia (1116-05-1625)

► 5:00PM (2480) *Graham's Pebbling Conjecture.* **Glenn Hurlbert**, Virginia Commonwealth University (1116-05-1567)

► 5:30PM (2481) *Odd dominating sets in the direct and strong products.* **Dewey Taylor***, Virginia Commonwealth University, and **Christopher Whisenant**, South University (1116-05-2469)

AMS Special Session on Mathematical Programming on Integral Invexity

1:00 PM – 5:50 PM **Skagit 4, Skagit Lower Level, Washington State Conference Center**

Organizers: **Ram Verma**, Texas State University, San Marcos
Alexander Zaslavski, Israel Institute of Technology

1:00PM (2482) *Variational gradients in function spaces.* **M. Zuhair Nashed**, University of Central Florida (1116-49-2910)

1:30PM (2483) *Mathematical Programming Based on Sufficient Optimality Conditions and Second Order Invex Functions.* **Ram N. Moahpatra***, University of Central Florida, and **Ram U. Verma**, University of North Texas, Denton (1116-90-2946)

► 2:00PM (2484) *A generalized relaxed positive-definite and skew-Hermitian splitting preconditioner for non-Hermitian saddle point problems.* Preliminary report. **Hongtao Fan**, Department of Mathematics, Lanzhou University, Lanzhou, Gansu, P. R. China, and **Xinyun Zhu***, Department of Mathematics, University of Texas of the Permian Basin, Odessa, TX, 79762 (1116-65-330)

2:30PM (2485) *Lp Approximation with Rates by Multivariate Generalized Discrete Singular Operators.* **George A Anastassiou** and **Merve Kester***, University of Memphis (1116-41-31)

3:00PM (2486) *On an alternating direction method for solving a weighted low-rank approximation problem.* Preliminary report. **Xin Li**, University of Central Florida (1116-90-2967)

► 3:30PM (2487) *Optimal Strategies in a Quantum Three-Player Dilemma Game.* **Aden O Ahmed**, Texas A&M University - Kingsville (1116-49-967)

4:00PM (2488) *The Aesthetic of Circulant Unistochastic Eigenpaths.* Preliminary report. **Aaron Carl Smith**, University of Central Florida (1116-15-1704)

► 4:30PM (2489) *Minmax Fractional Integral Programming Problems on Univexities.* Preliminary report. **Ram Verma**, University of North Texas (1116-90-569)

5:00PM (2490) *Spectral properties of discrete Strum-Liouville equation with quadratic Eigenparameter in boundry condition.* **Turhan Koprubasi**, University of Central Florida, Kastamonu University (1116-39-1855)

5:30PM (2491) *Approximate solutions of common fixed point problems.* **Alexander J Zaslavski**, Technion-Israel Institute of Technology (1116-90-520)

AMS Special Session on Moduli Spaces in Algebraic Geometry, II

1:00 PM – 5:40 PM **Room 604, Washington State Convention Center**

Organizer: **Yaim Cooper**, Harvard University

1:00PM (2492) *Extremality of Weierstrass points on genus-two curves.* **Dawei Chen**, Boston College, and **Nicola Tarasca***, University of Utah (1116-14-1519)

2:00PM (2493) *Lines on Elliptic Calabi-Yau Threefolds.* Preliminary report. **Francois Greer**, Stanford University (1116-14-2772)

3:00PM (2494) *On rationalizing divisors.* **Lorenzo Prelli**, University of Washington (1116-14-1529)

4:00PM (2495) *A moduli space of points in affine space as a Chow quotient.* **Noah Giansiracusa*** and **Patricio Gallardo**, University of Georgia (1116-14-1202)

5:00PM (2496) *Deriving the Grothendieck ring of varieties.* **Inna I Zakharevich**, University of Chicago (1116-14-1803)

AMS Special Session on Nonlinear Algebra, II

1:00 PM – 5:50 PM **Rooms 307/308, Washington State Convention Center**

Organizers: **Bernd Sturmfels**, University of California Berkeley
Rekha Thomas, University of Washington, Seattle

1:00PM (2497) *Structural Identifiability of Biological Models.* **Nicolette Meshkat***, Santa Clara University, and **Seth Sullivant**, North Carolina State University (1116-92-2123)

1:30PM (2498) *Symmetry and Turán Sums of Squares.* **Annie Raymond***, University of Washington, **Mohit Singh**, Microsoft Research, and **Rekha Thomas**, University of Washington (1116-05-686)

2:00PM (2499) *Matrix geometric means and semidefinite optimization.* **James Saunderson***, University of Washington, and **Hamza Fawzi**, Massachusetts Institute of Technology (1116-90-1320)

2:30PM (2500) *Eigenconfigurations of Tensors.* **Anna L Seigal**, University of California, Berkeley (1116-15-602)

3:00PM (2501) *Real Rank with Respect to Varieties.* **Rainer Sinn*** and **Grigoriy Blekherman**, Georgia Institute of Technology (1116-15-643)

3:30PM ► (2502) *Algebraic signatures of convex and non-convex neural codes.*
Carina Curto, Pennsylvania State University, **Elizabeth Gross**, San Jose State University, **Jack Jeffries**, University of Michigan, **Katherine Morrison**, University of Northern Colorado, **Mohamed Omar**, Harvey Mudd College, **Zvi Rosen**, Pennsylvania State University, **Anne Shiu***, Texas A&M University, and **Nora Youngs**, Harvey Mudd College (1116-92-679)

4:00PM (2503) *Combinatorial properties of hierarchical models.*
Daniel Irving Bernstein and **Seth Sullivant***, North Carolina State University (1116-05-975)

4:30PM (2504) *Computing the Riemann Constant Vector.*
Christopher Swierczewski, University of Washington (1116-14-2164)

5:00PM (2505) *Do generic polynomials generate a prime ideal?*
Josephine Yu, Georgia Institute of Technology (1116-13-1217)

5:30PM (2506) *Reciprocal linear spaces and their Chow forms.*
Mario Kummer, Universitat Konstanz, and **Cynthia Vinzant***, NC State (1116-14-1607)

AMS Special Session on Number Theory and Cryptography, III

1:00 PM – 5:50 PM **Room 606, Washington State Convention Center**

Organizers: **Matilde Lalin**, University of Montreal
Michelle Manes, University of Hawaii, Honolulu
Christelle Vincent, University of Vermont

1:00PM (2507) *Kernels of Eisenstein ideals.*
Kenneth A. Ribet, UC Berkeley (1116-11-1530)

1:30PM (2508) *Constructing Abelian Surfaces via Rosenhain Invariants.*
Craig Costello, Microsoft Reasearch, **Alyson Deines***, Center for Communications Research, **Kristin Lauter**, Microsoft Research, and **Tonghai Yang**, University of Wisconsin-Madison (1116-11-682)

2:00PM ► (2509) *Key Recovery for LWE in Polynomial Time.*
Kim Laine* and **Kristin Lauter**, Microsoft Research, Redmond (1116-11-1407)

2:30PM ► (2510) *Attacks on search-RLWE.*
Hao Chen*, University of Washington, **Kristin Lauter**, Microsoft Research, and **Katherine E Stange**, University of Colorado, Boulder (1116-11-729)

3:00PM (2511) *Class numbers of algebraic function fields, or Jacobians of curves over finite fields.*
Anastassia Etropolski, Emory University (1116-11-1111)

3:30PM (2512) *The arithmetic of a non-abelian cover of an elliptic curve.* Preliminary report.
Rachel Davis* and **Edray Herber Goins**, Purdue University (1116-11-1763)

4:00PM (2513) *The Brauer-Manin obstruction and surfaces.*
Mckenzie West, Emory University (1116-11-1025)

4:30PM (2514) *Integral Brauer-Manin obstruction for generalized affine Châtelet surfaces.* Preliminary report.
Jennifer Berg, University of Texas at Austin (1116-11-2066)

5:00PM (2515) *Uniform bounds on Brauer classes of certain K3 surfaces.* Preliminary report.
Anthony Várilly-Alvarado, Rice University, and **Bianca Viray***, University of Washington (1116-11-2184)

5:30PM (2516) *p-adic heights on elliptic curves over number fields.*
Jennifer S. Balakrishnan, University of Oxford (1116-11-1441)

AMS Special Session on Problems and Challenges in Financial Engineering and Risk Management, II

1:00 PM – 5:50 PM **Chelan 2, Chelan Level Two, Washington State Conference Center**

Organizers: **Matthew Lorig**, University of Washington, Seattle
Haijun Li, Washington State University, Pullman
Hong-Ming Yin, Washington State University, Pullman

1:00PM (2517) *Measures of Systemic Risk.*
Birgit Rudloff*, Vienna University of Economics and Business, **Zachary Feinstein**, Washington University in St. Louis, and **Stefan Weber**, Leibniz University Hannover (1116-91-1018)

1:30PM (2518) *Numerical Simulation for a Nonlinear American Option-Pricing Model.* Preliminary report.
Wen Wang*, Bellevue College, Washington, **Hong-Ming Yin**, Washington State University, and **Wenhan Wang**, Microsoft Corporation (1116-65-272)

2:00PM (2519) *Bond and CDS Pricing with Stochastic Recovery.*
Albert Cohen*, Michigan State University, and **Nick Costanzino**, RiskLab - University of Toronto & AIG Investments (NYC) (1116-91-1187)

2:30PM (2520) *Analytical Expansion to Forward-Backward Stochastic Differential Equations.*
Jerome Detemple, Boston University, Questrom School of Business, **Matthew Lorig**, University of Washington at Seattle, Department of Applied Mathematics, **Marcel Rindisbacher**, Boston University, Questrom School of Business, **Stephan Sturm**, WPI, Department of Mathematical Sciences, and **Liangliang Zhang***, Boston University, Questrom School of Business (1116-65-562)

3:00PM Discussion.

3:30PM (2521) *A Simulation Measure Approach to Monte Carlo Methods in Credit Risk.*
Alexander D Shkolnik*, UC Berkeley, and **Kay Giesecke**, Stanford University (1116-60-2698)

4:00PM (2522) *Rationalizing Behavioral Portfolio Choice.* Preliminary report.
Carole Bernard, Grenoble Ecole de Management, and **Stephan Sturm***, Worcester Polytechnic Institute (1116-91-184)

4:30PM (2523) *Small-Time Asymptotics for At-The-Money Option Prices Under Exponential Lévy Models.*
José Enrique Figueroa-López, Washington University in St. Louis, **Ruoting Gong***, Illinois Institute of Technology, and **Christian Houdré**, Georgia Institute of Technology (1116-60-401)

► 5:00PM (2524) *On the Boundedness Character of the First Order System of Rational Difference Equations with Nonconstant Coefficients.*
Deja R Washington, Xavier University of Louisiana (1116-39-2704)

► 5:30PM (2525) *Panel Discussion for Problems and Challenges in Financial Engineering and Risk Management.* Preliminary report.
Hong-Ming Yin, Washington State University (1116-35-706)

AMS Special Session on Random and Complex Dynamics of Reaction-Diffusion Systems, II

1:00 PM – 3:50 PM **Room 401, Washington State Convention Center**

Organizers: **Michael Anton Hoegele**, Universidad de Los Andes, Bogota, Colombia
Yuncheng You, University of South Florida, Tampa

1:00PM (2526) *Continuous Data Assimilation with Stochastically Noisy Data.*
Hakima Bessaih, University of Wyoming, Department of Mathematics (1116-60-2017)

1:30PM (2527) *On a class of stochastic transport equations for L2loc vector fields.*
Ennio Fedrizzi, University of Lyon, **Wladimir Neves**, University of Rio de Janeiro, and **Christian Olivera***, IMECC-UNICAMP (1116-60-1148)

► 2:00PM (2528) *Asymptotic dynamics of some microscopic heat conduction models.*
Yao Li*, University of Massachusetts Amherst, and **Lai-Sang Young**, Courant Institute, New York University (1116-60-1440)

2:30PM (2529) *Random Attractors of Stochastic Reaction-Diffusion Systems.*
Yuncheng You, University of South Florida (1116-35-2359)

► 3:00PM (2530) *Modeling of Pattern Formation in Vapor-to-Particle Reactions.*
Bahaudin A Hashmi, Colorado State University (1116-35-2366)

3:30PM (2531) *Multiplicity of positive solutions for one-dimensional p-Laplacian with weight functions.*
Inbo Sim, Department of Mathematics, University of Ulsan (1116-34-2569)

AMS Special Session on Recent Advances in Orthogonal Polynomials and Special Functions, II

1:00 PM – 5:50 PM **Room 310, Washington State Convention Center**

Organizer: **Xiang-Sheng Wang**, Southeast Missouri State University, Cape Girardeau

1:00PM (2532) *Uniform asymptotics of orthogonal polynomials arising from coherent states.*
Dan Dai, Department of Mathematics, City University of Hong Kong, Hong Kong (1116-33-582)

2:00PM (2533) *Asymptotics of Racah polynomials.* Preliminary report.
Roderick Sue Cheun Wong*, City University of Hong Kong, and **Xiang-Sheng Wang**, Southeast Missouri State University (1116-33-1108)

► 3:00PM (2534) *Classes of bivariate orthogonal polynomials.*
Mourad E. H. Ismail*, King Saud U, Saudi Arabia and U Central Florida, USA., and **Ruiming Zhang**, College of Science, Northwest A&F University (1116-33-642)

4:00PM (2535) *A Refinement of the Alladi-Schur Theorem.*
George E Andrews, Pennsylvania State University (1116-05-573)

► 5:00PM (2536) *Asymptotic Estimation of the Andrews Zagier $G_k(q)$ function and its connection to the Wright's Generalized Hyper geometric function.* Preliminary report.
Daniel Timothy Parry, University of Cologne (1116-05-2743)

5:30PM (2537) *Relations among weighted power means functions.*
Jin Liang, Department of Mathematics, Shanghai Jiao Tong University, Shanghai 200240, P. R. China (1116-33-273)

AMS Special Session on Stochastic Effects in Models for Mathematical Biology and Ecology

1:00 PM – 5:50 PM **Room 4C-4, Washington State Convention Center**

Organizers: **Olcay Akman**, Illinois State University
Timothy D. Comar, Benedictine University
Daniel Hrozencik, Chicago State University

► 1:00PM (2538) *Stochastic models of evidence accumulation in changing environments.*
Zachary P Kilpatrick*, **Kresimir Josic**, University of Houston, and **Alan Veliz-Cuba**, University of Dayton (1116-60-1058)

► 1:30PM (2539) *Outbreak of waterfowl disease in the Upper Mississippi River: Analysis of a stochastic temperature-driven model.* Preliminary report.
James P Peirce*, **Greg Sandland**, University of Wisconsin - La Crosse, and **Mary O'Driscoll**, Iowa State University (1116-92-1153)

2:00PM (2540) *Stochastic Gating in a Peripheral Auditory Neuron: Effects on Post Stimulus Time and Firing Efficiency of Action Potentials.*
Rebecca E Gasper, Creighton University (1116-92-2668)

► 2:30PM (2541) *Stochastic Integral Projection Models: Construction, Simulation and Analysis.*
Eric Alan Eager, University of Wisconsin - La Crosse (1116-92-1135)

► 3:00PM (2542) *Long-term survival and chaotic dynamics in population models.* Preliminary report.
Elena Dimitrova* and **Sherli Koshy**, Clemson University (1116-34-1779)

► 3:30PM (2543) *Computing Intensive Methods in ODE Modeling.*
Olcay Akman, Illinois State University (1116-92-1126)

4:00PM (2544) *Structural Identifiability Issues of Epidemic Models.*
Necibe Tuncer, Florida Atlantic University, and **Trang Le***, University of Tulsa (1116-65-58)

4:30PM (2545) *Sensitivity Analysis and the Probability of Pest Eradication or Permanence in a Stochastic Model for Integrated Pest Management.*
Timothy D Comar*, Benedictine University, **Olcay Akman**, Illinois State University, and **Daniel Hrozencik**, Chicago State University (1116-92-1246)

5:00PM (2546) *Computing Sensitivities in Discrete Stochastic Reaction Networks with Delay.* Preliminary report.
Elizabeth Skubak Wolf, Saint Mary's College (1116-60-1589)

► 5:30PM (2547) *When Genes Fail: Modeling Stochasticity in Gene Regulatory Networks.*
Dan Hrozencik, Chicago State University (1116-60-1073)

MAA Minicourse #10: Part B

1:00 PM – 3:00 PM **Tahoma 5, Tahoma Level Three, Washington State Conference Center**

Directing undergraduate research.
Presenter: **Aparna Higgins**, University of Dayton

MAA Minicourse #13: Part B

1:00 PM – 3:00 PM **Metropolitan B, 3rd Floor, Sheraton Seattle Hotel**

Introduction to process-oriented, guided-inquiry learning (POGIL) in mathematics courses.
Presenters: **Zdeňka Guadarrama**, Rockhurst University
Jill E. Guerra, University of Arkansas Fort Smith
Laurie Lenz, Mayrmount University

MAA Minicourse #7: Part B

1:00 PM – 3:00 PM **Metropolitan A, 3rd Floor, Sheraton Seattle Hotel**

Making sense of calculus with mapping diagrams.
Presenter: **Martin Flashman**, Humboldt State University

AMS Session on Combinatorics and Graph Theory, V

1:00 PM – 5:25 PM **Room 605, Washington State Convention Center**

1:00PM (2548) *A note on the independent domination number versus domination number.* Preliminary report.
Shaohui Wang* and **Bing Wei**, University of Mississippi (1116-05-849)

► 1:15PM (2549) *Overlap cycles of* $\binom{[n]}{k}$.
Thomas Grubb, Michigan State University, **Kyutae Paul Han***, Dartmouth College, and **Victoria Horan**, Air Force Research Laboratory (1116-05-1066)

► 1:30PM (2550) *Minimum vertex degree thresholds for tiling complete 3-partite 3-uniform hypergraphs.*
J. Han, University of Sao Paulo, **C. Zang*** and **Y. Zhao**, Georgia State University (1116-05-1099)

1:45PM (2551) *Toric g-Vectors of Convex Polytopes from Gale Diagrams.* Preliminary report.
Carl W. Lee and **Sarah A. Nelson***, University of Kentucky (1116-52-206)

2:00PM (2552) *Temporal Graph Theory and Functional Connectivity in the Human Brain.* Preliminary report.
Darren A Narayan*, Rochester Institute of Technology, and **Roger Vargas**, Williams College (1116-05-963)

2:15PM (2553) *Square-root cancellation for the signs of Latin squares (i.e., why the Alon-Tarsi conjecture is hard).*
Levent Alpoge, Princeton University (1116-05-1140)

2:30PM (2554) *Even $(\bar{s}, \bar{t})$-core partitions and self-associate characters of $\tilde{S}_n$.*
Calvin Deng, Harvard University (1116-05-1252)

2:45PM (2555) *The Saxl Conjecture for Fourth Powers via the Semigroup Property.*
Sammy Y Luo* and **Mark A Sellke**, Massachusetts Institute of Technology (1116-05-1402)

3:00PM (2556) *Unipancylic Matroids.*
Alana Huszar, The College of New Jersey, **Colin Starr**, Willamette University, **Christina Wahl**, State University of New York Potsdam, and **Corrine Yap***, Sarah Lawrence College (1116-05-1446)

3:15PM (2557) *Large Hamiltonian Balanced Bipartite Graphs with Arbitrary Partitions.*
Alexander Halperin*, Salisbury University, and **Colton Magnant**, Georgia Southern University (1116-05-506)

3:30PM (2558) *A Bound for the Laplacian Spectra of Simplicial Complexes.*
Rediet Abebe, Cornell University (1116-05-2804)

3:45PM (2559) *Topological Combinatorics via Finite Fourier Analysis.*
Steven Simon, Wellesley College (1116-05-529)

4:00PM (2560) *The well-covered dimension of generalized quadrangles.* Preliminary report.
Oscar Vega* and **Hillary Bese**, California State University, Fresno (1116-05-1584)

4:15PM (2561) *Combinatorial Interpretations of Generalized Central Factorial and Genocchi Numbers.*
Feryal Alayont, Grand Valley State University (1116-05-444)

4:30PM (2562) *Properties of Generalized de Bruijn Digraphs.* Preliminary report.
Abbas Mahdi Alhakim, American University of Beirut (1116-68-2635)

4:45PM (2563) *Computing the delta set of a numerical monoid.*
Thomas Barron, University of Kentucky, **Christopher ONeill***, Texas A&M University, and **Roberto Pelayo**, University of Hawaii at Hilo (1116-05-2502)

5:00PM (2564) *Bipartite Communities.*
Kelly Yancey, University of Maryland, and **Matthew Yancey***, Institute for Defense Analyses / Center for Computer Science (1116-05-2288)

5:15PM (2565) *30,000 Conjectures on Pattern-Avoidance.*
William Kuszmaul, Stanford (1116-05-1662)

AMS Session on Dynamical Systems and Ergodic Theory, II

1:00 PM – 4:40 PM **Skagit 1, Skagit Lower Level, Washington State Conference Center**

1:00PM (2566) *Invariant measures on set-valued functions with the specification property.* Preliminary report.
Tim Tennant*, **Brian Raines**, Baylor University, and **Johnathan Meddaugh**, University of Birmingham (1116-37-2081)

1:15PM (2567) *Structure of Rigidity Sequences for Substitution Dynamical Systems.* Preliminary report.
Kelly B. Yancey*, University of Maryland, and **Jon Fickenscher**, Princeton University (1116-37-2025)

1:30PM (2568) *Calculating Veech Groups of Translation Surfaces.* Preliminary report.
Brandon Edwards, Oregon State University (1116-37-2501)

1:45PM (2569) *Constructing Ergodic Families of Combinatorially Obtained Minimal Cantor Sets.*
Erin Denette* and **Araceli Bonifant**, University of Rhode Island (1116-37-1814)

2:00PM (2570) *Taylor series, and hybrid functions approximations for dynamical systems.*
Mohsen Razzaghi, Mississippi State University (1116-41-630)

2:15PM (2571) *Persistent Homology of Dynamical Systems on Networks.*
Rachel Neville, Colorado State University (1116-37-2552)

2:30PM (2572) *Constructing embedded surfaces with Anosov geodesic flows.* Preliminary report.
Victor Donnay, Bryn Mawr College, and **Daniel Visscher***, University of Michigan (1116-37-2576)

2:45PM (2573) *Elliptic islands and ergodicity of a family of moon-shaped billiard tables.*
Maria F. Correia*, University of Evora, Portugal, and **Hongkun Zhang**, Umass Amhrest (1116-37-2705)

3:00PM (2574) *Existence and uniqueness of solutions to the inverse problem for linear dynamical systems with uncertain data.* Preliminary report.
Shelby R. Stanhope*, **David Swigon** and **Jonathan Rubin**, University of Pittsburgh (1116-34-1854)

3:15PM (2575) *Entropy, Hausdorff Dimension and Immersed Surfaces in Hyperbolic 3-Manifolds.*
Lien-Yung Kao, University of Notre Dame (1116-37-1535)

3:30PM (2576) *Existence and Nonexistence of Traveling Pulses in a Lateral Inhibition Neural Network.*
Yixin Guo, Drexel University, and **Aijun Zhang***, University of Arkansas (1116-37-1497)

► 3:45PM (2577) *Negative Refraction and Tiling Billiards.*
Diana Davis, Northwestern University (1116-37-2924)

► 4:00PM (2578) *On the Fine Classification of Periodic Orbits of the Continuous Endomorphisms on the Real Line and Universality in Chaos.*
U. G. Abdulla, Florida Institute of Technology, **Rashad U Abdulla**, University of Pennsylvania, **Muhammad U Abdulla**, Melbourne, FL, **Alyssa Turnquist**, Morningside College, and **Naveed H Iqbal***, Florida Institute Of Technology (1116-39-970)

► 4:15PM (2579) *Survey of Input-independent Model Reduction Techniques for Nonlinear Dynamical Systems.*
Alan M Lattimer, Virginia Tech (1116-41-2013)

► 4:30PM (2580) *Unexpected distribution phenomenon resulting from Cantor series expansions.*
Dylan Airey*, University of Texas at Austin, and **Bill Mance**, Institute of Mathematics Polish Academy of Sciences (1116-11-1209)

AMS Session on Mathematics Education

1:00 PM – 4:55 PM **Room 615, Washington State Convention Center**

► 1:30PM (2581) *How to better prepare secondary mathematics teachers for graduate mathematics courses.* Preliminary report.
Xin Li, University of Central Florida (1116-00-2932)

► 1:45PM (2582) *The Influence of Language in the Students' Reasoning.* Preliminary report.
Paula Rangel, Rio de Janeiro, Brazil (1116-03-260)

► 2:00PM (2583) *Using item analysis of assessment instruments to enhance instruction, learning, and student achievement: The case of Numbers and Operations Course.*
Zephyrinus C Okonkwo* and **Anilkumar Devarapu**, Albany State University (1116-97-2922)

► 2:15PM (2584) *Rewarding commitment and community-building in a college mathematics classroom.* Preliminary report.
Polina D. Sabinin, Bridgewater State University (1116-97-945)

► 2:30PM (2585) *Emotional aspects of contending with mathematical challenges: The role of positive emotions.*
Ziva Deutsch*, Head of Math Department, Michlala, Jerusalem Collge Israel, and **Hava Greensfeld**, Head of the research unit, Michlala jerusalem college, Israel (1116-97-1183)

► 2:45PM (2586) *Writing Intensive Courses.* Preliminary report.
Weam M Al-Tameemi*, **Michael R Kidd** and **Ana L Cruz**, Texas A&M International University (1116-97-1472)

► 3:00PM (2587) *Online mathematics courses – A discussion of access and success.*
Girija Sarada Nair-Hart, University of Cincinnati Clermont College (1116-97-1980)

► 3:15PM (2588) *The Masters of Natural Sciences Degree Program at Louisiana State University.* Preliminary report.
James J Madden*, **Frank Neubrander**, Louisiana State University, and **Guillermo Ferreyra**, Louisisna State University (1116-97-2891)

3:30PM (2589) *A Fourth Grade Student's Exploration of Linear Equation Representations in a Function Task.* Preliminary report.
Katharine B Sawrey* and **Barbara M Brizuela**, Tufts University (1116-97-2372)

► 3:45PM (2590) *Sometimes a Step Forward Requires a Step Sideways: Early Intervention in Calculus I at Missouri S&T.* Preliminary report.
Paul N Runnion* and **Barbara J Wilkins**, Missouri University of Science and Technology (1116-97-104)

4:00PM (2591) *Facilitating collaboration in online multivariable calculus course via Google docs.*
Girija Sarada Nair-Hart, University of Cincinnati Clermont College (1116-97-2096)

► 4:15PM (2592) *Increasing Student Engagement in an Introductory/Intermediate Algebra Classroom.*
Marcel Prevuznak, Trident Technical College (1116-97-2562)

► 4:30PM (2593) *Can't make it to the bottom rung: Adults afraid of mathematics.*
Rachel Cywinski, San Antonio, Texas (1116-97-2588)

► 4:45PM (2594) *An Exploration of A Non-Traditional Introductory Statistics Course.*
Rachel M Bates, Redlands Community College (1116-97-2853)

AMS Session on Partial Differential Equations, II

1:00 PM – 5:25 PM **Room 616, Washington State Convention Center**

1:15PM (2595) *The two-and-half dimensional magnetohydrodynamic equations with horizontal dissipation and horizontal magnetic diffusion.* Preliminary report.
Dipendra Regmi, Farmingdale State College (1116-35-591)

1:30PM (2596) *Uniform rectifiability, harmonic and p-harmonic measure: The weak-A_∞ property of harmonic and p-harmonic measures implies uniform rectifiability.* Preliminary report.
Phi LE*, **Steve Hofmann**, University of Missouri-Columbia, **Jose Maria Martell**, Instituto de Ciencias Matematicas CSIC-UAM-UC3M-UCM, and **Kaj Nyström**, Uppsala University (1116-35-550)

1:45PM (2597) *Positive radial solutions to classes of singular problems on the exterior domain of a ball.*
Eun Kyoung Lee, Pusan National University, **Ratnasingham Shivaji** and **Byungjae Son***, University of North Carolina at Greensboro (1116-35-2607)

2:00PM (2598) *Spatial and temporal resolution analysis of collapsing high intensity pulses.* Preliminary report.
Alexey Sukhinin, Southern Methodist University (1116-35-1546)

2:15PM (2599) *Solutions of nonlinear Schrodinger equations.*
Alfredo Villanueva, Savannah State University (1116-35-2761)

2:45PM (2600) *A Fractional Decline Model for Shale Gas Reservoirs.*
Lihua Zuo* and **Wei Yu**, Texas A&M University, Department of Petroleum Engineering (1116-35-898)

3:00PM (2601) *Stochastic Partial Functional Differential Equations with Delay.*
Peter Y Pang, National University of Singapore (1116-35-899)

3:15PM (2602) *Analysis of Interfaces of the Double Degenerate Nonlinear Reaction-Diffusion Equation.*
Adam L Prinkey* and **Ugur G Abdulla**, Florida Institute of Technology (1116-35-999)

3:30PM (2603) *Properties of functionals of Almgren- and Weiss-type for harmonic functions on Carnot groups.*
Nicola Garofalo, Università di Padova, and **Kevin Rotz***, Purdue University (1116-35-2546)

3:45PM (2604) *Analysis of Steklov representations of solutions of Laplace's equation with singularity.*
Giles Auchmuty and **Manki Cho***, University of Houston (1116-35-2388)

4:00PM (2605) *Propagation of regularity of solutions to quasilinear Korteweg-de Vries type equations.*
Derek L. Smith, University of California, Santa Barbara (1116-35-1243)

► 4:15PM (2606) *Optimal Control of the Multiphase Stefan Problem.*
Bruno Giuseppe Poggi Cevallos*, Florida Institute of Technology, University of Minnesota, and **Ugur G. Abdulla**, Florida Institute of Technology (1116-35-1631)

4:30PM (2607) *Axisymmetric flow of ideal fluid moving in a narrow domain: a study of the axisymmetric hydrostatic Euler equations.*
Robert M. Strain and **Tak Kwong Wong***, University of Pennsylvania (1116-35-1670)

4:45PM (2608) *Homogenization of Stokes systems and Uniform Regularity Estimates.*
Zhongwei Shen and **Shu Gu***, University of Kentucky (1116-35-1736)

5:00PM (2609) *Non-periodic bounded potentials of the Schrödinger operator and solutions of KdV.*
Dmitry Zakharov, Courant Institute of Mathematical Sciences (1116-35-1952)

5:15PM (2610) *A Space-Time Discontinuous Galerkin Spectral Element Method for the Stefan Problem.*
Chaoxu Pei*, **Mark Sussman** and **M.Yousuff Hussaini**, Florida State University (1116-76-1359)

AMS Session on Undergraduate Research, II

1:00 PM – 5:55 PM **Chelan 4, Chelan Level Two, Washington State Conference Center**

► 1:00PM (2611) *Image Fusion Using SURE Guided Piecewise Linear Estimation.* Preliminary report.
Justin Scott Goodwill* and **Stacey Levine**, Duquesne University (1116-15-2730)

► 1:15PM (2612) *An Exploration of Iterative Matrix Transformations.* Preliminary report.
Cody J Griffith* and **Aaron Phillip Parker**, Metropolitan State University of Denver (1116-15-1989)

► 1:30PM (2613) *Polynomial Functions Over $\mathbb{Z}_n$.*
Gregory Taylor*, **Chi-Kwong Li** and **Diane Pelejo**, The College of William & Mary (1116-15-2416)

► 1:45PM (2614) *The Moduli Space of Complex 1|3-dimensional algebras.*
Austin D Riedl, **Hengzhou Liu**, **Dylan J Magnani*** and **Chris A Magyar**, University of Wisconsin-Eau Claire (1116-16-2801)

2:00PM ► (2615) *Computation in the completion of the free group algebra.* Preliminary report. **Tim Hsu**, San Jose State University, **Hang Lu Su***, McGill University, and **Olga Zamoroueva**, University of California, Davis (1116-16-1371)

2:15PM ► (2616) *Consensus vs. fragmentation in a model of opinion dynamics.* Preliminary report. **Ratna Khatri*** and **Matt Holzer**, George Mason University (1116-34-1907)

2:30PM ► (2617) *Stochastic Stabilization of Complex Multivariable Systems.* **Dylan P O'Connell***, Haverford College, **Joe Chen**, **Fan Ny Shum**, **Rajeshwari Majumdar**, University of Connecticut, **Lance Ford**, University of Central Oklahoma, **Derek Kielty**, Georgia Tech, and **Heather McCain**, Schreiner University (1116-34-2284)

2:45PM ► (2618) *Math Modeling in the Time of Cholera.* **Yinlin Dai*** and **Emma Kathryn Groves**, Southwestern University (1116-34-2356)

3:00PM ► (2619) *Modeling the Interaction Dynamics between Honeybees and Food Availability.* Preliminary report. **Carlos E Cruz***, Loyola Marymount University, **Matthew Baca**, New Mexico Institute of Mining and Technology, **Armando Salinas**, Arizona State University, and **Carlos Agrinsoni**, University of Puerto Rico, Cayey (1116-34-2175)

3:15PM ► (2620) *A fractional diffusion model for electric signal propagation through cardiac muscle tissue.* **Mae L Markowski**, George Mason University (1116-35-2033)

3:30PM ► (2621) *Infinite Symmetry Algebras of Partial Differential Equations.* Preliminary report. **Tucker Andrew Hartland*** and **Vladimir Rosenhaus**, Department of Mathematics and Statistics California State University, Chico (1116-35-2231)

3:45PM ► (2622) *Computational Dynamics of a Map with Multiple Stable States.* **William Bench**, The College of William and Mary (1116-37-1990)

4:00PM ► (2623) *A Physical Application of the Hypergeometric Function.* **Eric J Oden**, Southwestern University (1116-37-2611)

4:15PM ► (2624) *Anti-Periodic Solutions to a Higher Order Difference Equation with a p-Laplacian.* **Nicholas Joseph Russell***, Marist College, **Lingju Kong**, University of Tennessee at Chattanooga, **Jacob Parsely**, Tennessee Technological University, and **Kaitlin Rizzo**, Allegheny College (1116-39-473)

4:30PM ► (2625) *Minimizing recidivism by optimizing profit: a theoretical case study of incentivized reform in a Louisiana prison.* **Marco Hamins-Puertolas***, St. Mary's College of Maryland, **Jessie Conrad**, Tulane University, **Genesis Islas**, California State University, **Adrien Bossogo-Egoume**, University of Wisconsin-Madison, **Christopher Kribs**, University of Texas at Arlington, and **Benjamin Morin**, Arizona State University (1116-39-2405)

4:45PM ► (2626) *Edge Detection from Spectral Phase Data.* **Alexander B Reynolds**, Arizona State University (1116-42-2111)

5:00PM ► (2627) *Numerical Solutions of the Helmholtz Equation via the Modified Galerkin Method for the Shape of a Biconcave Disk.* Preliminary report. **Jill Sabrina Scarlett Resh*** and **Yajni M Warnapala**, Roger Williams University (1116-45-673)

5:15PM ► (2628) *Multiplication Operators on Weighted Banach Spaces of an Infinite Tree.* Preliminary report. **Robert F. Allen** and **Isaac M. Craig***, University of Wisconsin-La Crosse (1116-47-1131)

5:30PM ► (2629) *A Variational Approach for High Dynamic Range Imaging (HDR).* Preliminary report. **Kinardi Isnata**, Duquesne University (1116-49-2312)

5:45PM ► (2630) *The Convex Body Isoperimetric Conjecture.* **Matthew J Dannenberg***, Harvey Mudd College, **John Berry**, Williams College, **Jason Liang**, The University of Chicago, and **Yingyi Zeng**, St. Mary's College of Maryland (1116-52-2249)

AMS Session on Undergraduate Research, III

1:00 PM – 4:55 PM **Chelan 5, Chelan Level Two, Washington State Conference Center**

1:15PM ► (2631) *Invariants under the Poincare transformation and their corresponding evolution equations.* Preliminary report. **Andrew Osten Hoffman*** and **Joe Benson**, St. Olaf College (1116-53-1735)

1:30PM ► (2632) *An Introduction to Klein Links and Their Relation to Torus Links.* **Steven R Beres**, Gonzaga University (1116-54-2007)

1:45PM (2633) *An Application of Symplectic Integration on an N-body, with evaluations of Hamiltonian Mechanics interpretations.* **William Ty Frazier**, East Tennessee State University (1116-60-2786)

2:00PM ► (2634) *Typical Meteorological Year versus Actual Meteorological Year Weather Data: How modern data collection improves previous methods.* **Michael E Ramsey*** and **Jacob A Goldberg**, SUNY Geneseo (1116-62-2731)

2:15PM ► (2635) *Predicting Arrest from NYPD Stop, Question and Frisk Data.* Preliminary report.
Sara LaPlante* and **Jessica Mao**, Smith College (1116-62-1943)

2:30PM ► (2636) *New geometries for cellular automata.* Preliminary report.
Samanvitha Basole*, **Tim Hsu** and **Phyllis Lau**, San Jose State University (1116-68-1368)

2:45PM ► (2637) *Mathematics in Service to the Community: Mathematical Modeling for the Helena Food Share.*
Jesica Bauer, Carroll College (1116-90-2851)

3:00PM ► (2638) *The relationship between leptin and inflammation in adipose tissue determines critical points in excess nutrition in women.*
Sarah Bartlett Minucci*, Lee University, and **Stephen J. Merrill**, Marquette University (1116-92-2374)

3:15PM ► (2639) *Mathematical model for time to Neuronal Apoptosis due to accrual of DNA DSBs.*
Chindu Mohanakumar, University of Florida, Gainesville, FL, **Annabel E. Offer***, Texas Tech University, Lubbock, TX, and **Jennifer Rodriguez**, Arizona State University, Tempe, AZ (1116-92-2379)

3:30PM ► (2640) *Statistical models for estimating copy numbers of transposable elements using high-throughput DNA sequencing data.* Preliminary report.
Channing Stephanie Parker* and **Kathryn Rose Voss**, James Madison University (1116-92-2347)

3:45PM ► (2641) *A distance-based method for phylogenetic tree reconstruction using algebraic geometry.* Preliminary report.
Emily Chae Castner*, Mount Holyoke College, **Brent R Davis**, Colorado State University, and **Joseph P Rusinko**, Hobart and William Smith Colleges (1116-92-2266)

4:00PM ► (2642) *Female Centered Mate Selections as an Explanatory Mechanism for Dimorphic Solutions in a Rock-Paper-Scissors Game.* Preliminary report.
Kelly Ruth Buch*, Southern Illinois University Edwardsville, **Abena Serwaa Bonsu Annor**, University of Florida, and **Daniel Rodriguez Pinzon**, Universidad de los Andes (1116-92-2147)

4:15PM ► (2643) *Using statistical measurements to accurately predict septic events in premature infants.* Preliminary report.
Evan D Dienstman, The College of William & Mary (1116-92-1798)

4:30PM ► (2644) *Talk Math 2 Me: Changing One's Mathematical Identity.* Preliminary report.
Joni J Schneider, Texas State University (1116-97-2575)

4:45PM ► (2645) *Adaptations to the Curvature Based Image Denoising Framework.*
James A Matuk, Duquesne Universuty (1116-49-2309)

MAA Session on Addressing the Needs of Mathematics and Computer Science Majors in Discrete Mathematics Courses

1:00 PM – 4:35 PM **Yakima 2, Yakima Level One, Washington State Conference Center**

Organizers: **Ksenija Simic-Muller**, Pacific Lutheran University
Tom J. Edgar, Pacific Lutheran University

1:00PM ► (2646) *Discrete Mathematics for First Year Mathematics and Computer Science Majors.* Preliminary report.
William P Abrams, Longwood University (1116-A1-1889)

1:20PM ► (2647) *Throwing away the textbook: Teaching discrete mathematics from primary historical sources.*
David J. Pengelley, New Mexico State University (1116-A1-605)

1:40PM (2648) *Teaching with historical curricular modules: The Juxtaposition of Prüfer and Borůvka.*
Jerry Lodder, New Mexico State University (1116-A1-604)

2:00PM ► (2649) *Puzzling Through Discrete Mathematics.*
Edmund A. Lamagna, University of Rhode Island (1116-A1-1184)

2:20PM ► (2650) *Discrete Structures Projects - Addressing the Needs of Three Majors.*
Risto Atanasov, Western Carolina University (1116-A1-1612)

2:40PM ► (2651) *"Big O" Captain, My Captain.*
Tracey McGrail, Marist College (1116-A1-2799)

3:00PM ► (2652) *Teaching Discrete Mathematics to novice programmers using python, unit tests, and precompiled code.*
D A Dietz, American University (1116-A1-281)

3:20PM ► (2653) *Examples of Programming Labs that Apply and Motivate Discrete Math using Sage.*
Ruth Vanderpool, University of Washington Tacoma (1116-A1-1306)

3:40PM ► (2654) *Using Jupyter Notebooks to Bridge the Path from Math to Code.*
Carl Toews, University of Puget Sound (1116-A1-2688)

4:00PM ► (2655) *Using SAGE to illustrate the proof of Euler's polyhedron formula.* Preliminary report.
Monika Keindl, Northern Arizona University (1116-A1-2837)

4:20PM ► (2656) *How Calculators and Computers Compute.*
Paul R. Bouthellier, University of Pittsburgh-Titusville (1116-A1-48)

MAA Session on Conversations with the Partner Disciplines: Collaborations to Improve the Mathematics Curriculum, I

1:00 PM – 4:15 PM **Room 2A, Washington State Convention Center**

Organizers: **Victor Piercey**, Ferris State University
Suzanne I. Doree, Augsburg College
Jason Douma, University of Souix Falls
Susan Ganter, Virginia Tech

1:00PM (2657) *Reimagining Second-Year Calculus: The Vector Calculus Bridge Project.* **Tevian Dray***, Oregon State University, and **Corinne A. Manogue**, Oregon State University (Physics) (1116-D5-1444)

1:20PM (2658) *Teaching Non-Calculus-Based Physics: One Semester of Thoughts and Observations.* Preliminary report. **Chris Oehrlein**, Oklahoma City Community College (1116-D5-2320)

1:40PM (2659) *Designing Calculus for and with Biologists.* **Carrie Diaz Eaton***, Unity College, and **Hannah Callender**, University of Portland (1116-D5-1312)

2:00PM (2660) *Survey of Calculus with Excel.* Preliminary report. **Anneke Bart*** and **Mike May**, Saint Louis University (1116-D5-2507)

2:20PM (2661) *Social Justice – It's not only statistics!* **Julie C. Beier**, Earlham College (1116-D5-448)

2:40PM (2662) *An Application-First Approach to Statistics.* **David White**, Denison University (1116-D5-241)

3:00PM (2663) *Collaboration Across Disciplines Exploring Mathematical Tasks focused on Argumentation.* **Steven LeMay***, University of Connecticut, **Megan Brown**, University of Dayton, **Grace Wright**, Bates College, and **Fabiana Cardetti**, University of Connecticut (1116-D5-1822)

3:20PM (2664) *Revising General Education Math Courses with Client Discipline Input.* **Holly Hirst***, **Mark Ginn** and **Katrina Palmer**, Appalachian State University (1116-D5-519)

3:40PM (2665) *Just Enough Algebra to Prepare Students for Quantitative Courses Across the Disciplines – a New Approach to Developmental Algebra.* **Suzanne Ingrid Doree**, Augsburg College (1116-D5-905)

4:00PM (2666) *What can mathematics-across-the-disciplines learn from writing-across-the-disciplines?* **Susan A. Ruff**, Writing, Rhetoric, and Professional Communication, Massachusetts Institute of Technology (1116-D5-2780)

MAA Session on Graduate Students Teach Too: Ideas and Best Practices, II

1:00 PM – 2:55 PM **Room 304, Washington State Convention Center**

Organizer: **Samuel L. Tunstall**, Appalachian State University

1:00PM (2667) *Aligning Mathematics GTA Training with Research Findings.* **Mary Beisiegel***, **Emerald Stacey** and **Jesse Andrews**, Oregon State University (1116-F1-1492)

1:20PM (2668) *Inviting the Nations In: Aiding International Graduate Instructors at Clemson.* **Rachel Grotheer**, Clemson University (1116-F1-1000)

1:40PM (2669) *Teacher Training Revamped: Formalizing the Informal.* **Daniel J Katz**, Brown University (1116-F1-922)

2:00PM (2670) *A GREAT Idea.* **Tracy Weyand**, Baylor University (1116-F1-392)

2:20PM (2671) *Training Graduate Teaching Assistants to Use Evidence-Based Practices.* **Mary E Pilgrim*** and **Jessica Gehrtz**, Colorado State University (1116-F1-172)

2:40PM (2672) *Training and Evaluation of Graduate Teaching Assistants: Role of a Faculty Assistant Coordinator.* Preliminary report. **Robert Lee Nichols**, Florida Gulf Coast University (1116-F1-59)

MAA Session on Helping Students See Beyond Calculus

1:00 PM – 5:55 PM **Room 618, Washington State Convention Center**

Organizers: **David Strong**, Pepperdine University
James Tanton, MAA
Courtney Davis, Pepperdine University
Angela Spalsbury, Youngstown University

1:00PM (2673) *Squirrels, Electric Cars, and Hurricanes: DIMACS Applied Math Modules to Blow Away Your High School Students.* **James Kupetz***, Pittston Area High School, Pittston, PA 18640, and **Steve Leonhardi**, Winona State University, Winona, MN 55987 (1116-F5-2135)

1:20PM *Interactive Fractal Design.*
► (2674) **Robert Cohen**, Western State Colorado University (1116-F5-2145)

1:40PM *Math in the 21st Century: Making Sense*
► (2675) *of Dynamic Visualizations.*
Robin Angotti, University of Washington Bothell (1116-F5-2301)

2:00PM *Symmetries of polynomial roots.*
► (2676) **Chad Awtrey*** and **Taylor Cesarski**, Elon University (1116-F5-2229)

2:20PM *It is not a coincidence! On patterns in*
(2677) *some Calculus optimization problems.*
Maria Nogin, California State University, Fresno (1116-F5-1964)

2:40PM *Hats, Hamming and Hypercubes.*
► (2678) **Mike Pinter**, Belmont University (1116-F5-2543)

3:00PM *Agent Based Models in the Social and*
► (2679) *Biological Sciences.*
Daniel J Teague, NC School of Science and Mathematics (1116-F5-2525)

3:20PM *Math in action: solving crimes.*
► (2680) Preliminary report.
Violeta Vasilevska, Utah Valley University (1116-F5-2026)

3:40PM *Increasing Student Interest in*
(2681) *Mathematics using Cryptography.*
Neil P. Sigmon*, Radford University, and **Rick E. Klima**, Appalachian State University (1116-F5-1272)

4:00PM *Find Trig Boring? Look Anew!*
► (2682) **Deane E. Arganbright**, Divine Word University (Papua New Guinea) (1116-F5-191)

4:20PM *Model Assessment Practice: See Beyond*
► (2683) *Calculus.*
Tanweer Shapla, Eastern Michigan University (1116-F5-794)

4:40PM *Developing Young Mathematicians:*
► (2684) *An Undergraduate and Secondary Collaboration.*
Laura M Singletary* and **Debra L Mimbs**, Lee University (1116-F5-2336)

5:00PM *Successful Activities used in Outreach*
► (2685) *and STEM Programs.* Preliminary report.
Lisa M Rezac, University of St. Thomas, St. Paul MN (1116-F5-1179)

5:20PM *On Beyond Calculus.*
(2686) **Rebekah B. Johnson Yates**, Houghton College (1116-F5-2132)

5:40PM *Secret sharing in College Algebra and*
► (2687) *Precalculus.* Preliminary report.
Susan L Schmoyer, Worcester State University (1116-F5-1603)

MAA Session on Integrating Research into the Undergraduate Classroom, I

1:00 PM – 3:35 PM **Room 619, Washington State Convention Center**

Organizers: **Shannon R. Lockard**, Bridgewater State University
Timothy B. Flowers, Indiana University of Pennsylvania

1:00PM *Image Processing in an Undergraduate*
► (2688) *Capstone Experience.* Preliminary report.
Veronika Furst, Fort Lewis College (1116-J1-817)

1:20PM *Mimicking Mathematical Research in*
(2689) *Discrete Mathematics.* Preliminary report.
Feryal Alayont, Grand Valley State University (1116-J1-2169)

1:40PM *PIC Math: preparing students for*
► (2690) *industrial careers through an undergraduate research course.*
Michael Dorff*, Brigham Young University, **Suzanne Weekes**, Worcester Polytechnic Institute, **Linda Braddy**, MAA, and **Reza Malek-Madani**, United States Naval Academy (1116-J1-756)

2:00PM *The Peer Enhanced Experiential Research*
► (2691) *in STEM (PEERS) project at Northeastern Illinois University: Mathematics Component.* Preliminary report.
Joseph Hibdon*, **Lidia Filus**, **Elisabet Head**, **Sudha Srinivas**, **Kenneth Nicholson** and **Paulo Acioli**, Northeastern Illinois University (1116-J1-2833)

2:20PM *Mathematics in Flight.*
► (2692) **Marina Dedlovskaya**, **Malgorzata Aneta Marciniak***, **Marina Nechayeva** and **Vladimir Przhebelskiy**, CUNY (1116-J1-2662)

2:40PM *ASSURE Calculus - Achieving Success*
► (2693) *through Undergraduate Research and Engagement.*
Theresa A. Jorgensen, University of Texas at Arlington (1116-J1-2866)

3:00PM *Mathematics Research . . . Not Just for*
► (2694) *Math Majors!*
Rachelle Bouchat, Indiana University of Pennsylvania (1116-J1-1976)

3:20PM *Integrating Research into a College*
► (2695) *Algebra Course using MyMathLab.*
Yevgeniy V. Galperin, East Stroudsburg University of Pennsylvania (1116-J1-2381)

MAA Session on Mathematical Modeling in the Undergraduate Classroom, I

1:00 PM – 5:15 PM **Room 607, Washington State Convention Center**

Organizers: **Jason Douma**, University of Souix Falls
Rachel Levy, Harvey Mudd College

1:00PM *Math Bio or BioMath? Flipping the*
► (2696) *Mathematical Biological Classroom.*
Eric Alan Eager*, **James Peirce** and **Patrick Barlow**, University of Wisconsin - La Crosse (1116-K1-363)

1:20PM *Using Agent-Based Modeling to Gain*
(2697) *Insight into the Natural World.*
Angela B. Shiflet* and **George W. Shiflet**, Wofford College (1116-K1-443)

1:40PM ► (2698) *Introducing linear programming in mathematical modeling courses.*
Jakob Kotas, University of Washington (1116-K1-219)

2:00PM ► (2699) *Bringing current events to life: modeling the 2014 Ebola outbreak in Engineering Calculus I.*
Emma Smith Zbarsky, Wentworth Institute of Technology (1116-K1-1170)

2:20PM ► (2700) *Tsunami Simulation for Teaching CSE and HPC.*
Michael Bader, Technische Universität München (1116-K1-902)

2:40PM ► (2701) *An ODE-based climate modeling course.*
James Walsh, Oberlin College (1116-K1-294)

3:00PM ► (2702) *Mathematical Modeling: Dirac, Einstein, and Barging the Big Easy.*
Timothy J Pennings, Davenport University (1116-K1-110)

3:20PM ► (2703) *Modeling, Inquiry, and Discovery in Calculus.*
Debra L Mimbs, Lee University (1116-K1-2243)

3:40PM ► (2704) *A robotics-based calculus class.*
Jason Cantarella* and **Harrison Chapman**, University of Georgia (1116-K1-628)

4:00PM ► (2705) *Bridging Mathematics, Physics, and Computer Science in an undergraduate research project "Modeling the Earth – Moon Satellite Orbit".*
Alexander Y Vaninsky, **Daniel De La Cruz***, **Stephen Darko**, **Jesus Garcia** and **Cory Tambourine**, Hostos Community College, CUNY (1116-K1-1789)

4:20PM (2706) *Snails in a Tide Pool & Other New Modeling Applications for Mathematics Courses.*
Audrey Malagon*, Virginia Wesleyan College, and **Lisa Driskell**, Colorado Mesa University (1116-K1-2560)

4:40PM ► (2707) *Using a Sand Tank Groundwater Model to Investigate Groundwater Flow Models.*
Michael A Karls, Ball State University (1116-K1-2883)

5:00PM (2708) *What is Mathematical Modeling?*
Jean Marie Linhart, Central Washington University (1116-K1-2482)

MAA Session on Mathematics and the Arts, IV

1:00 PM – 4:15 PM **Room 2B, Washington State Convention Center**

Organizer: **Douglas Norton**, Villanova University

1:00PM ► (2709) *Exploring the Integration of Culture, Nature, Art and Mathematics from Indigenous Perspectives.* Preliminary report.
Belin Manuel Tsinnajinnie, Institute of American Indian Arts (1116-K5-2959)

1:20PM ► (2710) *Invisible Theatre: Math and Metaphor on the Digital Stage.*
Gail Tang, University of La Verne (1116-K5-1573)

1:40PM (2711) *Dancing with Polyhedra.*
Karl H. Schaffer, De Anza College (1116-00-2987)

2:00PM ► (2712) *Forms resulting from replacing edges with flexible plates in convex equilateral polyhedra.*
David A. Reimann, Albion College (1116-K5-2609)

2:20PM ► (2713) *Some Girihs and Puzzles from the Interlocks of Similar or Complementary Figures Treatise.*
Reza Sarhangi, Towson University, Maryland (1116-K6-465)

2:40PM ► (2714) *Classification of 4x4 arrangements of 16 2-color corner-matching Wang tiles.* Preliminary report.
Debra L. Hydorn, University of Mary Washington (1116-K5-1866)

3:00PM ► (2715) *Sidewalk Patterns: Symmetry at Home.* Preliminary report.
Darrah P Chavey, Beloit College (1116-K6-2941)

3:20PM ► (2716) *The role of geometry in architecture, Case study: QAL'EH DOKHTAR, in Firuzabad, Iran.*
Mostafa Aref Haghi*, Architectelement Compony, and **Samane Barjasteh Delforooz**, Crchitectelement compony (1116-K6-618)

3:40PM ► (2717) *Kaleidoscopes, chessboards, and symmetry.*
T. M. Brown, Armstrong State University (1116-K5-2261)

4:00PM ► (2718) *An Algorithm for Creating Wallpaper Patterns from Random Fractals.* Preliminary report.
Douglas Dunham*, University of Minnesota, Duluth, and **John Shier**, Apple Valley, Minnesota (1116-K6-2812)

MAA Session on Origami in the Mathematics K–12 Classroom, I

1:00 PM – 4:15 PM **Room 303, Washington State Convention Center**

Organizers: **Roger Alperin**, San Jose State University

Perla Myers, University of San Diego

1:00PM ► (2719) *Can Origami Help Improve Student Learning of Mathematics?*
Patsy Wang-Iverson, Gabriella & Paul Rosenbaum Foundation (1116-M5-969)

1:20PM ► (2720) *Origami-inspired deductive threads in pre-geometry, and the geometric modeling of aesthetically pleasing folded structures in grades 8-12.* Preliminary report.
Arnold Tubis, Department of Physics (ret.), Purdue University, West Lafayette, IN 47907 (1116-M5-549)

1:40PM ► (2721) *Dramatic Results uses research-based, innovative strategies to engage underserved youth from Long Beach USD in Core mathematical thinking using origami to achieve measurable and reproducible results.*
Christi L. Wilkins, Founder/Executive Director, Dramatic Results (1116-M5-934)

2:00PM ► (2722) *Seattle Public Schools STEM Paper Folding Program.*
Robert Orndorff*, Seattle, WA, **Debby Halperin** and **Mary Ann Crawford**, Seattle Public Schools (1116-M5-2863)

2:20PM ► (2723) *Geometry Meets Algebra in Making Simple Origami Cubes and a Carrying Box for Them.*
Charlene Morrow* and **James Morrow**, Mount Holyoke College (1116-M5-742)

2:40PM ► (2724) *Project Mathigami: engaging K-12 students in mathematics through Origami.*
Celina Gonzalez*, University of San Diego/HighTechHigh (HTeNC), **Perla Myers**, University of San Diego, and **Jeffrey Feitelberg**, HighTechHigh (HTeNC) (1116-M5-2990)

3:00PM ► (2725) *My Journey from Classroom Teacher to University Professor in a Preservice Teacher Program: Using Origami as a Tool for Improving Core Math Understanding in Local and Overseas Classrooms.*
Norma J Boakes, Stockton University (1116-M5-575)

3:20PM ► (2726) *Three Theorems Accessible to Middle and High School Students Used in Folding a Simple Modular Origami Book.*
Rona Gurkewitz, Western Connecticut State University (1116-M5-2690)

3:40PM ► (2727) *Constructing The Conic Sections By Paper Folding.*
Philip R Mallinson, Phillips Exeter Academy (1116-M5-145)

4:00PM ► (2728) *First Lessons in Origami with suggestions for incorporating mathematics.*
Jeanine Meyer, Purchase College/State University of New York (1116-M5-325)

MAA General Contributed Paper Session on Analysis, II

1:00 PM – 4:40 PM **Room 617, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

1:00PM ► (2729) *On a Second-Order Rational Recurrence Relation with Quadratic Terms.* Preliminary report.
Yevgeniy Kostrov, Xavier University of Louisiana, and **Zachary Kudlak***, Monmouth University (1116-VB-2622)

1:15PM (2730) *Geometry of hyperbolic conservation laws.*
Michael Benfield, North Carolina State University (1116-VB-2661)

1:30PM (2731) *Low regularity local and global solutions of the generalized Magneto-Hydrodynamics equations.*
Nathan Pennington, Creighton University (1116-VB-2717)

1:45PM (2732) *A hull with no nontrivial Gleason parts.* Preliminary report.
Swarup N Ghosh*, Southwestern Oklahoma State University, and **Alexander J Izzo**, Bowling Green State University (1116-VB-2760)

2:00PM ► (2733) *The Beautiful Dynamics of $f(z) = i^z$.*
Joseph P Previte, Penn State Erie, The Behrend College (1116-VB-2806)

2:15PM (2734) *Estimates on Functional Integrals of Quantum Mechanics and Non-Relativistic Quantum Field Theory.*
Gonzalo Bley* and **Lawrence Thomas**, University of Virginia (1116-VB-2807)

2:30PM ► (2735) *Kempner series, their associated power series and logarithmic means.* Preliminary report.
Bernd Sing, The University of the West Indies (1116-VB-2821)

2:45PM (2736) *Some results on nonlocal nonlinear diffusion equations.*
Tucker Hartland, California State University- Chico, **Petronela Radu**, University of Nebraska- Lincoln, and **Ravi Shankar***, California State University-Chico (1116-VB-2873)

3:00PM (2737) *The Metric Entropy of the Space of Separately Convex Functions.* Preliminary report.
James Cockreham* and **Fuchang Gao**, University of Idaho (1116-VB-2947)

3:15PM (2738) *Hilbert-Schmidtness of difference of two weighted composition operators - A survey.*
Soumyadip Acharyya*, Embry-Riddle Aeronautical University Worldwide, and **Zhijian Wu**, University of Nevada, Las Vegas (1116-VB-541)

3:30PM (2739) *L^p solutions to the mixed boundary value problem in C^2 domains.*
Laura Dawn Croyle, University of Kentucky (1116-VB-797)

3:45PM (2740) *On Inequalities between Norms in Weighted Hölder and Lebesgue Spaces for Operators with Endpoint Singularities.* **Anna Tarasenko***, Hidalgo State University, Institute of Basic Sciences and Engineering, Mathematical Research Center, and **Oleksandr Karelin**, Hidalgo State University, Institute of Basic Sciences and Engineering (1116-VB-809)

4:00PM (2741) *Composition Operators on Generalized Weighted Nevanlinna Class.* **Waleed Al-Rawashdeh**, Montana Tech (1116-VB-977)

4:15PM (2742) *On the Existence of Solutions to the Muskat Problem with Surface Tension.* **Spencer N. Tofts*** and **Robert Strain**, University of Pennsylvania (1116-VB-987)

4:30PM (2743) *On Hamburger-type weighted shifts.* Preliminary report. **George R. Exner**, Bucknell University, **Joo Young Jin*** and **Il Bong Jung**, Kyungpook National University (1116-VB-1005)

MAA General Contributed Paper Session on Geometry, II

1:00 PM – 2:55 PM **Room 213, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

1:00PM ► (2744) *Equivalences in Absolute Plane Geometry.* **John Donnelly**, University of Southern Indiana (1116-VE-2523)

1:15PM (2745) *Triangulations via Iterated Largest Angle Bisection.* **Yeon June Kang**, Peddie School (1116-VE-27)

1:30PM (2746) *Basmajian's identity in higher Teichmüller-Thurston theory.* **Andrew V Yarmola***, Boston College, and **Nicholas G Vlamis**, University of Michigan (1116-VE-2896)

1:45PM (2747) *Theta basis and quiver representation.* Preliminary report. **Man Wai Cheung**, University of California, San Diego (1116-VE-296)

2:00PM (2748) *Existence of Self Dual Tetrahedon.* **Derege Mussa**, University of Texas at Dallas (1116-VE-380)

2:15PM ► (2749) *Area Methods in Geometry Proving.* Preliminary report. **Zengxiang Tong***, Otterbein University, **Jingzhong Zhang**, Guangzhou University, and **Zhaozhi Zhang**, The Journal of Research in Advanced Mathematics (1116-VE-699)

2:30PM ► (2750) *Integrated Trig-Geometry.* **Jingzhong Zhang***, Guangzhou University, **Zhaochi Zhang**, The Journal of Research in Advanced Mathematics, and **Zengxiang Tong**, Otterbein University (1116-VE-702)

2:45PM ► (2751) *The Geometry of the Discriminant over Finite Fields.* Preliminary report. **Elena Alicia Gonzalez Malloy**, Yale University (1116-VE-468)

MAA General Contributed Paper Session on Graph Theory, III

1:00 PM – 5:25 PM **Room 212, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

1:00PM (2752) *A Group Action on Neighborhood Complexes of Cayley Graphs.* **Justin R Hughes**, Towson University (1116-VF-2358)

1:15PM ► (2753) *On the Star Arboricity of the Zero-Divisor Graph* $\Gamma(Z_{p^n})$. **Henry E Escuadro***, Juniata College, **Ian Garces**, **Agnes Garciano**, **Reginaldo Marcelo** and **Mari-Jo Ruiz**, Ateneo de Manila University (1116-VF-2367)

1:30PM (2754) *Unavoidable Minors for 2-connected k-hypergraphs.* Preliminary report. **Dennis Hall**, SC Governor's School for Science and Mathematics (1116-VF-2418)

1:45PM (2755) *Factors in graphs, weighted graphs and directed graphs.* **Jozsef Balogh**, **Theodore Molla*** and **Maryam Sharifzadeh**, University of Illinois at Urbana-Champaign (1116-VF-2613)

2:00PM ► (2756) *Adjacent vertex distinguishing total coloring of graphs with small maximum degree.* **Jiaao Li***, **You Lu** and **Rong Luo**, West Virginia University (1116-VF-2618)

2:15PM (2757) *r-hued coloring of graphs having no $K_{3,3}$ minor.* **Murong Xu*** and **Hong-Jian Lai**, Department of Mathematics in West Virginia University (1116-VF-2640)

2:30PM ► (2758) *New Results on Ramsey Multiplicity and Graph Commonality.* Preliminary report. **Sarvasva Raghuvanshi**, Research Science Institute 2015; Mentored by James Hirst of MIT (1116-VF-2724)

2:45PM (2759) *Vertex Colorings without Rainbow Subgraphs.*
Wayne Goddard, School of Computing, Clemson University, and **Honghai Xu***, Department of Mathematical Sciences, Clemson University (1116-VF-2826)

► 3:00PM (2760) *The t-pebbling number of a path of graphs.* Preliminary report.
Nándor Sieben, Northern Arizona University (1116-VF-2846)

► 3:15PM (2761) *On k-Ramsey Numbers of Non-bipartite Graphs.*
Daniel Johnston, University of Montana (1116-VF-2894)

► 3:30PM (2762) *Variations on coloring graphs under rainbow connection.*
Janet Fierson* and **Jackson Swindells**, La Salle University (1116-VF-2899)

3:45PM (2763) *Pancyclicity of 4-Connected Claw-free Net-free Graphs.*
Taoye Zhang, Penn State Worthington Scranton (1116-VF-2960)

4:00PM (2764) *Diagonal forms and zero-sum (mod 2) bipartite Ramsey numbers.*
Wing Hong Tony Wong, Kutztown University (1116-VF-387)

4:15PM (2765) *The Inverse Semigroups of Graphs.*
Tien Y Chih, Newberry College (1116-VF-853)

4:30PM (2766) *On Group Connectivity of Graphs.*
Ju Zhou, Kutztown University (1116-VF-613)

► 4:45PM (2767) *Refinements of results on cycles and chorded cycles.*
Theodore Molla, **Michael Santana***, University of Illinois at Urbana-Champaign, and **Elyse Yeager**, University of British Columbia, Vancouver (1116-VF-668)

5:00PM (2768) *Graph theory metrics for analyzing functional MRI data and brain connectivity.*
Darren Narayan, Rochester Institute of Technology (1116-VF-7)

5:15PM (2769) *Integer Flows in Signed Graphs with No Odd-K_4-minors.*
Jian Cheng, West Virginia University (1116-VF-843)

MAA General Contributed Paper Session on Modeling and Applications, IV

1:00 PM – 4:25 PM **Room 214, Washington State Convention Center**

Organizers: **Jennifer E. Beineke**, Western New England University
Bem Cayco, San Jose State University
Timothy Comar, Benedictine University
T. James Reid, University of Mississippi

► 1:00PM (2770) *The application of Homotopy Analysis Method for the solution of time-fractional diffusion equation with a moving boundary.* Preliminary report.
Ogugua N Onyejekwe, Melbourne,FL (1116-VM-25)

► 1:15PM (2771) *Fitting structured population dynamics models for the green treefrog (Hyla cinerea) to population estimates from field data.* Preliminary report.
Baoling Ma*, Millersville University of Pennsylvania, **Azmy S Ackleh** and **Xinyu Li**, University of Louisiana at Lafayette (1116-VM-2518)

1:30PM (2772) *A Computational Model for the Simulation of Atherosclerotic Plaques.*
Sunnie Joshi, Temple University (1116-VM-937)

► 1:45PM (2773) *Mathematical and Computational Modeling of Bacterial Motility and Swarming.* Preliminary report.
Cameron Harvey, Visible Music College, **Amy Buchmann***, Tulane University, **Scott Christley**, University of Chicago, **Joshua Shrout**, **Aboutaleb Amiri**, **Jianxu Chen**, **Danny Chen**, University of Notre Dame, **Igor Aronson**, Argonne National Lab, and **Mark Alber**, University of Notre Dame (1116-VM-2522)

2:00PM (2774) *The Dynamics of Multiple Myeloma Dysregulated Bone Remodeling.*
Catherine E Patterson*, **Bruce Ayati**, University of Iowa, and **Sarah Holstein**, Roswell Park Cancer Institute (1116-VM-255)

► 2:15PM (2775) *Uncertainty Quantification in Model of Treatment for Metastatic Prostate Cancer.* Preliminary report.
Zachary Dean Kenyon, Arizona State University (1116-VM-2563)

2:30PM (2776) *Urn Models for Honeybee Swarm Site-Selection.* Preliminary report.
Torrey A Johnson, Oregon State University (1116-VM-2680)

► 2:45PM (2777) *Speculative Bubbles and Crashes: Fundamentalists and Positive-Feedback Trading.*
Po-Keng Cheng*, Department of Applied Math and Statistics, State University of New York at Stony Brook, Stony Brook, U.S.A., **Frank J. Fabozzi**, EDHEC Business School, Nice, France, and **Young Shin Kim**, College of Business, State University of New York at Stony Brook, Stony Brook, U.S.A. (1116-VM-275)

► 3:00PM (2778) *Post-Secondary Enrollment in the United States: Model Validation and Student Life Tables.* Preliminary report.
Ariel Cintron-Arias, East Tennessee State University (1116-VM-2802)

3:15PM ► (2779) *Tumor Control Strategies for a Mixed Immuno-Chemotherapy via Impulsive Control.* **Qing Wang***, **Zhijun Wang**, Shepherd University, Shepherdstown, WV, and **David J Klinke**, West Virginia University, Morgantown, WV (1116-VM-2841)

3:30PM ► (2780) *Pedestrian Speed on Stairs: A Mathematical Model Based on Empirical Analysis for use in Computer Simulations.* Preliminary report. **Michelle L Isenhour***, United States Military Academy, and **Rainald Löhner**, George Mason University (1116-VM-2904)

3:45PM ► (2781) *Mathematical Modeling of Insulin Therapy in Patients with Diabetes Mellitus.* Preliminary report. **Dr. Boniface Otieno Kwach***, Kibabii University College, **Prof. Omolo N. Ongati**, **Prof. Michael Oduor Okoya**, Jaramogi Oginga Odinga University of Science and Technology, and **Dr. Amos E. O. Otedo**, Kisumu East District Hospital (1116-VM-352)

4:00PM (2782) *Mathematical Modeling of Language Regularization by Adults and Children.* **Jacquelyn L Rische***, Hobart and William Smith Colleges, and **Natalia L Komarova**, University of California, Irvine (1116-VM-542)

4:15PM (2783) *Modeling the Effects of Multiple Myeloma on Kidney Function.* Preliminary report. **Julia Walk**, University of Iowa (1116-VM-739)

SIAM Minisymposium on Applied analysis of partial differential equations

1:00 PM – 5:30 PM **Room 3A, Washington State Convention Center**

Organizers: **Gautam Iyer**, Carnegie Mellon University

Anna Mazzucatto, Penn State University

1:00PM (2784) *Nonlinear Surface Plasmons.* **Ryan G Halabi** and **John K Hunter***, University of California at Davis (1116-35-1595)

1:30PM (2785) *Global behavior of the free boundary of an ideal fluid surrounded by vacuum in the class of affine deformations.* **Thomas C. Sideris**, Department of Mathematics, University of California, Santa Barbara (1116-35-1995)

2:00PM (2786) *Global weak solutions to the inviscid 3D quasi-geostrophic equation.* **Alexis F. Vasseur***, University of Texas at Austin, and **Marjolaine Puel**, Universite de Nice (France) (1116-35-2614)

2:30PM (2787) *Aggregation equations and 2D incompressible fluids.* Preliminary report. **James P Kelliher**, University of California Riverside (1116-76-1500)

3:00PM (2788) *Title: Existence and Stability of small time-periodic solutions of the Navier-Stokes-Maxwell system.* **Slim Ibrahim***, Department of Mathematics & Statistics, University of Victoria, BC- Canada, **Pierre-Gilles Lemarie**, University of Evry, France, and **Nader Masmoudi**, CIMS, New-York University (1116-35-2059)

3:30PM (2789) *On the relation between collision dynamics of soliton sequences of coupled-NLS equations and population dynamics in Lotka-Volterra models.* **Avner Peleg***, Racah Institute of Physics, The Hebrew University of Jerusalem, Jerusalem 91904, Israel, **Quan M Nguyen**, Department of Mathematics, Vietnam National University at Ho Chi Minh City, Vietnam, and **Toan T Huynh**, Department of Mathematics, University of Medicine and Pharmacy-HCMC, Ho Chi Minh City, Vietnam (1116-35-499)

4:00PM (2790) *Discrete Approximations for High Contrast Heterogeneous Media Problems.* **Yuliya Gorb**, University of Houston (1116-35-2414)

4:30PM (2791) *Dynamics and Bifurcation of Multicomponent Amphiphilic Membranes.* **Keith Promislow*** and **Qiliang Wu**, Michigan State University (1116-35-531)

5:00PM (2792) *On a nonlinear model for tumor growth: Global existence of weak solutions.* **Konstantina Trivisa**, University of Maryland (1116-35-2094)

MAA Panel Discussion

1:00 PM – 2:20 PM **Room 609, Washington State Convention Center**

International engagement in research and education in the mathematical sciences.

Organizer: **Overtoun Jenda**, Auburn University

Panelists: **Neal Koblitz**, University of Washington

Overtoun Jenda, Auburn University

Suzanne Lenhart, University of Tennessee

Yuan Lou, Ohio State University

Fred Roberts, Rutgers University

SIGMAA on Math Circles for Students and Teachers-American Mathematics Competitions Special Presentation

1:00 PM – 2:30 PM **Room 612, Washington State Convention Center**

Math wrangle.

ASL Contributed Paper Session, II

2:00 PM – 5:20 PM **Room 4C-1, Washington State Convention Center**

2:30PM (2793) *Robust reflection principles.*
Chris Lambie-Hanson, Hebrew University of Jerusalem (1116-03-1247)

3:00PM (2794) *Connections between relational semantics for $E_\rightarrow$ and E.*
Katalin Bimbó, University of Alberta (1116-03-1667)

► 3:30PM (2795) *Does the Consistency Sentence Really State Consistency?*
Joachim Mueller-Theys, Heidelberg, Germany (1116-03-1649)

► 4:00PM (2796) *Sophotaxis.*
Ronald G. Fuller, Wipro Technologies, Analytics Services, and **Peter Cardon***, Center for Management Communication, Marshall School of Business, University of Southern California (1116-03-1076)

► 4:30PM (2797) *Logic is the missing link in information management.*
Ronald G. Fuller, Wipro Technologies, Analytics Services (1116-03-1068)

► 5:00PM (2798) *N-dimensional De Morgan Algebras and Further Applications.*
Atila Prates Correia, Universidade de Sao Paulo (1116-03-1869)

AWM Workshop: Special Session on Algebraic Combinatorics, II

2:00 PM – 4:55 PM **Room 4C-3, Washington State Convention Center**

Organizers: **Gizem Karaali**, Pomona College
Rosa Orellana, Dartmouth College

2:00PM (2799) *Littlewood-Richardson rules for symmetric skew quasisymmetric Schur functions.*
Stephanie van Willigenburg, University of British Columbia (1116-05-827)

2:30PM (2800) *The combinatorics of quasisymmetric (k,l)-hook Schur functions.*
Elizabeth Niese*, Marshall University, and **Sarah K Mason**, Wake Forest University (1116-05-150)

3:00PM (2801) *Discrete Homotopy and Homology Groups.*
Hélène Barcelo, Mathematical Sciences Research Institute (1116-05-2166)

3:30PM (2802) *Peak Sets of Classical Coxeter Groups.*
Alexander Diaz-Lopez, University of Notre Dame, **Pamela Estephania Harris***, United States Military Academy, **Erik Insko** and **Darleen Perez-Lavin**, Florida Gulf Coast University (1116-05-111)

4:00PM (2803) *The geometry behind permutations and their subwords.*
Julianna Tymoczko, Smith College (1116-05-2775)

4:30PM (2804) *Toric matrix Schubert varieties.*
Laura Escobar*, U Illinois Urbana-Champaign, and **Karola Meszaros**, Cornell University (1116-05-755)

MAA-AMS-SIAM Gerald and Judith Porter Public Lecture

3:00 PM – 4:00 PM **Ballroom 6BC, Washington State Convention Center**

(2805) *Network Science: From the Online World to Cancer Genomics.*
Jennifer Chayes, Microsoft Research (1116-00-46)

AMS Dinner Reception

6:30 PM – 7:30 PM **Grand Ballroom PreFunction, 2nd Floor, Sheraton Seattle Hotel**

AMS Dinner Celebration

7:30 PM – 10:30 PM **Grand Ballroom AB, 2nd Floor, Sheraton Seattle Hotel**

Michel L. Lapidus
AMS Associate Secretary
Riverside, California

Gerard A. Venema
MAA Associate Secretary
Grand Rapids, Michigan