Program of the Sessions

Baltimore, Maryland, January 16–19, 2019

Monday, January 14

AMS Short Course on Sum of Squares: Theory and Applications, Part I

8:15 AM – 5:30 PM **Holiday Ballroom 1-3, 2nd Floor, Hilton**

Organizers: **Pablo A Parrilo**, Massachusetts Institute of Technology
Rekha R Thomas, University of Washington

8:15AM Introduction

8:30AM (1) *Overview of SOS polynomials.*
Grigoriy Blekherman, Georgia Institute of Technology

10:10AM Break

10:40AM (2) *The geometry of spectrahedra.*
Cynthia Vinzant, North Carolina State University

12:20PM Lunch

2:00PM (3) *Engineering applications of SOS polynomials.*
Georgina Hall, INSEAD

3:40PM Break

4:10PM Problem session

AMS Short Course Reception

5:00 PM – 6:00 PM **Holiday Ballroom 1-3, 2nd Floor, Hilton**

Tuesday, January 15

AMS Department Chairs Workshop

8:00 AM – 6:30 PM **Grand Ballroom ABC, 1st Floor, Marriott Inner Harbor**

Organizers: **Malcolm Adams**, University of Georgia
Gloria Mari-Beffa, University of Wisconsin-Madison
Douglas Mupasiri, University of Northern Iowa
Jennifer Zhao, University of Michigan-Dearborn

AMS Short Course on Sum of Squares: Theory and Applications, Part II

8:30 AM – 5:30 PM **Holiday Ballroom 1-3, 2nd Floor, Hilton**

Organizers: **Pablo A Parrilo**, Massachusetts Institute of Technology
Rekha R Thomas, University of Washington

8:30AM (4) *Algebraic geometry through the lens of sums of squares.*
Mauricio Velasco, Universidad de los Andes

10:10AM Break

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 40, 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.

10:40AM (5) *Connections to theoretical computer science.*
Ankur Moitra, MIT

12:20PM Lunch

2:00PM (6) *Lifts of convex sets.*
Hamza Fawzi, University of Cambridge (1145-90-2300)

3:40PM Break

4:10PM Problem session

AMS Council

1:30 PM – 10:00 PM **Holiday Ballroom 4-6, 2nd Floor, Hilton**

Joint Meetings Registration

3:00 PM – 7:00 PM **Pratt Street Lobby, 300 Level, BCC**

Advanced registration will remain open until 7:30 pm.

Email Center

3:00 PM – 7:30 PM **Pratt Street Lobby, 300 Level, BCC**

Wednesday, January 16

Joint Meetings Registration

7:00 AM – 6:00 PM **Pratt Street Lobby, 300 Level, BCC**

Email Center

7:00 AM – 11:00 PM **Pratt Street Lobby, 300 Level, BCC**

MAA Minority Chairs Meeting

7:00 AM – 8:45 AM **Peale, 1st Floor, Hilton**

AMS-ASL Special Session on Algorithmic Dimensions and Fractal Geometry, I

8:00 AM – 10:50 AM **Room 343, BCC**

Organizers: **Jack H. Lutz**, Iowa State University
Elvira Mayordomo, University of Zaragoza, Spain

8:00AM (7) *The effective dimension of points on lines.*
Don Stull, Inria Nancy Grand Est (1145-68-1878)

8:30AM (8) *Algorithmic Dimensions of Projected Points.*
Neil Lutz, University of Pennsylvania (1145-03-2599)

9:00AM (9) *Optimal bounds for single-source Kolmogorov extractors.*
Laurent Bienvenu, University of Montpellier, **Barbara F Csima***, University of Waterloo, and **Matthew Harrison-Trainor**, Victoria University of Wellington (1145-03-1676)

9:30AM ► (10) *Short Paths in the Sierpiński Carpet and Menger Sponge.*
Derek Smith* and **Ethan Berkove**, Lafayette College (1145-51-1997)

10:00AM (11) *Normal numbers with digit dependencies.*
Verónica Becher, Universidad de Buenos Aires & CONICET, Argentina (1145-41-1693)

10:30AM (12) *Weak Computabilities of Real Numbers and Relative Randomness.*
Xizhong Zheng, Department of Computer Science and Mathematics, Arcadia University (1145-03-1700)

AMS Special Session on 25 years of Conferences for African-American Researchers in the Mathematical Sciences (CAARMS times 25), I

8:00 AM – 10:50 AM **Room 314, BCC**

Organizer: **William A. Massey**, Princeton University

9:00AM (13) *The Falconer Distance Set Problem.*
Xiumin Du, Institute for Advanced Study, **Larry Guth**, Massachusetts Institute of Technology, **Yumeng Ou**, The City University of New York, Baruch College, **Hong Wang**, Massachusetts Institute of Technology, **Bobby Wilson***, University of Washington, and **Ruixiang Zhang**, Institute for Advanced Study (1145-42-2034)

9:30AM ► (14) *Queueing Theory in the Age of Technology.*
Jamol Pender, Cornell University (Operations Research and Information Engineering) (1145-90-2235)

10:00AM (15) *Algorithms for Computing Tau Signatures.*
Alfred G Noel*, **Steven Glenn Jackson**, **Todor Milev** and **Thomas Folz-Donahue**, University of Massachusetts Boston (1145-22-675)

10:30AM (16) *Numerical and Analytic Study of Dynamic Materials.*
Suzanne L. Weekes, Worcester Polytechnic Institute (1145-65-2348)

AMS Special Session on A Showcase of Number Theory at Undergraduate Institutions, I

8:00 AM – 10:50 AM **Room 325, BCC**

Organizers: **Adriana Salerno**, Bates College
Lola Thompson, Oberlin College

8:00AM ► (17) *Rank and Bias in Families of Curves via Nagao's Conjecture.* Preliminary report. **Steven J Miller**, Williams College (1145-11-1207)

8:30AM ► (18) *On a Frobenius problem for integral domains.* Preliminary report. **Ricardo Conceição***, Gettysburg College, and **Rodrigo Gondim**, UFPE - Brazil (1145-11-2892)

9:00AM ► (19) *Factoring* $m^2 + 1$. Preliminary report. **Marc Chamberland*** and **Eugene Herman**, Grinnell College (1145-11-797)

9:30AM (20) *Almost Prime Components in Apollonian Circle Packings.* Preliminary report. **Holley Friedlander***, Dickinson College, **Elena Fuchs**, University of California, Davis, **Piper H**, University of Hawaii at Manoa, **Catherine Hsu**, University of Bristol, **Katherine Sanden**, University of California, Davis, **Damaris Schindler**, Utretch University, and **Katherine Stange**, University of Colorado, Boulder (1145-11-2633)

10:00AM (21) *Non-abelian generalizations of the Cohen-Lenstra heuristics.* **Michael R. Bush***, Washington and Lee University, **Nigel Boston**, University of Wisconsin, Madison, and **Farshid Hajir**, University of Massachusetts, Amherst (1145-11-2189)

10:30AM ► (22) *Quadratic relations between Feynman integrals.* **David P. Roberts**, University of Minnesota Morris (1145-11-633)

AMS Special Session on Analysis of Fractional, Stochastic, and Hybrid Dynamic Systems with Applications, I

8:00 AM – 10:50 AM **Room 328, BCC**

Organizers: **John R. Graef**, University of Tennessee at Chattanooga
G. S. Ladde, University of South Florida
A. S. Vatsala, University of Louisiana at Lafayette

8:00AM (23) *Existence of local solutions for a fractional difference equation with Dirichlet boundary conditions.* **Johnny Henderson**, Baylor University (1145-39-65)

8:30AM ► (24) *Coercive Nonlocal Elements in Fractional Differential Equations.* **Christopher S. Goodrich**, Creighton Preparatory School (1145-34-2141)

9:00AM (25) *Nonlinear Caputo Impulsive Fractional Differential Equations and Generalized Monotone Method.* Preliminary report. **Yunxiang Bai*** and **Aghalaya S Vatsala**, University of Louisiana at Lafayette (1145-34-743)

9:30AM (26) *Defect formation probability in stochastic models of Ising type.* **Nathan Hayford*** and **Razvan Teodorescu**, University of South Florida (1145-60-2451)

10:00AM (27) *Boundary value problems for a fractional differential inclusion with a Hadamard type derivative.* **John R Graef**, University of Tennessee at Chattanooga (1145-34-1064)

10:30AM (28) *On Two Fractional q-Derivative Inclusions.* Preliminary report. **S. Melike Aydogan**, Istanbul Technical University (1145-49-80)

AMS Special Session on Commutative Ring Theory: Research for Undergraduate and Early Graduate Students, I

8:00 AM – 10:50 AM **Room 320, BCC**

Organizers: **Nicholas Baeth**, Franklin and Marshall College
Branden Stone, Hamilton College

8:00AM ► (29) *Depths of Powers of Ideals and the Power of Depth of Understanding Algebra.* **Susan Morey**, Texas State University (1145-13-1004)

8:30AM ► (30) *Algebraic Invariants and Symbolic Powers of Edge Ideals.* **Joseph W Skelton**, Tulane University (1145-13-1759)

9:00AM ► (31) *The index of stability: a project for undergraduate students.* **Janet Striuli***, National Science Foundation, **Corey Brooke**, University of Oregon, **Molly Hoch**, Wellesley College, **Sabrina Lato**, University of Waterloo, and **Bryan Wang**, University of California Berkeley (1145-13-1670)

9:30AM ► (32) *Associated Primes of h-Wheels and Other Graphs.* **Corey Brooke**, University of Oregon (1145-13-1622)

10:00AM ► (33) *Trace Ideals and the Gorenstein Property.* **H. Lindo*** and **N Pande**, Williams College (1145-13-1849)

10:30AM ► (34) *Graphs and Commutative Rings.* **Joe A. Stickles, Jr.**, Millikin University, Decatur, IL (1145-13-1060)

AMS Special Session on Financial Mathematics, I

8:00 AM – 10:50 AM **Room 338, BCC**

Organizers: **Maxim Bichuch**, Johns Hopkins University
Anja Richter, Baruch College, City University of New York
Stephan Sturm, Worcester Polytechnic Institute

8:00AM (35) *Machine-Learning Hidden Markov Model for Global Stock Portfolio.* Preliminary report.
Nguyet N Nguyen, Youngstown State University (1145-03-2435)

8:30AM (36) *Low-dimensional analysis of financial markets.*
Nitish Bahadur and **Randy Paffenroth***, Worcester Polytechnic Institute (1145-62-1559)

9:00AM ► (37) *Deep Learning-Based Numerical Methods for High-Dimensional Parabolic PDEs and Forward-Backward SDEs.* Preliminary report.
Jiequn Han, Department of Mathematics, Princeton University (1145-65-1173)

9:30AM (38) *The data-driven Schrödinger bridge.*
Giulio Trigila, Baruch College, City University of New York (1145-62-706)

10:00AM (39) *The Learning Premium.*
Maxim Bichuch*, Johns Hopkins University, and **Paolo Guasoni**, Boston University and Dublin City University (1145-91-1803)

10:30AM (40) *Nonlinear Filtering and Non-Markov Control in Financial Portfolio Optimization.*
Andrew Papanicolaou, NYU Tandon (1145-60-700)

AMS Special Session on Geometry Labs United: Research, Visualization, and Outreach, I

8:00 AM – 10:50 AM **Room 326, BCC**

Organizers: **Marianne Korten**, Kansas State University
Sean Lawton, George Mason University
Anton Lukyanenko, George Mason University

8:00AM ► (41) *Geometry Labs United: Welcome and Overview.*
Sean Lawton* and **Anton Lukyanenko**, George Mason University (1145-00-1291)

9:00AM ► (42) *The near-peer mathematical mentoring cycle: studying the impacts of outreach.*
Aaron T. Wilson, University of Texas Rio Grande Valley (1145-97-1358)

9:30AM ► (43) *3D Printing for outreach at the UIC Mathematical Computing Laboratory.* Preliminary report.
Edgar A. Bering IV, Temple University (1145-00-1359)

10:00AM ► (44) *Rice Geometry Lab.*
Arindam Roy, University of North Carolina, Charlotte (1145-00-2064)

10:30AM ► (45) *LoG(M): making connection and community natural at Michigan.*
Harrison Bray* and **Mark Greenfield**, University of Michigan (1145-97-1315)

AMS Special Session on Hopf Algebras and Tensor Categories, I

8:00 AM – 10:50 AM **Room 318, BCC**

Organizers: **Siu-Hung Ng**, Louisiana State University
Julia Plavnik, Texas A&M University
Henry Tucker, University of California, San Diego

8:00AM (46) *On classification of semisimple Hopf algebras of dimension* 2^n.
Yevgenia Kashina, DePaul University (1145-17-2516)

8:30AM (47) *On actions of Drinfel'd doubles on finite dimensional algebras.*
Zachary Cline, Temple University (1145-81-2440)

9:00AM (48) *On the bijectivity of the antipode and serial quantum groups.* Preliminary report.
Miodrag C Iovanov, University of Iowa (1145-16-2912)

9:30AM (49) *The Jacobian, Reflection Arrangement, and Discriminant for Reflection Hopf Algebras.* Preliminary report.
Ellen E Kirkman*, Wake Forest University, and **James J Zhang**, University of Washington, Seattle (1145-16-2043)

10:00AM (50) *A description of the relative Serre functor for comodule algebras.*
Kenichi Shimizu, Shibaura Institute of Technology (1145-18-1652)

10:30AM (51) *Frobenius-Perron Theory of Modified ADE Bound Quiver Algebras.*
Elizabeth Wicks, University of Washington (1145-16-637)

AMS Special Session on How to Guard an Art Gallery and Other Discrete Mathematical Adventures (In Memory of T. S. Michael, 1960 to 2016), I

8:00 AM – 10:45 AM **Room 345, BCC**

Organizers: **Joseph Bonin**, The George Washington University
Carolyn Chun, US Naval Academy
Nancy Neudauer, Pacific University

8:00AM ► (52) *The combinatorics of evenly spaced binomial coefficients.* Preliminary report.
Nicholas A. Loehr*, Virginia Tech Department of Mathematics, and **T. S. Michael**, United States Naval Academy (1145-05-612)

8:30AM ► (53) *Binomial proofs of fundamental results in geometry.*
Will Traves, United States Naval Academy (1145-51-615)

9:00AM (54) *Generalization of combinatorial partition identities via topology and geometry.* **Justin Allman**, US Naval Academy (1145-05-218)

9:30AM (55) *How to vertex color acyclic digraphs and what is it good for?* **Geir Agnarsson**, George Mason University (1145-05-688)

10:00AM (56) *T.S. Michael and his Mathematics.* **Richard A Brualdi**, University of Wisconsin-Madison (1145-05-1016)

AMS Special Session on Mappings on Metric and Banach Spaces with Applications to Fixed Point Theory, I

8:00 AM – 10:50 AM **Room 347, BCC**

Organizers: **Torrey M. Gallagher**, Bucknell University

Christopher J. Lennard, University of Pittsburgh

8:00AM (57) *Results in the Theory of Fixed Point Free Mappings.* **Adam Stawski**, University of PIttsburgh (1145-46-1535)

8:30AM (58) *Weak Compactness and the Fixed Point Property.* **Pamela I. Delgado**, University of Pittsburgh (1145-46-2177)

9:00AM (59) *Some Geometric Properties characterized by Fixed Point Theorems.* **Maria Angeles Japon**, Sevilla University (Spain) (1145-46-1329)

10:00AM (60) *Existence of shift basic sequences and its implications in metric fixed point theory.* **Cleon S. Barroso**, Federal University of Ceará (UFC) (1145-46-1840)

10:30AM (61) *Recent results for mean nonexpansive mappings.* **Torrey M Gallagher**, Bucknell University (1145-47-2670)

AMS Special Session on Natural Resources Modeling, I

8:00 AM – 10:50 AM **Room 336, BCC**

Organizers: **Julie Blackwood**, Williams College

Shandelle M. Henson, Andrews University

8:00AM ► (62) *Evolutionary adaptation of cannibalism in fluctuating environments.* Preliminary report. **Jim Cushing***, Department of Mathematics and Interdisciplinary Program in Applied Mathematics, University of Arizona, and **Shandelle Henson**, Departments of Mathematics and Biology, Andrews University (1145-92-1129)

8:30AM (63) *Comparison of adaptive and optimal control illustrated with pest management.* Preliminary report. **Christina Joy Edholm***, University of Tennessee, Knoxville, **Chris Guiver**, University of Bath, **Brigitte Tenhumberg**, University of Nebraska-Lincoln, **Stuart Townley**, The University of Exeter, and **Richard Rebarber**, University of Nebraska-Lincoln (1145-49-1134)

9:00AM ► (64) *Assessing the Economic Tradeoffs Between Prevention and Suppression of Forest Fires.* **Suzanne Lenhart**, University of Tennessee and NIMBioS (1145-92-347)

9:30AM ► (65) *Sensitivity analysis of the recovery time for a population under the impact of an environmental disturbance.* **Azmy Ackleh**, University of Louisiana at Lafayette, **Hal Caswell**, Woods Hole Oceanographic Institution, **Ross Chiquet**, University of Louisiana at Lafayette, **Tingting Tang***, University of Notre Dame, and **Amy Veprauskas**, University of Louisiana at Lafayette (1145-92-1604)

10:00AM ► (66) *Data Driven Models of Pathogen Competition in Gypsy Moth Populations.* Preliminary report. **E E Goldwyn**, University of Portland (1145-92-2445)

10:30AM (67) *The effect of prey evolution on predator-prey dynamics.* Preliminary report. **Azmy S. Ackleh**, Professor of Mathematics and Dean, R.P. Authement College of Sciences, **Md Istiaq Hossain***, Graduate Student (PhD), Department of Mathematics, and **Amy Veprauskas**, Assistant Professor, Department of Mathematics (1145-37-1200)

AMS Special Session on New Directions in the Theory of Complex Multiplication, I

8:00 AM – 10:45 AM **Room 321, BCC**

Organizers: **Henri Darmon**, McGill University

Samit Dasgupta, University of California, Santa Cruz

Benedict Gross, Harvard University

8:00AM (68) *Algebraic cycles and L-functions: a relative trace formula approach.* **Wei Zhang**, Massachusetts Institute of Technology (1145-11-398)

9:00AM (69) *On the classes of Heegner-Drinfeld cycles.* **Zhiwei Yun*** and **Wei Zhang**, MIT (1145-11-1788)

10:00AM (70) *Intersections of Heegner-Drinfeld cycles.* **Ari Shnidman**, CCR-Princeton (1145-11-1313)

AMS Special Session on Nonlinear Evolution Equations and Their Applications, I

8:00 AM – 10:50 AM **Room 331, BCC**

Organizers: **Mingchao Cai**, Morgan State University
Gisele Mophou Loudjom, University of French West Indies, Guadeloupe, France
Gaston N'Guerekata, Morgan State University
Alexander Pankov, Morgan State University
Xuming Xie, Morgan State University
Guoping Zhang, Morgan State University

8:00AM (71) *Traveling waves in Fermi-Pasta-Ulam lattices with non-local interaction.* **Alexander Pankov**, Morgan State University (1145-35-371)

8:30AM (72) *On the energy decay rates for the 1D damped fractional Klein-Gordon equation.* **Milena Stanislavova*** and **Satbir Malhi**, University of Kansas (1145-35-556)

9:00AM ► (73) *Stable and unstable compact support solutions of non-Lipschitz evolution problems.* Preliminary report. **Yavdat Ilyasov**, Institute of Mathematics of RAS, Ufa, Russia; Instituto de Matematica e Estatistica Universid Federal de Goias, Brazil (1145-35-533)

9:30AM (74) *On the ground states of the Ostrovskyi equation and their stability.* **Atanas Stefanov*** and **Iurii Posukhovskyi**, University of Kansas (1145-35-402)

10:00AM (75) *Stability of multidimensional fronts via exponentially weighted spaces.* **Yuri Latushkin**, University of Missouri Columbia (1145-35-379)

10:30AM (76) *Fronts for the SQG Equation.* **John K. Hunter**, **Jingyang Shu*** and **Qingtian Zhang**, University of California at Davis (1145-35-131)

AMS Special Session on Numerical Methods for PDEs and Applications, I

8:00 AM – 10:50 AM **Room 330, BCC**

Organizers: **Wenrui Hao**, Pennsylvania State University
Qingguo Hong, Pennsylvania State University
Jinchao Xu, Pennsylvania State University

8:00AM ► (77) *Automated Modeling with FEniCS.* **L. Ridgway Scott**, University of Chicago (1145-65-1250)

9:00AM (78) *An adaptive rescaling scheme for moving interface problems.* **Shuwang Li**, Illinois Institute of Technology, Chicago IL (1145-65-439)

9:30AM (79) *Central and Central Discontinuous Galerkin (DG) Schemes on Overlapping Cells of Unstructured Grids for Solving Ideal MHD Equations with Globally Divergence-Free Magnetic Field.* **Zhiliang Xu**, Applied and Computational Mathematics and Statistics Department, University of Notre Dame (1145-65-1975)

10:00AM (80) *Preconditioners and solvers for Biot's model.* **Mingchao Cai**, Morgan State University (1145-65-929)

10:30AM (81) *The finite element conditioning on a class of anisotropic meshes.* **Hengguang Li***, Wayne State University, and **Xun Lu**, Xiangtan University (1145-65-778)

AMS Special Session on Optimal Methods in Applicable Analysis: Variational Inequalities, Low Rank Matrix Approximations, Systems Engineering, Cyber Security, I

8:00 AM – 10:50 AM **Room 329, BCC**

Organizers: **Aritra Dutta**, King Abdullah University of Science and Technology, Saudi Arabia
Ram Mohapatra, University of Central Florida
Gayatri Pany, Singapore University of Technology and Design, Singapore
Nabin Kumar Sahu, Dhirubhai Ambani Institute of Information and Communication Technology, India

8:00AM ► (82) *A fast weighted singular value thresholding method.* Preliminary report. **Aritra Dutta**, Abdullah University of Science and Technology, and **Xin Li***, University of Central Florida, Orlando, FL 32816 (1145-15-2681)

8:30AM ► (83) *Ways to Avoid Low Rank and Nearly Low Rank Predictors without Throwing Away Data.* Preliminary report. **Aaron Carl Smith**, Seminole County Public Schools (1145-62-136)

9:00AM (84) *Solution of ill-posed linear inverse problems using over-complete dictionaries under non-gaussian noise.* **Pawan K Gupta*** and **Marianna Pensky**, University of Central Florida (1145-49-1775)

9:30AM (85) *Fixed Point Theorems on Partially Ordered Banach Spaces and Their Applications.* **Jinlu Li**, Shawnee State University (1145-49-389)

10:00AM (86) *Some Results on Nonlinear Mixed Variational-like Inequalities.*
Sabyasachi Pani, School of Basic Sciences, Indian Institute of Technology Bhubaneswar, Bhubaneswar-752050, India (1145-49-2240)

10:30AM (87) *A system of multivariate variational inequalities and the existence of its solutions in Banach spaces.*
Nabin Kumar Sahu, Dhirubhai Ambani Institute of Information and Communication Technology, Gandhinagar, Gujarat, India (1145-49-2201)

AMS Special Session on Quaternions, I

8:00 AM – 10:50 AM **Room 319, BCC**

Organizers: **Terrence Blackman**, Medgar Evers College, City University of New York

Johannes Familton, Borough of Manhattan Community College, City University of New York

Chris McCarthy, Borough of Manhattan Community College, City University of New York

8:00AM (88) *Involutions of groups of type G_2 over fields.*
John Hutchens*, Winston-Salem State University, and **Nathaniel Schwartz**, Washington College (1145-20-93)

8:30AM ► (89) *Using quaternions to prove theorems in spherical geometry.*
Marshall A Whittlesey, California State University San Marcos (1145-51-232)

9:00AM (90) *Edge-minimal Graphs with Given Generalized Quaternion Automorphism Group.* Preliminary report.
Lindsey-Kay Lauderdale*, Towson University, **Christina Graves** and **Stephen Graves**, University of Texas at Tyler (1145-05-474)

9:30AM (91) *Generalized twistor spaces of quaternionic manifolds.* Preliminary report.
Justin Sawon, University of North Carolina - Chapel Hill (1145-53-77)

10:00AM (92) *Macfarlane hyperbolic 3-manifolds.*
Joseph A Quinn, National Museum of Mathematics (1145-57-240)

10:30AM (93) *Spectral correspondences for Maass waveforms on quaternion groups.*
Terrence Richard Blackman, Medgar Evers College, CUNY (1145-11-2949)

AMS Special Session on Recent Advancements in Mathematical Modeling of Cancer, I

8:00 AM – 10:45 AM **Room 337, BCC**

Organizers: **Kamila Larripa**, Humboldt State University

Hwayeon Ryu, University of Hartford

8:00AM (94) *Modeling Tumor Immune Dynamics in Multiple Myeloma.*
Marissa Renardy*, University of Michigan, **Jill Gallaher**, H. Lee Moffitt Cancer Center and Research Institute, **Diana White**, Clarkson University, **Nessy Tania**, Smith College, **Blerta Shtylla**, Pomona College, **Helen Moore**, AstraZeneca, **Karen Wood**, University of California, Irvine, **Kamila Larripa**, Humboldt State University, and **Urszula Ledzewicz**, Southern Illinois University (1145-92-238)

9:00AM ► (95) *Mathematical Models to Guide Cancer Therapy.*
Robert Gatenby, Moffitt Cancer Center (1145-92-1108)

10:00AM (96) *Mathematical models of cancer evolution through Moran processes with migration.*
Jesse Kreger*, **Natalia L. Komarova** and **Dominik Wodarz**, University of California, Irvine (1145-92-1126)

AMS Special Session on Recent Advances and Trends in Computable Structure Theory (in honor of J. Remmel), I

8:00 AM – 10:50 AM **Room 344, BCC**

Organizers: **Jennifer Chubb**, University of San Francisco

Tim McNicholl, Iowa State University

8:00AM (97) *Computability and complexity in structure theory: the work of Jeffrey B. Remmel.*
Douglas Cenzer, University of Florida (1145-03-484)

9:00AM (98) *Effectively categorical structures.*
Valentina Harizanov, George Washington University (1145-03-1607)

9:30AM (99) *Complexity of Scott sentences.*
Rachael Alvir, **Julia F. Knight***, University of Notre Dame, and **Charles McCoy**, University of Portland (1145-03-998)

10:00AM (100) *Model completeness and relative decidability of countable structures.*
Jennifer Chubb, University of San Francisco, **Russell Miller***, Queens College & CUNY Graduate Center, and **Reed Solomon**, University of Connecticut (1145-03-1244)

10:30AM (101) *The Hanf Number for Scott Sentences of Computable Structures.*
Sergey S. Goncharov, Sobolev Institute of Mathematics, Novosibirsk, Russia, **Julia F. Knight**, University of Notre Dame, Notre Dame, IN 46556, USA, and **Ioannis Souldatos***, University of Detroit Mercy (1145-03-460)

AMS Special Session on Recent Advances in Regularity Lemmas, I

8:00 AM – 10:45 AM **Room 346, BCC**

Organizers: **Gabriel Conant**, University of Notre Dame
Rehana Patel
Julia Wolf, University of Bristol, UK

8:00AM (102) *A Tight Bound for Hypergraph Regularity.*
Guy Moshkovitz*, Institute for Advanced Study, and **Asaf Shapira**, Tel Aviv University (1145-05-912)

8:30AM ► (103) *Model theory and hypergraph regularity.*
Artem Chernikov, University of California, Los Angeles (1145-03-1452)

9:30AM (104) *Irregular Pairs in Structures with Bounded VC Dimension.*
Nate Ackerman, Harvard University (1145-03-1150)

10:00AM (105) *Algorithmic barriers to representing conditional independence in sequences and arrays.*
Daniel M Roy*, University of Toronto, **Cameron E. Freer**, MIT, **Jeremy Avigad**, Carnegie Mellon University, **Nathanael L. Ackerman**, Harvard University, and **Jason M. Rute**, Penn State University (1145-03-1663)

MAA Invited Paper Session on Building Successful Communities in Mathematics

8:00 AM – 10:50 AM **Room 323, BCC**

Organizer: **Deanna Haunsperger**, Carleton College

8:00AM ► (106) *MAA Project NExT: A community for new faculty.*
David T. Kung*, Saint Mary's College of Maryland, and **Alissa S. Crans**, Loyola Marymount University (1145-AJ-71)

8:30AM ► (107) *Women in Numbers: A research community.*
Michelle Manes, University of Hawaii / National Science Foundation (1145-AJ-72)

9:00AM ► (108) *EDGE: Building a thriving community of women mathematicians.* Preliminary report.
Raegan Higgins*, Texas Tech University, and **Ami Radunskaya**, Pomana College (1145-AJ-75)

9:30AM ► (109) *Successful Section?*
Judith Covington, Northwestern State University Louisiana (1145-AJ-70)

10:00AM (110) *Advancing Research on Undergraduate Mathematics Education.*
Stacy A. Brown, Cal Poly Pomona (1145-AJ-68)

10:30AM ► (111) *Building a national mentoring community.*
David Goldberg*, Purdue University Mathematics and the Math Alliance, and **Philip C Kutzko**, University of Iowa (1145-AJ-66)

MAA Invited Paper Session on Trends in Mathematical and Computational Biology

8:00 AM – 10:50 AM **Room 317, BCC**

Organizers: **Timothy Comar**, Benedictine University
Alicia Prieto Langarcia, Youngstown State University
Raina Robeva, Sweet Briar College

8:00AM ► (112) *A mathematical model of tumorigenesis.* Preliminary report.
Kamel Lahouel*, Postdoc, Johns Hopkins University, The Center for Imaging Science, **Donald Geman**, **Laurent Younes**, Professor, Department of Applied Mathematics and Statistics, Johns Hopkins University, and **Cristian Tomasetti**, Associate Professor, Department of Biostatistics, Johns Hopkins University (1145-AA-2632)

8:30AM ► (113) *On the Collective Dynamics of Coupled Morris-Lecar Neurons.*
Shelby N Wilson, Morehouse College (1145-AA-2626)

9:00AM ► (114) *Modeling and Simulation for Drug Development.*
Anita T Layton, Departments of Applied Mathematics, Pharmacy, and Biology, University of Waterloo (1145-AA-1734)

9:30AM ► (115) *Identifying Biologically Relevant Structures: From Clustering to Manifold Learning.*
Jeff Knisley*, East Tennessee State University, and **Debra Knisley**, Easedis (1145-AA-1837)

10:00AM ► (116) *Mathematical and statistical approaches for forecasting Infectious Disease Epidemics Using Dynamic Modeling.*
Gerardo Chowell, Georgia State University School of Public Health (1145-AA-2641)

10:30AM ► (117) *Mathematical -Omics Models in Error-Prone Data Regimes.*
Mario Banuelos*, California State University, Fresno, **Suzanne Sindi** and **Roummel F Marcia**, University of California, Merced (1145-AA-2567)

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

8:00 AM – 10:25 AM **Room 312, BCC**

8:00AM (118) *Critical multipliers via second-order generalized differentiation of a subclass of piecewise linear-quadratic functions.* Preliminary report.
Boris Mordukhovich, Wayne State University, **Ebrahim Sarabi**, Miami University, and **Hong Do***, Wayne State University (1145-49-2466)

8:15AM (119) *An approximate method for solving variational problems.*
Mohsen Razzaghi, Mississippi State University (1145-49-772)

8:30AM (120) *Optimal Control of One-Phase Free Boundary Problems in Multiple Space Dimensions.*
Ugur Abdulla and **Jonathan Goldfarb***, Florida Institute of Technology (1145-49-2889)

8:45AM (121) *On the Optimal Control of the Multiphase Free Boundary Problems for Nonlinear Parabolic Equations.* Preliminary report.
Ugur G Abdulla and **Evan Cosgrove***, Florida Institute of Technology (1145-49-605)

9:00AM (122) *Breast Cancer Detection through Electrical Impedance Tomography and Optimal Control Theory: Theoretical and Computational Analysis.*
Ugur Abdulla, **Vladislav Bukshtynov** and **Saleheh Seif***, Florida Institute of Technology (1145-49-611)

9:15AM (123) *Switching Dynamics in Liquid Crystals.*
Tiziana Giorgi, New Mexico State University, **Sookyung Joo**, Old Dominion University, and **Lidia Mrad***, University of Arizona (1145-49-2932)

9:30AM (124) *Examining the Relative Density of Two Lipid Types to Determine if Solutions to a Phase Separation Problem Are Geodesic Disks.*
Michael Barg and **Amanda J Mangum***, Niagara University (1145-49-2850)

9:45AM (125) *Using Numerical Solutions of the Geodesic Equations to Determine Sizes and Shapes of Strongly Separated Lipid Patches in Equilibrium.*
Michael C. Barg* and **Amanda J. Mangum**, Niagara University (1145-49-2865)

10:00AM ► (126) *Optimization of Student Loans using Euler-Lagrange Equation.* Preliminary report.
Reecha Upadhyay* and **Arundhati Bagchi Misra**, Saginaw Valley State University (1145-49-2283)

10:15AM ► (127) *Optimizing Compositions of Popular Pharmaceutical Drugs.* Preliminary report.
David Shoup, Alvernia University (1145-49-1476)

AMS Contributed Paper Session on Fluid Mechanics

8:00 AM – 10:40 AM **Room 311, BCC**

8:00AM (128) *Interfacial Waves Between Two Fluids With a Shear Flow.*
Stephanie A. Blanda, Lebanon Valley College (1145-76-1610)

8:15AM (129) *Linear Stability Analysis of a Hydrodynamic Problem in the Absence of Dissipation.*
Dania Sheaib, University of Oklahoma (1145-76-1675)

8:30AM (130) *Diffusion of Passive Tracers Advected by Laminar Shear Flow in Triangular Capillary Pipes.*
Francesca Bernardi*, Florida State University, **Roberto Camassa**, **Gabrielle M Hobson** and **Richard M McLaughlin**, University of North Carolina at Chapel Hill (1145-76-2133)

8:45AM (131) *Rake or Sieve: modelling flow past an array of rigid hairs.*
Kaitlyn Hood*, **M.S. Suryateja Jammalamadaka** and **A. E. Hosoi**, MIT (1145-76-2603)

9:00AM (132) *Dissipation enhancement by mixing.*
Yuanyuan Feng, Carnegie Mellon University (1145-76-2792)

9:15AM ► (133) *Flow of cement slurry in a vertical pipe.*
Chengcheng Tao*, **Barbara Kutchko** and **Mehrdad Massoudi**, U.S. Department of Energy, National Energy Technology Laboratory (NETL) (1145-76-403)

9:30AM (134) *Extensions of the Immersed Interface Method to Open Interfaces and Hemodynamic Models.*
Sarah Elizabeth Ritchey Patterson, Duke University (1145-76-1406)

9:45AM (135) *A new preconditioning technique for fluid-structure interaction problems with applications in biomechanics.*
Guoyi Ke*, Department of Mathematics and Physical Sciences, Louisiana State University of Alexandria, **Sara Calandrini** and **Eugenio Aulisa**, Department of Mathematics and Statistics, Texas Tech University (1145-76-2185)

10:00AM (136) *Modal analyses on transitional boundary layer.*
Yong Yang, West Texas A&M University (1145-76-2615)

10:15AM (137) *Swimming Near a Solid Wall in a Brinkman fluid.* Preliminary report.
Nguyenho Ho, Bridgewater State University (1145-76-2438)

10:30AM (138) *An investigation of different hydrological models.*
Anh Bui, Smith College (1145-76-3031)

AMS Contributed Paper Session on Group Theory and Generalizations

8:00 AM – 9:55 AM **Room 333, BCC**

8:00AM (139) *The Schur-Zassenhaus Theorem: Its Origin, Development, and Extension.*
Joseph Kirtland, Marist College (1145-20-296)

8:15AM (140) *The Chermak-Delgado lattice of a 2-nilpotent product.* Preliminary report.
Arturo Magidin, University of Louisiana at Lafayette (1145-20-2368)

8:30AM (141) *A generalization of the Chermak-Delgado lattice to words in two variables.*
Luise-Charlotte Kappe*, Binghamton University, and **Elizabeth Wilcox**, State University of New York at Oswego (1145-20-849)

8:45AM ► (142) *Intersections of maximal subgroups of finite groups.* Preliminary report.
Kassie Archer, **Humberto Bautista Serrano***, University of Texas at Tyler, **Kayla Cook**, Kilgore College, **Lindsey-Kay Lauderdale**, Towson University, **Yansy Perez**, University of Texas at Tyler, and **Vincent Villalobos**, University of Illinois at Urbana-Champaign (1145-20-2182)

9:00AM ► (143) *The Powerful Subgroup Covering Number of Dihedral 2-Groups.* Preliminary report.
Risto Atanasov, **Adam Gregory***, **Luke Guatelli** and **Andrew Penland**, Western Carolina University (1145-20-2121)

9:15AM ► (144) *The upper central series of the maximal p-subgroup of a group of automorphisms.*
María A. Aviñó-Díaz, Instituto Tecnológico de Estudios Superiores Monterrey, **Phill Schultz**, The University of Western Australia, and **Marcos Zyman***, The City University of New York-BMCC (1145-20-2416)

9:30AM (145) *Computational algebraic geometry theory for chemical structures.* Preliminary report.
Javad Namazi, Fairleigh Dickinson University, **Ali Moghani***, The College of New Rochelle, and **John Najarian**, William Paterson University (1145-20-750)

9:45AM ► (146) *On the Saxl graphs of a family of permutation groups.*
Joanna B Fawcett, Imperial College London, and **Chase P Vogeli***, Massachusetts Institute of Technology (1145-20-2502)

AMS Contributed Paper Session on Mathematical Physics and Related Topics

8:00 AM – 10:10 AM **Room 313, BCC**

8:00AM (147) *Estimates of Pure Point Spectra and Spectral Functions for a Lowest-order Hamiltonian as an Unbounded Self-Adjoint Operator formed from the sum of a Gravitational and a Harmonic Dark Potential.*
Michael A. Maroun, Boston, MA (1145-81-2383)

8:15AM (148) *Spectral Properties of Quantum Circulant Graphs.*
Erica K. Swindle, Baylor University (1145-81-2509)

8:30AM (149) *A short proof of Anderson localization for the 1-d Anderson model.*
Svetlana Jitomirskaya and **Xiaowen Zhu***, University of California (1145-81-3021)

8:45AM (150) *Direct Methods for Investigating Phase Transitions in Classical Models of Kac Type.*
Assane Lo, University of Wollongong in Dubai (1145-82-84)

9:00AM (151) *Slow transport in some one-dimensional disordered many-body systems.* Preliminary report.
Bruno Nachtergaele* and **Jake Reschke**, University of California, Davis (1145-82-1737)

9:15AM (152) *Integrating Factors for Dirac-Schrodinger Operators and Positive Mass Theorems Outside Horizon(s).* Preliminary report.
Robert J Abramovic, Farmingdale State College (1145-83-1799)

9:30AM (153) *Classical and quantum singularities in self-similar solutions of Einstein's equations.*
Deborah A Konkowski*, U.S. Naval Academy, **Thomas M Helliwell**, Harvey Mudd College, and **J Williams**, U.S. Naval Academy (1145-83-2672)

9:45AM ► (154) *Discontinuous Fronts as Exact Solutions to Precipitating Quasi-Geostrophy.*
Alfredo N. Wetzel*, **Leslie M. Smith** and **Samuel N. Stechmann**, University of Wisconsin-Madison (1145-86-2541)

10:00AM ► (155) *Numerical Methods for Potential Vorticity Inversion with Phase Changes.*
Chung-Nan Tzou* and **Samuel Stechmenn**, University of Wisconson - Madison (1145-86-2644)

AMS Contributed Paper Session on Mathematics Education

8:00 AM – 8:55 AM **Room 334, BCC**

8:00AM ► (156) *Competitive math problems made simple.* Preliminary report.
Steven W Davis, Anaheim, California (1145-00-2)

8:15AM ► (157) *Exploring Open Educational Resources for Precalculus.* Preliminary report.
Keneth Allen Horwitz, New Jersey Institute of Technology (1145-97-705)

8:30AM ► (158) *Assessing a curriculum for Calculus II with Bayesian networks.* Preliminary report.
Yasanthi Kottegoda*, University of New Haven, and **Lochana Siriwardena**, University of Indianapolis (1145-97-1233)

8:45AM ► (159) *The Daily Question: Building Student Trust and Interest in Undergraduate Introductory Probability and Statistics Courses.*
Matthew A Hawks, United States Naval Academy (1145-97-2301)

AMS Contributed Paper Session on Order, Lattices, and Logic

8:00 AM – 10:10 AM **Room 335, BCC**

8:00AM ► (160) *The Lattice Data Analytics Toolkit.* Preliminary report.
L. Markowsky* and **G. Markowsky**, Missouri University of Science and Technology (1145-06-2701)

8:15AM (161) *Lattice Data Analytics: Adding Understanding to Machine Learning.* Preliminary report.
G. Markowsky* and **L. Markowsky**, Missouri University of Science & Technology (1145-06-2799)

8:30AM ► (162) *The Real Numbers as Completions of Linearly Ordered Sets: A Constructive Study.*
Jean S. Joseph, West Palm Beach, FL (1145-06-1614)

8:45AM (163) *Random walks vs Spoke Hub distribution models on a Lattice Basis Reduction under a projective special linear group* $PSL_2(q)$.
Bal K. Khadka*, Georgia Military College-Augusta, and **Spyros Magliveras**, Florida Atlantic University Boca Raton (1145-06-2804)

9:00AM (164) *Correlation immune functions with respect to the q-transform.*
Ting Gu, Elizabethtown College (1145-06-1936)

9:15AM (165) *Jonathan Farley's Mathematical Terror Theory: The Structure of Perfect Terrorist Cells with a Single Leader.*
Zeinab Bandpey, Morgan State University (1145-06-2079)

9:30AM ► (166) *A Formally Verified Proof of the Central Limit Theorem.*
Luke S. Serafin, Carnegie Mellon University (1145-03-59)

9:45AM (167) *Relative complexities of various homeomorphic equivalent relations on closed subsets of* $[0,1]^n$. Preliminary report.
C Chang*, Mercy College, and **S Gao**, University of North Texas (1145-03-2389)

10:00AM (168) *Sheaf Representation of De Morgan Algebras.*
Gezahagne Mulat Addis, Department of Mathematics, University of Gondar (1145-06-509)

MAA Contributed Paper Session on Discrete Mathematics in the Undergraduate Curriculum - Ideas and Innovations in Teaching, I

8:00 AM – 10:55 AM **Room 305, BCC**

Organizers: **John Caughman**, Portland State University
Oscar Levin, University of Northern Colorado
Elise Lockwood, Oregon State University

9:00AM ► (169) *Proofs? But I Can't Do Proofs!*
Kristi Meyer, Wisconsin Lutheran College (1145-C5-2452)

9:20AM ► (170) *An easy proof of quadratic reciprocity for an undergraduate number theory course.*
Brant Jones, James Madison University (1145-C5-1858)

9:40AM ► (171) *Implementing a capstone project in an introduction to proof course.* Preliminary report.
Leah Childers, Pittsburg State University (1145-C5-564)

10:00AM ► (172) *Group Work in a Discrete Mathematics Course with Proof-Writing.* Preliminary report.
Emily J. Olson, Millikin University (1145-C5-2654)

10:20AM ► (173) *Using an open source platform like Scilab or Octave as a framework to introduce students of discrete mathematics to computer programming.*
Mohamed Jamaloodeen, Georgia Gwinnett College (1145-C5-1969)

10:40AM ► (174) *Investigating the role of computing in solving counting problems: Four Python commands that correspond to four common problem types.*
Elise Lockwood, Oregon State University (1145-C5-824)

MAA Contributed Paper Session on Mathematics and the Arts, I

8:00 AM – 10:55 AM **Room 306, BCC**

Organizers: **Karl Kattchee**, University of Wisconsin-LaCrosse
Douglas Norton, Villanova University
Anil Venkatesh, Ferris State University

8:00AM ► (175) *Grid-Based Closed Paths from de Bruijn Sequences.* Preliminary report.
Karl Kattchee, University of Wisconsin-La Crosse (1145-D1-2896)

8:20AM ► (176) *Images Produced via Modular Multiplicative Inverses.*
Donald Spector, Hobart and William Smith Colleges (1145-D1-2617)

8:40AM ► (177) *Visualizing Integer Sequences.* Preliminary report.
Margaret Kepner, Washington, DC (1145-D1-2549)

9:00AM ► (178) *Darboven: Writing Time.*
Jennifer M Wilson, Lang College, The New School (1145-D1-2241)

9:20AM ► (179) *Arnold's Weak Resonance Equation in Modeling of Greek Ornamental Design.*
Faina Berezovskaya*, Mathematics Department, Howard University, Washington, DC 20059, USA, and **Georgiy Karev**, National Center for Biotechnology Information, NIH, Bethesda, MD 20894, USA (1145-D1-2494)

9:40AM ► (180) *Curve stitching as a two-dimensional density plot.*
John Nicholson, Austin Peay State University (1145-D1-1994)

10:00AM ► (181) *Three-dimensional Symmetries in Dance and Other Movement Arts.*
Karl H. Schaffer, De Anza College (1145-D1-2228)

10:20AM ► (182) *Unfolding Humanity: Burning Man Mathematics.* Preliminary report.
Satyan Devadoss* and **Diane Hoffoss**, University of San Diego (1145-D1-624)

10:40AM ► (183) *Finding the Way with More Mathematics.*
Susan A. McBurney, Western Springs, IL (1145-D1-1304)

MAA Contributed Paper Session on The Scholarship of Teaching and Learning in Collegiate Mathematics, I

8:00 AM – 10:55 AM **Room 322, BCC**

Organizers: **Tom Banchoff**, Brown University
Curtis Bennett, California State University, Long Beach
Pam Crawford, Jacksonville University
Jacqueline Dewar, Loyola Marymount University
Edwin Herman, University of Wisconsin-Stevens Point
Lew Ludwig, Denison University

9:20AM ► (184) *Getting Students on Track: experience with a newly developed self-paced online pre-calculus review course at The Catholic University of America.*
Anita M. Shagnea*, **Joshua L. Himmelsbach** and **Kiran R. Bhutani**, The Catholic University of America, Washington, DC (1145-E1-90)

9:40AM (185) *Mindset and Developmental Math: an Embedded Curricular Approach to Demystifying and Illuminating Mathematical Ideas.*
Yevgeniya Rivers, University of New Haven (1145-E1-3025)

10:00AM ► (186) *Improving success in introductory mathematics courses: A metacognitive growth approach.* Preliminary report.
Jane F. Reed, Ed.D.* and **Thomas W. Reed**, Seneca, South Carolina (1145-E1-2157)

10:20AM ► (187) *Transforming the Teaching and Learning in Introductory Statistics.* Preliminary report.
Megan J Breit-Goodwin, Anoka-Ramsey Community College (1145-E1-2656)

10:40AM ► (188) *A Detailed Analysis of Two Methods of Instruction in College Precalculus: The Pros and Cons for Students and Instructors.*
Aimee J Ellington, Virginia Commonwealth University (1145-E1-1260)

MAA Contributed Paper Session on Touch it, Feel it, Learn it: Tactile Learning Activities in the Undergraduate Mathematics Classroom, I

8:00 AM – 10:55 AM **Room 340, BCC**

Organizers: **Chris Oehrlein**, Oklahoma City Community College
Ann Trenk, Wellesley College
Laura Watkins, Glendale Community College

8:00AM (189) *Constructing with Zomes.*
Jonathan Needleman, Le Moyne College (1145-J1-908)

8:20AM ► (190) *Using the campus to connect accessibility to precalculus.* Preliminary report.
Melanie A Pivarski, Roosevelt University (1145-J1-2781)

8:40AM ► (191) *Developing more robust mathematical understanding utilizing manipulatives and variations of a single problem.*
Mercedes A. McGowen, Streamwood, Illinois (1145-J1-2500)

9:00AM ► (192) *Delving Deeper into Geometry through Purposeful Play.*
Teresa Deltz Magnus, Rivier University (1145-J1-1523)

9:20AM ► (193) *Modeling the Unit Circle in Precalculus.*
Sharon S. Emerson-Stonnell, Longwood University (1145-J1-1015)

9:40AM ► (194) *Decimals, Dilutions, DivisionS, without Division.* Preliminary report.
Anthony J. Macula, SUNY Geneseo (1145-J1-476)

10:00AM ► (195) *A Physical Number Line as a Support for Students' Work with Absolute Value Equations and Inequalities.*
Erin R Moss, Millersville University of Pennsylvania (1145-J1-328)

10:20AM ► (196) *Tactile Trigonometry: Lessons Learned from a Tactile Active Learning Classroom.*
Lee W. Singleton, Whatcom Community College (1145-J1-2568)

10:40AM ► (197) *The Use of Card Tricks to Discover How to Read a Math Text.*
Olivia M. Carducci, East Stroudsburg University (1145-J1-1570)

MAA General Contributed Paper Session on History or Philosophy of Mathematics

8:00 AM – 8:55 AM **Room 348, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

8:00AM ► (198) *Euler's proof that every integer is the sum of four or fewer square fractions.*
Paul R. Bialek, Trinity International University (1145-VB-1058)

8:15AM ► (199) *History of Math in Competitive Math Problems.*
Steven W Davis, Anaheim, California (1145-VB-1140)

8:30AM ► (200) *Teaching the meaning of arithmetic in early nineteenth-century England, according to teacher William Russell.*
Patricia Baggett*, New Mexico State University, and **Andrzej Ehrenfeucht**, University of Colorado Boulder (1145-VB-1478)

8:45AM ► (201) *Napier, Todhunter and Nayaraj Pant: A discussion on 'The Rules of Circular Parts'.*
Deepak Basyal, University of Wisconsin-Milwaukee at Washington County (1145-VB-2474)

MAA General Contributed Paper Session on Linear Algebra

8:00 AM – 10:40 AM **Room 341, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

8:00AM (202) *Diagonal entries of the combined matrix of a totally negative matrix.*
Rafael Bru, **María T Gassó**, **Isabel Giménez**, Dept. de Matemática Aplicada, Universitat Politécnica de Valencia, Spain, and **Máximo Santana***, Inst. de Matemática, Univ. Autónoma de Santo Domingo, Dominican Rep. (1145-VQ-1390)

8:15AM ► (203) *Householder Sets and their Application to the Polynomial Eigenvalue Problem.* Preliminary report.
Thomas R Cameron, Davidson College (1145-VQ-1475)

8:30AM (204) *New sights on the location theory of matrix eigenvalues.*
Rachid Marsli, King Fahd University of Petrulium and Minerals (1145-VQ-1589)

8:45AM ► (205) *The Numerical Range of a Composition Operator on the Hardy Space.*
Laney Bowden*, Colorado State University, **Julia Balukonis**, Providence College, **Fatme Hourani**, University of Michigan - Dearborn, **Ellie Lochner**, University of Wisconsin - Eau Claire, and **John Clifford**, University of Michigan - Dearborn (1145-VQ-1889)

9:00AM (206) *Some Extension of the Kreiss Matrix Theorem.*
Samir Raouafi, Auburn University (1145-VQ-1896)

9:15AM ► (207) *Multivariable n-step maps.* Preliminary report.
Ivko M Dimitric, Pennsylvania State University Fayette (1145-VQ-2180)

9:30AM (208) *The incoherent matrices and their applications.*
Ghanshyam Bhatt, Tennessee State University (1145-VQ-2816)

9:45AM ► (209) *Generalization Theory of Linear Algebra.*
Christina Pospisil* and **Eric L Grinberg**, University of Massachusetts Boston (1145-VQ-2858)

10:00AM ► (210) *A Non-iterative Parallelizable Eigenbasis Algorithm for Johnson Graphs.* Preliminary report.
Olivia R. Vasquez*, Central Washington University, **Amadou Y. Bah**, Massachusetts Institute of Technology, and **Jackson Abascal**, University of Rochester (1145-VQ-2994)

10:15AM ► (211) *Topological Properties of J-Orthogonal Matrices.*
Sara M. Motlaghian*, Georgia State University, **Ali Armandnejad**, Vali-E- Asr University, and **Frank J. Hall**, Georgia State University (1145-VQ-326)

10:30AM (212) *Positive Diagonal Solutions to the Lyapunov Matrix Inequalities.*
Mehmet Gumus, Auburn University (1145-VQ-629)

SIAM Minisymposium on Advances in mathematical modeling of complex materials systems

8:00 AM – 10:50 AM **Room 342, BCC**

Organizer: **Maria Emelianenko**, George Mason University

8:00AM ► (213) *Recent progress and challenges using phase-field models for quantitative modeling of rapid solidification.*
Jean-Luc Fattebert*, **Balasubramaniam Radhakrishnan** and **John A. Turner**, Oak Ridge National Laboratory (1145-35-1326)

8:30AM (214) *Γ-convergence of threshold dynamics algorithms.*
Selim Esedoglu and **Tiago Salvador***, University of Michigan (1145-49-2111)

9:00AM ► (215) *Modeling nucleation using vertex code with stored energy.* Preliminary report.
Claudio Torres*, **Alejandro Sazo**, Universidad Técnica Federico Santa María, Chili, **Maria Emelianenko**, George Mason University, and **Dmitry Golovaty**, University of Akron (1145-35-2254)

9:30AM ► (216) *Mound Formation during Epitaxial Growth studied by Kinetic Monte Carlo and Island Dynamics Simulations.*
Christian Ratsch, Institute for Pure and Applied Mathematics, UCLA (1145-65-1906)

10:00AM (217) *On the possible effective elasticity tensors of 2 and 3 dimensional printed materials.*
Graeme Milton, University of Utah, **Mark Briane**, University of Rennes, and **Davit Harutyunyan***, University of California Santa Barbara (1145-74-1383)

10:30AM (218) *Numerical mathematics for peridynamics and nonlocal models.*
Xiaochuan Tian, University of Texas at Austin (1145-00-2483)

Project NExT Workshop

8:00 AM – 6:00 PM **Room 308, BCC**

Employment Center

8:00 AM – 5:30 PM **Exhibit Hall E, 100 Level, BCC**

MAA General Contributed Paper Session on Interdisciplinary Topics in Mathematics

8:15 AM – 10:55 AM **Room 302, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

8:15AM ► (219) *A Framework for ECG Feature Identification.*
Emily Hendryx, University of Central Oklahoma (1145-VC-2205)

8:30AM ► (220) *Exploring reversible EMT using DSGRN.* Preliminary report.
Tomas Gedeon, **Bree Cummins** and **Ying Xin***, Montana State University, Department of Mathematical Sciences (1145-VC-2650)

8:45AM ► (221) *Interdisciplinary Applications for the Linear Algebra Classroom.* Preliminary report.
Rachelle R Bouchat, Indiana University of Pennsylvania (1145-VC-2703)

9:00AM ► (222) *Political Polarization: Voting Patterns in the Senate.* Preliminary report.
Nathan Morris and **Haley A Yaple***, Carthage College (1145-VC-2771)

9:15AM ► (223) *High Quality Mathematical Preparation and Quantitative Reasoning for Nurses: A New Partnership Between the Math and Nursing Education Communities.* Preliminary report.
Daniel Ozimek*, Pennsylvania College of Health Sciences, and **Rebecca Hartzler**, The Charles A. Dana Center, University of Texas at Austin (1145-VC-2806)

9:30AM ► (224) *Mixed Convection Flow Over a Slender Cylinder.*
Anilkumar Devarapu*, **Zephyrinus C. Okonkwo** and **Robert S. Owor**, Albany State University (1145-VC-2884)

9:45AM (225) *Robust Feasibility of Systems of Quadratic Equations Using Topological Degree Theory.*
Krishnamurthy Dvijotham, Google DeepMind, **Bala Krishnamoorthy** and **Ben Rapone***, Washington State University (1145-VC-606)

10:00AM ► (226) *Celebrities in Politics.*
C. Ray Rosentrater* and **Thomas Knecht**, Westmont College (1145-VC-745)

10:15AM ► (227) *The voiced Tonnetz and the $\mathcal{J}$-group, with illustrations in Schubert's B$\flat$ major Sonata.* Preliminary report.
Patrick DeBonis*, University of New Mexico, **Siri Mellem**, St. Olaf College, **Thomas M Fiore**, Univeristy of Michigan-Dearborn, and **Emma Bidwell**, George Fox University (1145-VC-2453)

10:30AM ► (228) *A new ADI method for the Poisson-Boltzmann equation with a two-component regularization.* Preliminary report.
Sheik Ahmed Ullah* and **Shan Zhao**, University of Alabama, Tuscaloosa (1145-VC-980)

AMS Special Session on Bifurcations of Difference Equations and Discrete Dynamical Systems with Applications, I

8:30 AM – 10:50 AM **Room 332, BCC**

Organizers: **Arzu Bilgin**, Recep Tayyip Erdogan University, Turkey
Toufik Khyat, Trinity College

8:30AM (229) *Heuristic Observation on the Comparison Between the Behavior of Orbits in the $3x+1$ Problem and the $5x+1$ Problem.* Preliminary report.
Candace Marie Kent, Virginia Commonwealth University (1145-39-86)

9:00AM (230) *Invariant Curves for Planar Competitive and Cooperative Maps.*
M. R. S. Kulenovic* and **Orlando Merino**, Department of Mathematics, University of Rhode Island (1145-39-203)

9:30AM ► (231) *Analysis of Age-Structured Discrete-Time Model of Infectious Salmon Anemia.* Preliminary report.
Abdul-Aziz Yakubu*, Howard University, and **Pauline van den Driessche**, University of Victoria (1145-92-1212)

10:00AM (232) *Difference Equations as Models of Evolutionary Population Dynamics.*
Jim Cushing, Department of Mathematics and Interdisciplinary Program in Applied Mathematics, University of Arizona (1145-39-1133)

10:30AM (233) *Bifurcation in the Almost Periodic Ricker Map.* Preliminary report.
Robert J Sacker, University of Southern California (1145-39-1032)

MAA Contributed Paper Session on Open Educational Resources: Combining Technological Tools and Innovative Practices to Improve Student Learning, I

8:40 AM – 10:55 AM **Room 303, BCC**

Organizers: **Benjamin Atchison**, Framingham State University
Marianna Bonanome, New York City College of Technology
Margaret Dean, Borough of Manhattan Community College
Annie Han, Borough of Manhattan Community College
Michael Gage, University of Rochester

8:40AM ► (234) *Using WeBWorK with WebSim, SageMath and Geogebra to teach the simplex method, linear algebra and other aspects of a Linear Optimization course.* Preliminary report.
Michael E Gage, University of Rochester (1145-L1-1223)

9:00AM ► (235) *Taking Advantage of Smartphones: Using Kahoot to Keep Students Engaged.* Preliminary report.
Chung Y Wong, County College of Morris (1145-L1-350)

9:20AM ► (236) *Improving Distance Learning of Advanced Mathematics.* Preliminary report.
Ariel Cintron-Arias*, **Michael Garrett** and **Ryan Nivens**, East Tennessee State University (1145-L1-440)

9:40AM ► (237) *How does using OERs and teaching online effect student success at a community college?* Preliminary report.
Zeynep Akcay, Queensborough Community College - CUNY (1145-L1-2782)

10:00AM ► (238) *Open Educational Resources Adaptation for Mathematics Instructions in Online Mathematics Courses.* Preliminary report.
Michael D. Miner, American Public University System (1145-L1-2843)

10:20AM ► (239) *Developing Students' consciousness about Greenhouse Effect through Dynamic Mathematical Activities.*
Debasmita Basu* and **Nicole Panorkou**, Montclair State University (1145-L1-2137)

10:40AM ► (240) *An Examination of the Impact of Affordable Learning Georgia Textbook Transformation Projects on Instruction, Learning, and Student Achievement at Albany State University.*
Zephyrinus C. Okonkwo*, **Anilkumar Devarapu** and **Robert S. Owor**, Albany State University (1145-L1-2768)

MAA Minicourse #1: Part A

9:00 AM – 11:00 AM **Holiday Ballroom 1, 2nd Floor, Hilton**

Mathematical Inquiry and Writing through Sports

Presenters: **Eric Kahn**, Bloomsburg University
Tricia Muldoon Brown, Georgia Southern University

MAA Minicourse #2: Part A

9:00 AM – 11:00 AM **Holiday Ballroom 2, 2nd Floor, Hilton**

Start Teaching Statistics using R and RStudio

Presenters: **Shonda Kuiper**, Grinnell College
Randall Pruim, Calvin College

MAA Minicourse #7: Part A

9:00 AM – 11:00 AM **Holiday Ballroom 3, 2nd Floor, Hilton**

Using Data Applications to Inspire Linear Algebra Topics in the Classroom

Presenters: **Tom Asaki**, Washington State University
Amanda Harsy, Lewis University
Heather A. Moon, Lewis-Clark State College
Marie A. Snipes, Kenyon College

AMS Contributed Paper Session on Computer Science

9:00 AM – 10:40 AM **Room 334, BCC**

9:00AM ► (241) *Approximation Algorithms for Network Connectivity.* Preliminary report.
Owen Levin, University of Minnesota - Twin Cities (1145-68-547)

9:15AM ► (242) *Tensor flattening approaches to estimate lower bound of small matrix multiplication tensor's border ranks.*
Yu Ma, UC Berkeley (1145-68-293)

9:30AM ► (243) *On the rank of matrix multiplication tensors of medium size.* Preliminary report.
Jiahan Du, University of California, Berkeley (1145-68-382)

9:45AM ► (244) *Adaptive Data Dissemination for Wireless Ad Hoc Networks based on Stochastic Branching Process.*
Hyunsun Lee*, Mathematics, Hawaii Pacific University, **Yi Zhu** and **Brian Spain**, Computer Science, Hawaii Pacific University (1145-68-1902)

10:00AM ► (245) *Vulnerability Analysis of networks and Attack Graphs.*
Rachid Ait Maalem Lahcen, University of Central Florida, Orlando, FL., 32816, and **R. N. Mohapatra***, University of Central Florida, Orlando, FL. 32816, (1145-68-257)

10:15AM ► (246) *Towards a Functorial Approach to Dynamic Topic Modeling.* Preliminary report.
Cliff Joslyn, **Emilie Purvine*** and **Mark Raugas**, Pacific Northwest National Laboratory (1145-68-2742)

10:30AM ► (247) *Using Quality-of-Life Scores to Guide Prostate Radiation Therapy Dosing.*
Giulia Isabella Pintea*, Simmons University, **Daniel J Olszewski**, Carroll College, **Zhijian Yang**, New York University, and **Chujun He**, Smith College (1145-68-2375)

MAA Contributed Paper Session on Introducing Mathematical Modeling through Competitions, I

9:00 AM – 10:55 AM **Room 304, BCC**

Organizers: **Chris Arney**, United States Military Academy
William Bauldry, Appalachian State University
Amanda Beecher

9:00AM (248) *Mathematical Modeling Competition: A Trinity University approach to preparation.* Preliminary report.
Eddy Kwessi*, Trinity University, **Sidoine Raoul Youtcha Nyandjou** and **Rose Sandrine Mougoue Faguen**, Societe Nationale des Brasseries du Cameroun (1145-G1-458)

9:20AM ► (249) *A 2-Credit Course Series for Applied Problem Solving and MCM/ICM Preparation.* Preliminary report.
Csilla Szabo* and **Lucy Spardy Oremland**, Skidmore College (1145-G1-2866)

9:40AM ► (250) *Can mathematical modeling competitions help participants build confidence? If so, so what?*
Jennifer A Czocher*, Texas State University, and **Kathleen Melhuish**, Texas State Univesrity (1145-G1-339)

10:00AM ► (251) *Judging the Mathematical Contest in Modeling (MCM): Process and Insights.*
William C Bauldry, Appalachian State University (1145-G1-2350)

10:20AM ► (252) *Complementing Applied Mathematics Education with Modeling Contests at Rensselaer.*
Peter R Kramer, Rensselaer Polytechnic Institute (1145-G1-2327)

10:40AM ► (253) *Thirty years of using the MCM for teaching Math Modeling.*
Ruth G. Favro, Lawrence Technological University (1145-G1-2263)

MAA General Contributed Paper Session on Outreach

9:00 AM – 9:25 AM **Room 301, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

9:00AM ► (254) *Math Day: increasing math awareness in a rural area.*
Elizabeth A Donovan, Murray State University (1145-VG-1904)

9:15AM ► (255) *Promoting diversity through outreach at the Girls Talk Math camp.*
Katrina Morgan*, University of North Carolina at Chapel Hill, and **Francesca Bernardi**, Florida State University (1145-VG-2685)

MAA-SIAM-AMS Hrabowski-Gates-Tapia-McBay Session: Lecture

9:00 AM – 9:45 AM **Room 307, BCC**

Organizer: **Ricardo Cortez**, Tulane University

9:00AM ► (256) *On the discrete Hilbert transform.*
Rodrigo Bañuelos, Purdue University (1145-00-383)

AMS Directors of Undergraduate Studies

9:00 AM – 10:30 AM **Key Ballroom 2, 2nd Floor, Hilton**

MAA Panel

9:00 AM – 10:20 AM **Room 349, BCC**

What Every Student Should Know about the JMM

Organizers: **Peri Shereen**, California State University, Monterey Bay
Violeta Vasilevska, Utah Valley University

Panelists: **Matt DeLong**, Marian University
Jacqueline Jensen-Vallin, Lamar University
Zsuzsanna Szaniszlo, Valparaiso University

AMS Special Session on Symbolic Dynamics, I

9:30 AM – 10:50 AM **Room 327, BCC**

Organizers: **Van Cyr**, Bucknell University
Bryna Kra, Northwestern University

9:30AM (257) *On the Bernoulli property for some partially hyperbolic systems.*
Adam Kanigowski, University of Maryland (1145-37-1760)

10:00AM (258) *Dimension and differential structures on cookie-cutter Cantor sets.*
Daniel J. Ingebretson, University of Indianapolis (1145-37-1727)

10:30AM (259) *Orbit structure and orbit equivalence for actions of semi-direct product groups.* Preliminary report.
Stefanos Orfanos, DePaul University, **Ayse A. Sahin***, Wright State University, and **Ilie Ugarcovici**, DePaul University (1145-37-2309)

MAA General Contributed Paper Session on Logic and Foundations

9:30 AM – 10:25 AM **Room 348, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

9:30AM (260) *On Tautological Globular Operads.*
Phillip Michael Bressie, Kansas State University (1145-VR-1678)

9:45AM ► (261) *Condorcet's paradox and ultrafilters.* Preliminary report.
Timothy Trujillo, Sam Houston State University (1145-VR-2907)

10:00AM (262) *On definable completeness for ordered fields.*
Mojtaba Moniri, Normandale Community College (1145-VR-2909)

10:15AM ► (263) *On involutive filters of pseudo-hoops.* Preliminary report.
Lavinia Corina Ciungu, Univ. of Iowa (1145-VR-939)

MAA Panel

9:35 AM – 10:55 AM **Room 350, BCC**

Mathematics Placement Trends and Innovations that Increase Equitable Access & Success

Organizers: **Keith Hubbard**, Stephen F. Austin State University
James Ham, Delta College
Kathryn Lineham, Montgomery College

Panelists: **Elizabeth Barnett**, Columbia University
David Bressoud, Macalester College
John Hetts, Educational Results Partnership
Uri Treisman, University of Texas at Austin

MAA Workshop

9:35 AM – 10:55 AM **Room 324, BCC**

NSF Funding Opportunities in the Education and Human Resources Directorate and the Division of Mathematical Sciences

Organizer: **Karen Allen Keene**, National Science Foundation, Division of Undergraduate Education

Presenters: **Karen Allen Keene**, National Science Foundation, Division of Undergraduate Education
Matt Douglass, National Science Foundation, Division of Mathematical Sciences
Karen King, National Science Foundation, Division of Research on Learning
Swatee Naik, National Science Foundation, Division of Mathematical Sciences
Sandra Richardson, National Science Foundation, Division of Undergraduate Education
Tara Smith, National Science Foundation, Division of Graduate Education
Talitha Washington, National Science Foundation, Division of Undergraduate Education
Lee Zia, National Science Foundation, Division of Undergraduate Education

Project NExT Workshop on Using Mathematical Software

9:40 AM – 10:55 AM **Room 308, BCC**

Effective Use of Computer Software in Mathematics Classrooms

Organizers: **Richard Gustavson**, Manhattan College
Yevgeniy Milman, Borough of Manhattan Community College, CUNY
Eze Nwaeze, Tuskegee University
Mckenzie West, Kalamazoo College

MAA-SIAM-AMS Hrabowski-Gates-Tapia-McBay Panel

9:50 AM – 10:30 AM **Room 307, BCC**

Actions to increase the participation of underrepresented minority groups in mathematics.

Organizer: **Ricardo Cortez**, Tulane University
Panelists: **Rodrigo Bañuelos**, Purdue University
Minerva Cordero, University of Texas at Arlington
Pamela Harris, Williams College

MAA Contributed Paper Session on Innovative Curricular Strategies for Increasing Mathematics Majors

10:00 AM – 10:50 AM **Room 301, BCC**

Organizers: **Stuart Boersma**, Central Washington University
Eric Marland, Appalachian State University
Victor Piercey, Ferris State University
Frank Savina, University of Texas at Austin

10:00AM ► (264) *Students Need Yin!* Preliminary report.
Igor V. Minevich, Rose-Hulman Institute of Technology (1145-A1-2358)

10:30AM (265) *From Mathphobes to Math Majors: The Wheelock College Model.*
Debra K. Borkovitz* and **Galina Dobrynina**, Boston University (1145-A1-2061)

AMS Invited Address

10:05 AM – 10:55 AM **Ballrooms I & II, 400 Level, BCC**

► (266) *Algebraic, Geometric, and Topological Methods in Optimization.*
Jesús A. De Loera, University of California, Davis (1145-90-83)

Radical Dash Kickoff Meeting

10:20 AM – 10:50 AM **Room 339, BCC**

Organizers: **Stacey Muir**, University of Scranton
Janine Janoski, Kings College

AMS-MAA Invited Address

11:10 AM – NOON **Ballrooms I & II, 400 Level, BCC**

► (267) *What is the shape of a rational map?*
Sarah Koch, University of Michigan (1145-00-2550)

Exhibits and Book Sales

12:15 PM – 5:30 PM **Exhibit Hall F, 100 Level, BCC**

AMS Colloquium Lectures: Lecture I

1:00 PM – 1:50 PM **Ballrooms I & II, 400 Level, BCC**

► (268) *Complex multiplication: past, present, future.*
Benedict H. Gross, University of California San Diego (1145-11-33)

MAA Contributed Paper Session on Touch it, Feel it, Learn it: Tactile Learning Activities in the Undergraduate Mathematics Classroom, II

1:00 PM – 2:55 PM **Room 340, BCC**

Organizers: **Chris Oehrlein**, Oklahoma City Community College
Ann Trenk, Wellesley College
Laura Watkins, Glendale Community College

1:20PM ► (269) *The SIR Game: Modeling an Epidemic.*
Brian Hollenbeck, Emporia State University (1145-J1-2856)

1:40PM ► (270) *Teaching rigid motions through embodied activities: Making the jump from 2- to 3- dimensions.*
Rachel Schmitz*, **Youyu Liu** and **Kristin M Frank**, Towson University (1145-J1-2325)

2:00PM ► (271) *Using Tangle Toys to Explore Ideas in Knot Theory.*
Adam Giambrone, Elmira College (1145-J1-2169)

2:20PM ► (272) *3D Printed Mathematics: Student-led design and creation of mathematical objects to discover fractals, polyhedra, and knots.*
Laura Taalman, James Madison University (1145-J1-1655)

2:40PM ► (273) *Using Tactile Models for Non-Euclidean Geometry.*
Heather Pierce, Emmanuel College (1145-J1-1341)

MAA General Contributed Paper Session on Mathematics and Technology

1:00 PM – 1:55 PM **Room 323, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

1:00PM ► (274) *MYMathApps Tutorials.* Preliminary report.
Matthew Weihing* and **Philip B Yasskin**, Texas A&M University (1145-VD-1617)

1:15PM ► (275) *Textbook Problem Dependency Web.* Preliminary report.
Joseph M Martinsen* and **Philip B Yasskin**, Texas A&M University (1145-VD-1989)

1:30PM (276) *The Logic Behind the Turing Bombe's Role in Breaking Enigma.*
Neil Sigmon*, Radford University, and **Rick Klima**, Appalachian State University (1145-VD-2265)

1:45PM (277) *Using LaTeX to Optimize Proof Writing.*
Jason A. Hardin, Worcester State University (1145-VD-2667)

MAA Invited Address

2:15 PM – 3:05 PM **Ballrooms I & II, 400 Level, BCC**

(278) *Symmetry, almost.*
Amanda Folsom, Amherst College (1145-A0-16)

AMS-ASL Special Session on Algorithmic Dimensions and Fractal Geometry, II

2:15 PM – 5:35 PM **Room 343, BCC**

Organizers: **Jack H. Lutz**, Iowa State University
Elvira Mayordomo, University of Zaragoza, Spain

2:15PM (279) *Measure and randomness for algebraic structures.*
Johanna N.Y. Franklin*, Hofstra University, and **Russell Miller**, Queens College, CUNY (1145-03-2447)

2:45PM ► (280) *A Turing ideal with positive outer measure.* Preliminary report.
Takayuki Kihara, Nagoya University, Japan, and **Arno Pauly***, Swansea University, UK (1145-03-2017)

3:15PM (281) *Mutual Dimension and Random Sequences.*
Adam Case*, Drake University, and **Jack H. Lutz**, Iowa State University (1145-68-1686)

3:45PM (282) *Sofic subshifts and completely positive topological entropy.* Preliminary report.
Linda Brown Westrick, Penn State (1145-03-2198)

4:15PM (283) *On Several New Notions of Algorithmic Dimension.* Preliminary report.
David J. Webb, University of Hawaii at Manoa (1145-03-1712)

4:45PM (284) *Quantization for Probability Distributions.*
Mrinal K Roychowdhury, University of Texas Rio Grande Valley (1145-37-1685)

5:15PM (285) *Hausdorff dimension and randomness for continuous measures.*
Jan Reimann, Pennsylvania State University (1145-03-1703)

AMS Special Session on 25 years of Conferences for African-American Researchers in the Mathematical Sciences (CAARMS times 25), II

2:15 PM – 6:00 PM **Room 314, BCC**

Organizer: **William A. Massey**, Princeton University

2:15PM ► (286) *BPTree: an l_2 heavy hitters algorithm using constant memory.*
Vladimir Braverman, Johns Hopkins University, **Stephen R Chestnut**, G-Research, **Nikita Ivkin**, Johns Hopkins University, **Jelani Nelson***, **Zhengyu Wang**, Harvard University, and **David P Woodruff**, Carnegie Mellon University (1145-68-1998)

3:15PM (287) *Correlation induced by missing spatial covariates: a connection between variance components models and kriging.*
Jessica Rothman, Yale University, **Monica C Jackson***, American University, **Kimberly Sellers**, Georgetown University, **Talithia Williams**, Harvey Mudd College, **Lance Waller**, Emory University, and **Subhash Lele**, University of Alberta (1145-62-2264)

3:45PM ► (288) *Theory and applications of algebraic and combinatorial constructs.* Preliminary report.
Edinah K. Gnang, Assistant Professor/ Department of Applied Mathematics and Statistics, Johns Hopkins (1145-15-2086)

4:15PM (289) *Quantum Measurement Problem.*
James D Whitfield, Dartmouth College (1145-81-2024)

4:45PM ► (290) *Dynamic Queueing Transience.*
William A Massey, Princeton University (1145-60-1925)

5:15PM (291) *Gabor Frames with arbitrary redundancy and Wilson tight frames in $L^2(\mathbb{R})$.* Preliminary report.
Divyang Bhimani, University of Maryland, and **Kasso Okoudjou***, MIT (1145-42-2140)

AMS Special Session on A Showcase of Number Theory at Undergraduate Institutions, II

2:15 PM – 6:05 PM **Room 325, BCC**

Organizers: **Adriana Salerno**, Bates College

Lola Thompson, Oberlin College

2:15PM (292) *Fuchsian Differential Equations with Prescribed Monodromy: An Introduction to Solving a Quintic Without Using Radicals.* Preliminary report.
Edray Herber Goins, Pomona College (1145-11-1601)

2:45PM (293) *A probabilistic local-global principle for torsion on elliptic curves.*
John Cullinan, Bard College (1145-11-793)

3:15PM ► (294) *When is the product of two Siegel eigenforms an eigenform?*
Jim Brown*, Occidental College, **Hugh Geller**, Clemson University, **Rico Vicente**, California State University - Long Beach, and **Alexandra Walsh**, Brown University (1145-11-1422)

3:45PM (295) *Solving the S-Unit Equation in Sage and Applications.*
Alejandra Alvarado, Eastern Illinois University, **Angelos Koutsianas**, University of British Columbia, **Beth Malmskog***, Colorado College, **Christopher Rasmussen**, Wesleyan University, **Christelle Vincent**, University of Vermont, and **Mckenzie West**, Kalamazoo College (1145-11-1990)

4:15PM ► (296) *On the average spacing of fractional parts of sequences generated by irrational numbers.*
Geremias Polanco*, Hampshire College and UASD, **Daniel Schultz**, Penn State University, and **Alexandru Zaharescu**, University of Illinois (1145-11-1412)

4:45PM ► (297) *Some refinements of Artin's conjecture.*
Leo Goldmakher*, Williams College, and **Greg Martin**, University of British Columbia (1145-11-806)

5:15PM ► (298) *Arithmetical Structures on Graphs.*
Darren B Glass, Gettysburg College (1145-11-687)

5:45PM (299) *Hypergeometric decomposition of symmetric K3 quartic pencils.*
Adriana Salerno*, Bates College, **Charles F Doran**, University of Alberta, **Tyler L Kelly**, University of Birmingham, **Steven Sperber**, University of Minnesota, **John Voight**, Dartmouth College, and **Ursula Whitcher**, Mathematical Reviews (1145-11-2630)

AMS Special Session on Algebraic and Geometric Methods in Discrete Optimization, I

2:15 PM – 6:00 PM **Room 344, BCC**

Organizers: **Amitabh Basu**, Johns Hopkins University

Jesus De Loera, University of California, Davis

2:15PM (300) *Intersecting restrictions in clutters.* Preliminary report.
Ahmad Abdi, **Gerard Cornuejols*** and **Dabeen Lee**, Carnegie Mellon University (1145-05-1427)

3:15PM ► (301) *Solving the Customized Coverage Probing problem through Set Covering.* Preliminary report.
Carla Michini*, University of Wisconsin Madison, **Peter Ohmann**, Saint John's University, **Ben Liblit** and **Jeff Linderoth**, University of Wisconsin Madison (1145-90-2160)

3:45PM (302) *The disjunctive hull of facility location problems.* Preliminary report.
Quentin Louveaux, University of Liège, Belgium (1145-90-1732)

4:15PM (303) *Duality for Discrete Optimization: Theory and Applications.*
Ted K Ralphs, Lehigh University (1145-90-2540)

4:45PM ► (304) *Time-varying semidefinite optimization.*
Amir Ali Ahmadi* and **Bachir El Khadir**, Princeton University (1145-49-2920)

5:15PM (305) *Blended Conditional Gradients.*
Gabor Braun, **Sebastian Pokutta***, **Dan Tu**, Georgia Tech, and **Stephen Wright**, University of Wisconsin–Madison (1145-90-377)

AMS Special Session on Analysis of Fractional, Stochastic, and Hybrid Dynamic Systems with Applications, II

2:15 PM – 6:05 PM **Room 328, BCC**

Organizers: **John R. Graef**, University of Tennessee at Chattanooga

G. S. Ladde, University of South Florida

A. S. Vatsala, University of Louisiana at Lafayette

2:15PM (306) *Composition of Pathway Fractional Integral operator on Generalized k - Wright Function.*
Sunita Nagar*, Bhilwara, Rajasthan India, and **Harish Nagar**, Sangam University, Bhilwara, Rajasthan India (1145-33-1723)

2:45PM (307) *Blow-up Results for One Dimensional Caputo Fractional Reaction Diffusion Equation.*
Subhash Subedi* and **Aghalaya S. Vatsala**, University of Louisiana at Lafayette (1145-35-945)

3:15PM ► (308) *Modeling online social network dynamics using fractional order differential equations.*
Lingju Kong, University of Tennessee at Chattanooga (1145-34-1763)

3:45PM (309) *Stochastic dynamical systems under geometric constraints.*
Iuliana Teodorescu and **Razvan Teodorescu***, University of South Florida (1145-60-2109)

4:15PM (310) *Existence of the Solution in the Large for the Caputo Fractional Reaction Diffusion Equation by Picard's method.*
Pradeep Godar Chhetri* and **Aghalaya S Vatsala**, University of Louisiana at Lafayette (1145-35-1236)

4:45PM (311) *Spectra of Boundary Integral Operators Defined on the Unit Sphere for the Modified Laplace Equation.*
Vani Cheruvu*, The University of Toledo, **Shravan Veerapaneni**, **Eduardo Corona** and **Ryan Kohl**, The University of Michigan (1145-65-1215)

5:15PM ► (312) *Interconnected Nonlinear Survival State Hybrid Dynamic Models.* Preliminary report.
Gangaram S Ladde, University of South Florida at Tampa (1145-92-2488)

5:45PM (313) *Mixed Generalized Iterative Method For Nonlinear Problems.* Preliminary report.
Aghalaya S. Vatsala*, University of Louisiana at Lafayette, and **M Sowmya**, R. V. College of Engineering, Bengaluru, Karnataka 560059, India (1145-34-1445)

AMS Special Session on Bifurcations of Difference Equations and Discrete Dynamical Systems with Applications, II

2:15 PM – 6:05 PM **Room 332, BCC**

Organizers: **Arzu Bilgin**, Recep Tayyip Erdogan University, Turkey
Toufik Khyat, Trinity College

2:15PM (314) *Cooperative hunting in a discrete predator-prey system.*
Yunshyong Chow, Institute of Mathematics, Academia Sinica, **Sophia Jang***, Department of Mathematics and Statistics, Texas Tech University, and **Hua-Ming Wang**, Department of Statistics, Anhui Normal University (1145-92-466)

2:45PM (315) *The structure of the omega limit sets of non-autonomous discrete dynamical systems.* Preliminary report.
Saber Elaydi, Trinity University (1145-39-2370)

3:15PM (316) *Symmetry Methods in the Solution of Difference Equations and Discrete Dynamical Systems.* Preliminary report.
Ann Brett, Johnson & Wales University (1145-39-540)

3:45PM ► (317) *On a System of Rational Difference Equations with Non-constant Coefficients.*
Yevgeniy Kostrov, Manhattanville College, **Zachary Kudlak***, United States Coast Guard Academy, and **Patrick Vernon**, Xavier University of Louisiana (1145-39-715)

4:15PM ► (318) *A fractional nonlinear Schrödinger-Poisson system.*
Michail E. Filippakis*, University of Piraeus, Department of Digital Systems, Piraeus, Greece, and **Maria Eleni Poulou**, Department of Product and Systems Design Engineering, University of Aegean (1145-37-195)

4:45PM (319) *Bifurcations as the Genesis of Instabilities in the Numerical Solutions to Differential Equations.*
Ronald E. Mickens*, Clark Atlanta University, and **Talitha M. Washington**, Howard University (1145-39-1405)

5:15PM ► (320) *Template iterations of quadratic maps and hybrid Mandelbrot sets.*
Anca Radulescu*, **Kelsey Butera**, SUNY New Paltz, and **Brandee Williams**, SUNY New Paltz alumna (1145-37-1160)

5:45PM ► (321) *Global Dynamics for Discrete Models in Populations Dynamics of Single Species.*
Arzu Bilgin*, Recep Tayyip Erdogan University, and **Mustafa Kulenovic**, University of Rhode Island (1145-39-427)

AMS Special Session on Commutative Ring Theory: Research for Undergraduate and Early Graduate Students, II

2:15 PM – 6:05 PM **Room 320, BCC**

Organizers: **Nicholas Baeth**, Franklin and Marshall College
Branden Stone, Hamilton College

2:15PM ► (322) *Numerical semigroup invariants and eventually quasipolynomial behavior.*
Christopher ONeill, San Diego State University (1145-13-639)

2:45PM ► (323) *Membership and Elasticity in Certain Affine Monoids.*
Jackson Autry, San Diego State University (1145-13-1146)

3:15PM ► (324) *Multiplicative factorization in numerical semigroups.* Preliminary report.
Matthew C. Enlow, University of Central Missouri (1145-13-653)

3:45PM ► (325) *Semigroups of Modules.*
Roger A Wiegand, University of Nebraska (1145-13-817)

4:15PM ► (326) *Betti Numbers: Large and Small.*
Adam Boocher, University of San Diego (1145-13-299)

4:45PM ► (327) *Lower Bounds on Betti Numbers.*
Adam Boocher, University of San Diego, and **James Seiner***, Stony Brook University (1145-13-1268)

5:15PM ► (328) *Boij-Soederberg theory as an introduction to research in commutative algebra.* Preliminary report.
Courtney R Gibbons, Hamilton College (1145-13-966)

5:45PM ► (329) *A Recursive Technique for finding Betti Decompositions of Complete Intersections.*
Robert Huben, University of Nebraska - Lincoln (1145-13-1504)

AMS Special Session on Financial Mathematics, II

2:15 PM – 6:05 PM **Room 338, BCC**

Organizers: **Maxim Bichuch**, Johns Hopkins University
Anja Richter, Baruch College, City University of New York
Stephan Sturm, Worcester Polytechnic Institute

2:15PM ► (330) *Optimal portfolio allocations in a heterogeneous banking system.*
Marko Weber* and **Agostino Capponi**, Columbia University (1145-60-1798)

2:45PM (331) *Systemic Risk: the Effect of Market Confidence.* Preliminary report.
Maxim Bichuch and **Ke Chen***, John Hopkins University (1145-91-1624)

3:15PM (332) *Information Relaxation and the Duality-Based Dynamic Programming.*
Nan Chen* and **Xiang Ma**, The Chinese University of Hong Kong (1145-90-1193)

4:15PM (333) *XVA Valuation Under Market Illiquidity.*
Weijie Pang* and **Stephan Sturm**, Worcester Polytechnic Institute (1145-60-785)

4:45PM (334) *Pricing debt in financial networks with comonotonic endowments.*
Tathagata Banerjee and **Zachary Feinstein***, Washington University in St. Louis (1145-60-1365)

5:15PM (335) *An Asymptotic Model for Fire Sales.*
Nils Detering*, University of California Santa Barbara, **Thilo Meyer-Brandis**, **Konstantinos Panagiotou** and **Daniel Ritter**, University of Munich (1145-60-1259)

5:45PM (336) *Prime Broker Lending and Hedge Fund Exposures.* Preliminary report.
Mathias S Kruttli, Federal Reserve Board, **Phillip J Monin***, Office of Financial Research, and **Sumudu W Watugala**, Cornell University (1145-91-2298)

AMS Special Session on Geometry Labs United: Research, Visualization, and Outreach, II

2:15 PM – 6:00 PM **Room 326, BCC**

Organizers: **Marianne Korten**, Kansas State University
Sean Lawton, George Mason University
Anton Lukyanenko, George Mason University

2:15PM ► (337) *Mathways: building a pipeline to undergraduate research in the Illinois Geometry Lab.* Preliminary report.
Matthew Ando, **Jennifer McNeilly** and **Jeremy T. Tyson***, University of Illinois at Urbana-Champaign (1145-97-2018)

2:45PM ► (338) *Dynamics on the Character Variety of the Fricke Spaces of Surfaces on Two Generators.*
Ajeet S Gary, University of Maryland, College Park (1145-51-843)

3:15PM ► (339) *An Overview of the University of Kentucky Math Lab.*
Ben Riley* and **Christopher Manon**, University of Kentucky (1145-00-1577)

3:45PM ► (340) *Mason Experimental Geometry Lab: Overview and Community Engagement.*
Sean Lawton, **Jack Love*** and **Anton Lukyanenko**, George Mason University (1145-00-1296)

4:15PM ► (341) *Labs: The I-Center at Kansas State University, 12 years of trans-generational math research.*
Marianne Korten* and **Jamie Peabody**, Kansas State University (1145-97-1294)

4:45PM (342) *Washington Experimental Mathematics Lab (WXML).*
Samantha Kay Fairchild, University of Washington (1145-97-2639)

5:15PM ► (343) *Panel on starting and running a Geometry Lab.*
Sean Lawton and **Anton Lukyanenko***, George Mason University (1145-00-1292)

AMS Special Session on Hopf Algebras and Tensor Categories, II

2:15 PM – 6:05 PM **Room 318, BCC**

Organizers: **Siu-Hung Ng**, Louisiana State University
Julia Plavnik, Texas A&M University
Henry Tucker, University of California, San Diego

2:15PM (344) *On the subcategory lattices of fusion categories.* Preliminary report.
Alex Levin and **Dmitri Nikshych***, University of New Hampshire (1145-18-1349)

2:45PM (345) *Morita equivalence classes of small index subfactors.*
Pinhas Grossman, University of New South Wales, **Scott Morrison**, The Australia National University, **David Penneys**, The Ohio State University, **Emily Peters**, Loyola University Chicago, and **Noah Snyder***, Indiana University (1145-18-1118)

3:15PM (346) *Kac cohomology as relative group cohomology.* Preliminary report.
César Galindo and **Yiby Morales***, Universidad de los Andes (1145-18-2289)

3:45PM (347) *The module embedding theorem.*
David Penneys, The Ohio State University (1145-18-1219)

4:15PM (348) *Applications of Quantum Representations of Mapping Class Groups.*
Wade Bloomquist*, University of California Santa Barbara, and **Zhenghan Wang**, Microsoft Research Station Q and University of California Santa Barbara (1145-55-1105)

4:45PM (349) *An Interpolation Approach to Untwisted Dijkgraaf–Witten Invariants.* Preliminary report.
Robert Laugwitz*, Rutgers University, and **Johannes Flake**, RWTH Aachen University (1145-18-1793)

5:15PM (350) *Braided module categories.* Preliminary report.
Alexei Davydov, Ohio University (1145-18-2409)

5:45PM (351) *Higher central charge and higher Gauss sum of premodular categories.*
Yilong Wang, Louisiana State University (1145-18-2213)

AMS Special Session on How to Guard an Art Gallery and Other Discrete Mathematical Adventures (In Memory of T. S. Michael, 1960 to 2016), II

2:15 PM – 6:05 PM **Room 345, BCC**

Organizers: **Joseph Bonin**, The George Washington University
Carolyn Chun, US Naval Academy
Nancy Neudauer, Pacific University

2:15PM ► (352) *A Singular Way with Words.*
Jennifer J Quinn, University of Washington Tacoma (1145-05-1886)

2:45PM ► (353) *Guarding Art Galleries, Fortresses and Prison Yards.*
T. S. Michael, U. S. Naval Academy, and **Val Pinciu***, Southern Connecticut State University (1145-05-1162)

3:15PM (354) *Cube unfoldings never overlap.*
Kristin DeSplinter, University of Utah, **Satyan Devadoss***, **Jordan Readyhough**, University of San Diego, and **Bryce Wimberly**, Trident Analysis (1145-52-620)

3:45PM (355) *Matroids and the minimum rank of a matrix pattern.* Preliminary report.
Louis Deaett, Quinnipiac University (1145-05-1934)

4:15PM ► (356) *T.S.Michael's joint work on intrinsically knotted graphs.*
Mark E. Kidwell, U.S.Naval Academy (retired) (1145-05-279)

4:45PM (357) *Bent p-ary functions and strongly regular graph decompositions.*
Caroline G Melles* and **David Joyner**, United States Naval Academy (1145-05-1582)

5:15PM ► (358) *Sphere-of-Influence Graphs, and Reminiscences of working with TS Michael.*
Thomas Quint, Department of Mathematics and Statistics, University of Nevada Reno (1145-05-2487)

5:45PM (359) *A matrix rank identity with applications to combinatorial matices.*
Bryan L Shader, University of Wyoming (1145-05-790)

AMS Special Session on Mappings on Metric and Banach Spaces with Applications to Fixed Point Theory, II

2:15 PM – 6:00 PM **Room 347, BCC**

Organizers: **Torrey M. Gallagher**, Bucknell University
Christopher J. Lennard, University of Pittsburgh

2:15PM (360) *Lipschitz Free Spaces on Finite Metric Spaces.*
Stephen J Dilworth*, University of South Carolina, **Denka Kutzarova**, University of Illinois at Urbana-Champaign, and **Mikhail I Ostrovskii**, St. John's University (1145-46-1351)

3:15PM (361) *Grothendieck Operators and Weakly p-summable series.*
Roxana Popescu, University of Pittsburgh (1145-46-1857)

3:45PM ► (362) *An Operator-Valued Kantorovich Metric on Complete Metric Spaces.*
Trubee Hodgman Davison, University of Colorado (1145-46-734)

4:15PM (363) *Some recent results on Mackey duals of Banach spaces.*
Douglas Mupasiri, University of Northern Iowa (1145-46-2669)

5:15PM (364) *Continuous Schauder frames for Banach spaces.*
Joseph Eisner, University of Virginia, and **Daniel Freeman***, St Louis University (1145-46-1699)

AMS Special Session on Natural Resources Modeling, II

2:15 PM – 6:05 PM **Room 336, BCC**

Organizers: **Julie Blackwood**, Williams College
Shandelle M. Henson, Andrews University

2:15PM ► (365) *Genetic diversity as a rescue mechanism in stochastic environments.*
Sebastian Schreiber, University of California, Davis (1145-92-1176)

2:45PM (366) *A Discrete-Time Anthrax Model In Human and Herbivore Populations.*
Najat Ziyadi*, Morgan State University, and **Abdul-Aziz Yakubu**, Howard University (1145-92-584)

3:15PM (367) *Risk Structured Model of Cholera Infections In Cameroon.* Preliminary report.
Fnu Eric Ngang Che* and **Abdul-Aziz Yakubu**, Howard University (1145-92-1153)

3:45PM (368) *Modeling and control of enzootic West Nile virus transmission: The role of the avian nesting curve.*
Suzanne Robertson, Virginia Commonwealth University (1145-92-1762)

4:15PM ► (369) *Understanding species persistence under reoccurring and interacting disturbances.* Preliminary report.
Amy Veprauskas*, University of Louisiana at Lafayette, and **Tingting Tang**, University of Notre Dame (1145-92-1356)

4:45PM (370) *Optimization and Games for Environmental Federalism.*
Ben G Fitzpatrick, Loyola Marymount University (1145-91-1509)

5:15PM ► (371) *Applications of Optimal Control for Ecosystem-Based Fishery Management.*
Mahir Demir, University of Tennessee, Knoxville (1145-34-1199)

5:45PM (372) *Modeling Population Dynamics of Honeybee: Parasite, Disease and Nutrition.*
Yun Kang*, Arizona State University, **Jun Chen**, Simon A. Levin Mathematical, Computational, and Modeling Sciences Center, ASU., **Marisabel Rodriguez-Messan**, Dartmouth College, **Komi Messan**, U.S. Army Engineer Research, and **Gloria DeGrandi-Hoffman**, Carl Hayden Bee Research Center (1145-34-1714)

AMS Special Session on New Directions in the Theory of Complex Multiplication, II

2:15 PM – 6:00 PM **Room 321, BCC**

Organizers: **Henri Darmon**, McGill University
Samit Dasgupta, University of California, Santa Cruz
Benedict Gross, Harvard University

2:15PM (373) *Eisenstein cohomology and equivariant transgressions of the Euler class.*
Luis Garcia, University of Toronto (1145-11-1283)

3:15PM (374) *On a conjecture of Harris and Venkatesh.*
Victor Rotger, Universitat Politecnica de Catalunya (UPC) (1145-11-426)

4:15PM (375) *The eigencurve at weight one Eisenstein points.* Preliminary report.
Alice Pozzi, University College London (1145-11-429)

5:15PM (376) *The Lambda invariant and its CM values.*
Tonghai Yang*, University of Wisconsin-Madison, **Hongbo Yin**, Shandong University, and **Peng Yu**, the Morningside Center of Mathematics, Beijing, China (1145-11-417)

AMS Special Session on Nonlinear Evolution Equations and Their Applications, II

2:15 PM – 6:05 PM **Room 331, BCC**

Organizers: **Mingchao Cai**, Morgan State University
Gisele Mophou Loudjom, University of French West Indies, Guadeloupe, France
Gaston N'Guerekata, Morgan State University
Alexander Pankov, Morgan State University
Xuming Xie, Morgan State University
Guoping Zhang, Morgan State University

2:15PM (377) *Eberlein-weakly almost periodic (in Stepanov - like sense) functions and applications.* Preliminary report.
Gaston M N'Guerekata, Math Department, School of Computer, Mathematical and Natural Sciences, Morgan State University (1145-46-1130)

2:45PM (378) *Optimal control of averaged state of a parabolic equation with missing boundary condition.*
Gisèle Mophou*, Aims-Cameroon, Limbé, Cameroon, **Romario Tiomela Foko**, AIMS-Cameroon, Limbe , Cameroon, and **Ali Seibou**, Université Ouaga 3S, Ouagadougou, Burkina Faso (1145-49-510)

3:15PM (379) *Coupled systems of second order evolution equations in Hilbert spaces.* Preliminary report.
Ti-Jun Xiao, School of Mathematical Sciences, Fudan University (1145-46-367)

3:45PM (380) *Properties of operator semigroups.* Preliminary report.
Jin Liang, School of Mathematical Sciences, Shanghai Jiao Tong University (1145-46-366)

4:15PM (381) *Existence results of S-asymptotically ω-periodic mild solutions to some integro-differential equations with non-local conditions.*
Darin Orrie Brindle, Morgan State University (1145-34-2441)

4:45PM (382) *Large-time asymptotic expansions in general systems of decaying functions for the Navier-Stokes equations.*
Dat T Cao* and **Luan T Hoang**, Texas Tech University (1145-35-284)

5:15PM (383) *Optimal control of diffusion equation with missing data governed by Dirichlet fractional Laplacian.*
Jean-Daniel Djida, Departamento de Estatıstica, Analise Matematica e Optimizacion, Universidade de Santiago de Compostela, 15782 Spain., **Gisele Mophou** and **Pasquini Fotsing Soh***, African Institute for Mathematical Sciences (AIMS), P.O. B ox 608, Limbe Crystal Gardens, South West Region, Cameroon (1145-35-511)

5:45PM ► (384) *Resonant (p,q)-equations with Robin boundary condition.*
Michail E. Filippakis, University of Piraeus, Department of Digital Systems, Piraeus, Greece (1145-35-190)

AMS Special Session on Numerical Methods for PDEs and Applications, II

2:15 PM – 6:05 PM **Room 330, BCC**

Organizers: **Wenrui Hao**, Pennsylvania State University
Qingguo Hong, Pennsylvania State University
Jinchao Xu, Pennsylvania State University

2:15PM (385) *The Basic Principles and Recent Developments of Weak Galerkin Finite Element Methods.*
Junping Wang, National Science Foundation (1145-35-577)

3:15PM (386) *Discontinuous Galerkin method and Weak Galerkin Method.*
Xiu Ye, University of Arkansas at Little Rock (1145-65-505)

3:45PM (387) *A New Primal-Dual Weak Galerkin Finite Element Method for Ill-posed Elliptic Cauchy Problems.*
Chunmei Wang, Texas Tech University (1145-65-751)

4:15PM (388) *Extended Galerkin Method.*
Qingguo Hong*, The Pennsylvania State Univiersity, **Shuonan Wu**, Peking University, and **Jinchao Xu**, The Pennsylvania State University (1145-65-419)

4:45PM (389) *A modified preconditioned conjugate gradient method for a nonsymmetric elliptic boundary value problem.*
Zhen Chao* and **Dexuan Xie**, Department of Mathematical Sciences, University of Wisconsin-Milwaukee (1145-65-2612)

5:15PM (390) *Locally conservative finite elements for axisymmetric Stokes equation.*
Young Ju Lee*, Texas State University, and **Hengguang Li**, Wayne State University (1145-76-1149)

5:45PM (391) *Preconditioning for mixed variational formulations.*
Constantin Bacuta and **Jacob Jacavage***, University of Delaware (1145-65-1239)

AMS Special Session on Optimal Methods in Applicable Analysis: Variational Inequalities, Low Rank Matrix Approximations, Systems Engineering, Cyber Security, II

2:15 PM – 6:05 PM **Room 329, BCC**

Organizers: **Aritra Dutta**, King Abdullah University of Science and Technology, Saudi Arabia
Ram Mohapatra, University of Central Florida
Gayatri Pany, Singapore University of Technology and Design, Singapore
Nabin Kumar Sahu, Dhirubhai Ambani Institute of Information and Communication Technology, India

2:15PM (392) *Equilibrium structure for a spatial economy: effects of automated transport modes.*
Gayatri Pany, Singapore University of Technology and Design, Singapore (1145-49-1469)

2:45PM (393) *Effect of information on the social efficiency of a service system in the presence of strategic customers.*
Gopinath Panda, Singapore University of Technology and Design, Singapore (1145-91-1543)

3:15PM (394) *Group Interactions in TU games : The k-lateral value.*
Surajit Borkotokey*, Department of Mathematics, Dibrugarh University, Assam, India, **Dhrubajit Choudhury**, **Loyimee Gogoi**, Dibrugarh University, Dibrugarh, Assam, India, and **Rajnish Kumar**, Queen's Management School, Queen's University, Belfat, UK (1145-91-124)

3:45PM ► (395) *UAVs Mesh Network Survivability Against Cyber Attacks: A Simulation Study.* Preliminary report.
Rachid Ait Maalem Lahcen* and **Ram Mohapatra**, University of Central Florida (1145-00-361)

4:15PM (396) *Multivariate and Convex Approximation by Choquet integrals.*
George A Anastassiou, University of Memphis (1145-41-147)

4:45PM (397) *Primal First-Order Necessary Efficiency Conditions for Locally Lipschitz Multiobjective Optimization Problems.*
Elena Constantin, University of Pittsburgh at Johnstown (1145-90-152)

5:15PM ► (398) *The A-analytic approach to X-ray tomography.*
Kamran Sadiq, Johann Radon Institute of Computational and Applied Mathematics (RICAM) (1145-35-362)

5:45PM (399) *Multilevel wavelet approximation on the sphere.*
Ratikanta Behera, Department of Mathematics and Statistics, Indian Institute of Science Education and Research Kolkata, West Bengal, India (1145-41-263)

AMS Special Session on Quaternions, II

2:15 PM – 6:05 PM **Room 319, BCC**

Organizers: **Terrence Blackman**, Medgar Evers College, City University of New York

Johannes Familton, Borough of Manhattan Community College, City University of New York

Chris McCarthy, Borough of Manhattan Community College, City University of New York

2:15PM ► (400) *Maxwell, Clifford, and Hestenes.*
Johannes Familton*, BMCC City University of New York, and **Richard Friedberg**, Columbia University (emeritus) (1145-78-531)

2:45PM (401) *Quaternions in Geometric Algebra and Physics.*
David Hestenes, Department of Physics, Arizona State University (1145-15-150)

3:45PM ► (402) *Computational advantages and historical insights from viewing quaternionic interpolation of three-dimensional rotations as geodesic vector interpolation on S^2.*
Bob Palais, Utah Valley University (1145-22-2929)

4:15PM ► (403) *How can symmetries of a rectangle, tethered up to homotopy, provide a physical model for the quaternion group? Generalizations?* Preliminary report.
William A. Bogley and **David Pengelley***, Oregon State University (1145-55-2199)

4:45PM ► (404) *Visualization and separation of chromatic information in natural and medical images based on a quaternion algebra framework.*
Nektarios A Valous*, **Rodrigo Rojas Moraleda**, National Center for Tumor Diseases (NCT), **Neha Pandey**, Interdisciplinary Center for Scientific Computing (IWR), **Dirk Jaeger**, **Inka Zoernig** and **Niels Halama**, National Center for Tumor Diseases (NCT) (1145-68-30)

5:15PM ► (405) *Split-quaternion representation of a functional hierarchy of a biologic system.* Preliminary report.
Garri Davydyan, Russian Medical Academy of Postgraduate Education (1145-16-250)

5:45PM ► (406) *Quaternion-valued Solutions to the Korteweg-deVries Equation.* Preliminary report.
John Cobb, **Alex Kasman***, **Albert Serna** and **Monique Sparkman**, College of Charleston (1145-35-61)

AMS Special Session on Recent Advancements in Mathematical Modeling of Cancer, II

2:15 PM – 6:00 PM **Room 337, BCC**

Organizers: **Kamila Larripa**, Humboldt State University

Hwayeon Ryu, University of Hartford

2:15PM ► (407) *An intracellular model of synergistic CD8 T cell costimulation by 4-1BB (CD134) and OX40 (CD137).*
Anna Konstorum*, Center for Quantitative Medicine, UConn Health, **Anthony T. Vella**, **Adam J. Adler**, Department of Immunology, UConn Health, 263 Farmington Ave., Farmington, and **Reinhard C. Laubenbacher**, Center for Quantitative Medicine, UConn Health, 263 Farmington Ave., Farmington, CT (1145-92-1730)

3:15PM ► (408) *The Impact of Induced Drug Resistance in Cancer Chemotherapy.*
James Greene*, Rutgers University, **Eduardo Sontag**, Northeastern University and Harvard Medical School, **Jana Gevertz**, The College of New Jersey, and **Cynthia Sanchez-Tapia**, Rutgers University (1145-92-2005)

4:15PM (409) *Mechanical feedback and stress relaxation in tumor spheroid growth.* Preliminary report.
Min Wu, Mathematical Sciences, Worcester Polytechnic Institute, **Huaming Yan**, **Daniel Ramirez-Guerrero*** and **John Lowengrub**, Mathematics, University of California, Irvine (1145-00-2019)

5:15PM ► (410) *Modeling cell-cell interaction based pattern generation by Notch pathway.* Preliminary report.
Gaurav Mendiratta, Salk Institute for Biological Studies, La Jolla, California, USA (1145-92-2074)

AMS Special Session on Recent Advances in Regularity Lemmas, II

2:15 PM – 6:00 PM **Room 346, BCC**

Organizers: **Gabriel Conant**, University of Notre Dame

Rehana Patel

Julia Wolf, University of Bristol, UK

2:15PM (411) *The robustness framework for strong regularity lemmas and the application for ordered graphs.*
Eldar Fischer, Faculty of Computer Science, Technion - Israel Institute of Technology (1145-05-1515)

3:15PM (412) *Using combinatorial limits to obtain regularity lemmas.*
Mirna Džamonja*, University of East Anglia, Norwich, UK, associated to IHPST, Paris, France, and **Ivan Tomašić**, Queen Mary University of London, UK (1145-03-1014)

4:15PM (413) *Regularity Lemmas in the Limit.*
Henry P Towsner, University of Pennsylvania (1145-03-869)

4:45PM (414) *Digraphon estimation via step-function approximations.*
Diana Cai*, Princeton University, **Nate Ackerman**, Harvard University, and **Cameron Freer**, Borelian Corporation (1145-62-2094)

5:15PM ► (415) *Connections between learning, pseudo-randomness, and regularity.* Preliminary report.
Russell G. Impagliazzo, University of California, San Diego (1145-94-2671)

AMS Special Session on Symbolic Dynamics, II

2:15 PM – 5:05 PM **Room 327, BCC**

Organizers: **Van Cyr**, Bucknell University
Bryna Kra, Northwestern University

2:15PM (416) *The mapping class group of a minimal subshift (Part I).*
Kitty Yang* and **Scott Schmieding**, Northwestern University (1145-37-2062)

2:45PM ► (417) *The mapping class group of a minimal subshift (part 2).* Preliminary report.
Scott Schmieding* and **Kitty Yang**, Northwestern University (1145-37-1851)

3:15PM (418) *Mildly mixing interval exchange transformations.*
Donald Robertson, University of Utah (1145-37-2076)

3:45PM (419) *Optimal lower bounds for multiple recurrence.*
Sebastian Donoso, Instituto de Ciencias de la Ingenieria, Universidad de O'Higgins, **Anh Ngoc Le**, **Joel Moreira***, Northwestern University, and **Wenbo Sun**, Ohio State University (1145-37-2413)

4:15PM ► (420) *Almost periodic along subsequences.* Preliminary report.
Anh N Le, Northwestern University (1145-37-1379)

4:45PM (421) *Topological models characterizing multiple ergodic averages.*
Sebastian Donoso, Universidad de O'Higgins, and **Wenbo Sun***, the Ohio State University (1145-37-1089)

MAA Invited Paper Session on Using Research about Teaching and Learning to Inform the Preparation of Graduate Students to Teach

2:15 PM – 5:35 PM **Room 317, BCC**

Organizers: **Jack Bookman**, Duke University
Teri J. Murphy, University of Cincinnati

2:15PM Introduction to the session from Jack Bookman.

2:25PM ► (422) *Activities for Building and Honing MGTAs' Abilities to Foster Student Engagement.*
Mary Beisiegel, Oregon State University (1145-AC-2305)

2:55PM ► (423) *Research Sampler for Learning to Foster Student Engagement.*
Shandy Hauk, WestEd and U. Northern Colorado (1145-AC-2819)

3:25PM ► (424) *Activities to Build Department Culture that Supports Engaged Learning Classroom Culture.*
Kelly MacArthur, University of Utah (1145-AC-2657)

3:55PM (425) *An activity on aligning calculus problem session tasks to learning objectives.*
Cody L Patterson* and **Carlos Acevedo**, University of Texas at San Antonio (1145-AC-1124)

4:25PM (426) *Selecting and Creating Mathematical Tasks to Promote Student Engagement.*
Natasha Speer, The University of Maine (1145-AC-1357)

4:55PM ► (427) *An Activity for Unpacking Different Features of Mathematical Tasks.*
Kimberly Cervello Rogers, Bowling Green State University (1145-AC-1766)

5:25PM Session wrap-up with Jack Bookman.

MAA Minicourse #3: Part A

2:15 PM – 4:15 PM **Holiday Ballroom 1, 2nd Floor, Hilton**

Advanced Authoring in WeBWorK: Turn good math problems into great ones & submit them to the OpenProblemLibrary

Presenters: **Marianna Bonanome**, NYC College of Technology
Samar El Hitti, NYC College of Technology
Michael E. Gage, University of Rochester
K. Andrew Parker, NYC College of Technology

MAA Minicourse #9: Part A

2:15 PM – 4:15 PM **Holiday Ballroom 3, 2nd Floor, Hilton**

Mathematical Art from Complex Analysis

Presenter: **Frank Farris**, Santa Clara University

MAA Minicourse #4: Part A

2:15 PM – 4:15 PM **Holiday Ballroom 2, 2nd Floor, Hilton**

Teaching an Undergraduate Computational Science Course

Presenters: **Joseph Eichholz**, Rose-Hulman Insitute of Technology

Allen Holder, Rose-Hulman Insitute of Technology

AMS Contributed Paper Session on Dynamical Systems and Ergodic Theory

2:15 PM – 5:55 PM **Room 313, BCC**

2:15PM (428) *Relating singularly perturbed rational maps to families of entire maps.* **Joanna Furno***, University of Houston, and **Lorelei Koss**, Dickinson College (1145-37-1971)

2:30PM ► (429) *A Quasi-Strictly Non-Volterra Quadratic Stochastic Operator.* **A. J. M. Hardin***, University of Oklahoma, and **U. A. Rozikov**, Institute of mathematics, Tashkent, Uzbekistan (1145-37-171)

2:45PM (430) *The connectedness locus of IFS consisting of two similitudes.* **Nick Mendler**, University of San Francisco (1145-37-2832)

3:00PM ► (431) *Models on the unit square of the Chacón, Pascal, and other cutting and stacking transformations.* **Jennifer N Jones-Baro***, Centro de Investigación en Matemáticas (CIMAT), **Hindy Drillick**, Stony Brook University, **Alonso Espinosa-Dominguez**, Massachusetts Institute of Technology, **James Leng**, University of California, Berkeley, **Yelena Mandelshtam**, Stanford University, and **Cesar E. Silva**, Williams College (1145-37-2534)

3:15PM ► (432) *Non-Rigid Rank-One Infinite Measures on the Circle.* Preliminary report. **Yelena Mandelshtam***, Stanford University, **Alonso Espinosa-Dominguez**, Massachusetts Institute of Technology, **Hindy Drillick**, Stony Brook University, **Jennifer N. Jones-Baro**, Universidad de Guanajuato/CIMAT, **James Leng**, University of California, Berkeley, and **Cesar E. Silva**, Williams College (1145-37-2737)

3:30PM ► (433) *Effects of additional interactions on the dynamics of networks.* Preliminary report. **Yunjiao Wang***, **Alberto Zepeda**, **Faith Grice**, **Erika Martinez**, **Susan Gonzalez** and **Julio Chavez**, Texas Southern University (1145-37-2800)

3:45PM ► (434) *Billiards Inside, Circles Outside: Dynamics of a Charged Particle in a Piecewise Constant Magnetic Field.* **Sean Gasiorek**, University of California Santa Cruz (1145-37-1300)

4:00PM ► (435) *Quantifying intensity of dynamic attractors using bounded, non-autonomous control.* Preliminary report. **Katherine Meyer*** and **Richard McGehee**, University of Minnesota (1145-37-1436)

4:15PM (436) *A mathematical model of gender bias and homophily in professional hierarchies.* Preliminary report. **Sara M Clifton**, University of Illinois at Urbana-Champaign, **Kaitlin Hill***, University of Minnesota, **Avinash J Karamchandani**, Northwestern University, **Eric A Autry**, Duke University, **Patrick McMahon** and **Grace Sun**, University of Illinois at Urbana-Champaign (1145-37-2759)

4:30PM ► (437) *Mathematical models linking within-host to between-host HIV dynamics.* **Elyssa N Sliheet***, Southwestern University, and **J Montgomery Maxwell**, DePaul University (1145-37-1602)

4:45PM (438) *Stoichiometry and Toxicity in Aquatic Food Webs.* **Md Nazmul Hassan***, Texas Tech University,Lubbock,TX, and **Angela Peace**, Texas Tech University (1145-37-1880)

5:00PM ► (439) *Decomposition of Nonlinear System Dynamics into Multiple Time Scales.* **Ryan Chakmak**, Claremont McKenna College, **Colleen Chan**, Yale University, **Gal Dimand**, University of Redlands, and **Aaron George***, University of Maryland (1145-37-470)

5:15PM ► (440) *Frequency effects of various cubic resonances on a delayed oscillator.* **Lauren Lazarus**, Trinity College (1145-37-2259)

5:30PM (441) *Synchronization of a chaotic system by generalized active control.* **Nour elhouda Berguellah***, Constantine 1 university, and **Nasr eddine Hamri**, Mila university center (1145-37-457)

5:45PM ► (442) *Well-Posedness and Long-Time Dynamics of Geophysical Fluid Flows.* **Maleafisha Joseph Stephen Tladi**, University of Limpopo (1145-37-1)

AMS Contributed Paper Session on Low-Dimensional Manifolds

2:15 PM – 5:25 PM **Room 333, BCC**

2:15PM ► (443) *Computational methods applied to local moves on knots.*
Katie Tucker, University of Nebraska-Lincoln (1145-54-2378)

2:30PM (444) *Character Varieties of* $(2k+1, 3, 2k+1)$ *Knots.* Preliminary report.
Leona Sparaco, St. Mary's College of Maryland (1145-54-2053)

2:45PM ► (445) *Weights of Essential State Surfaces: A Combinatorial Approach.* Preliminary report.
Cynthia L. Curtis and **Kate O'Connor***, The College of New Jersey (1145-57-1910)

3:00PM ► (446) *Twisted Knots of Color.* Preliminary report.
Catherine Ross, Missouri State University (1145-00-2826)

3:15PM (447) *A generalization of the rectangle condition.*
Bo-hyun None Kwon, Korea University (1145-57-975)

3:30PM (448) *On the topology of groups of type* $\mathcal{Z}$.
Kirk McDermott, Slippery Rock University of Pennsylvania (1145-57-1940)

3:45PM ► (449) *Niebrzydowski Algebras and Trivalent Spatial Graphs.*
Paige Graves, University of Virginia, **Sam Nelson**, Claremont McKenna College, and **Sherilyn Tamagawa***, University of California, Santa Barbara (1145-57-665)

4:00PM Break

4:15PM (450) *DGA Representations, Ruling Polynomials, and the Colored HOMFLY-PT Polynomial.*
Caitlin Leverson*, Georgia Institute of Technology, and **Dan Rutherford**, Ball State University (1145-57-2119)

4:30PM ► (451) *Representing knot types by elements of a symmetric group.*
Cory Glover*, **Mark Hughes**, **Leslie Colton** and **Samantha Sandberg**, Brigham Young University (1145-57-2117)

4:45PM ► (452) *A Complete Set of Moves on Petal Diagrams.*
Leslie Colton*, **Corey Glover**, **Samantha Sandberg** and **Mark Hughes**, Brigham Young University (1145-57-2506)

5:00PM ► (453) *Link Shake Concordance and Link Homotopy.*
Anthony Bosman, Andrews University (1145-54-2864)

5:15PM (454) *Torsion in Khovanov Homology of 3-Braids.* Preliminary report.
Alex A Chandler*, North Carolina State University, **Adam Lowrance**, Vassar College, **Radmila Sazdanovic** and **Victor Summers**, North Carolina State University (1145-18-2808)

AMS Contributed Paper Session on Partial Differential Equations, I

2:15 PM – 5:25 PM **Room 312, BCC**

2:15PM (455) *Using geometric evolution equations to show stability in mathematical relativity.*
Brian Allen, United States Military Academy (1145-35-268)

2:30PM (456) *Mean Value Theorems for Riemannian Manifolds via the Obstacle Problem.*
Jeremy LeCrone*, University of Richmond, **Ivan Blank**, Kansas State University, and **Brian Benson**, University of California Riverside (1145-35-1055)

2:45PM (457) *Existence and structure of minimizers of least gradient problems.*
Amir Moradifam, University of California, Riverside (1145-35-2032)

3:00PM (458) *Existence and Selection of Saffman-Taylor Fingers by Kinetic Undercooling.*
Xuming Xie, Morgan State University (1145-35-1053)

3:15PM (459) *Steklov eigenvalues of reflection-symmetric nearly-circular planar domains.* Preliminary report.
Robert Paul Viator*, Southern Methodist University, and **Braxton Osting**, University of Utah (1145-35-2434)

3:30PM ► (460) *Breather Soliton Interactions for the Quaternionic KdV Equation.*
John David Cobb*, **Alex Kasman**, **Albert Serna** and **Monique Sparkman**, College of Charleston (1145-35-453)

3:45PM ► (461) *Computations on the Koch Snowflake with Boundary and Interior Energies.*
Malcolm Gabbard, Colorado College (1145-35-2663)

4:00PM (462) *Infinitely many solutions for a semilinear problem on exterior domains with nonlinear boundary condition.*
Janak R Joshi*, State University of New York, Oswego, and **Joseph Iaia**, University of North Texas, Denton, TX (1145-35-656)

4:15PM (463) *Cross-diffusive instabilities and pattern formation in a nonlinear public goods game.*
Russ F. deForest, Pennsylvania State University (1145-35-2802)

4:30PM ► (464) *Traveling wave solutions for a cancer stem cell invasion model.* Preliminary report.
Caleb Mayer, University of Michigan, and **Eric Stachura***, Kennesaw State University (1145-35-406)

4:45PM ► (465) *A finite sampling method for approximating initial data in some linear evolution equations.* Preliminary report. **Ramesh Karki**, Indiana University East (1145-35-1899)

5:00PM (466) *Asymptotic behavior of positive solutions to a diffusive predator-prey system with hunting cooperation in predators.* **Wonlyul Ko**, Institute of Basic Science/Korea university (1145-35-1330)

5:15PM (467) *On global and blow-up solutions for a short-ranged chemical signaling loop.* **Tian Xiang**, Renmin University of China (1145-35-3008)

AMS Contributed Paper Session on Topics in Analysis

2:15 PM – 5:10 PM **Room 335, BCC**

2:15PM (468) *The monotonicity properties of a generalized Bessel function.* **See Keong Lee**, Universiti Sains Malaysia (1145-30-991)

2:30PM ► (469) *Zeros of polynomials with four-term recurrence and linear coefficients.* **Khang D Tran*** and **Andres Zumba**, California State University, Fresno (1145-30-1022)

2:45PM ► (470) *Zero Distribution of a Sequence of Polynomials with a Higher Order Three Term Recurrence.* **Libby Farrell**, Grinnell College, and **Andres Zumba***, California State University, Fresno (1145-30-119)

3:00PM (471) *On the Limit Behavior of Iterated Function Systems of Holomorphic Maps.* **Kourosh Tavakoli**, Oklahoma City University (1145-30-2809)

3:15PM (472) *Convolutions of Normalized Harmonic Mappings.* Preliminary report. **Stacey Muir**, The University of Scranton (1145-30-2624)

3:30PM (473) *Equivalence among variable exponent Hardy or Bergman spaces.* **Tim Ferguson**, University of Alabama (1145-30-1370)

3:45PM (474) *Composition of Marichev-Saigo-Maeda Fractional Operators and Generalized k-Struve Function.* **Harish Nagar*** and **Seema Kabra**, Sangam University, Bhilwara, Rajasthan, India (1145-33-56)

4:00PM (475) *Convex families of holomorphic mappings related to the convex mappings of the ball in $\mathbb{C}^n$.* **Jerry R. Muir, Jr.**, The University of Scranton (1145-32-2662)

4:15PM (476) *p-Capacity and p-Poisson Equation.* Preliminary report. **Lucio M-G Prado**, Department of Mathematics, BMCC - The City University of New York (1145-31-2750)

4:30PM ► (477) *Sequences of Ratios of 1-Periodic Functions.* **Tessa Murthy**, Yale University (1145-26-423)

4:45PM (478) *For which geometric object , its shape can be heard?* Preliminary report. **Javad Namazi**, FDU (1145-26-2274)

5:00PM (479) *A singular function from Sturmian continued fractions.* **DoYong Kwon**, Chonnam National University (1145-26-1542)

MAA Contributed Paper Session on Discrete Mathematics in the Undergraduate Curriculum - Ideas and Innovations in Teaching, II

2:15 PM – 4:50 PM **Room 305, BCC**

Organizers: **John Caughman**, Portland State University

Oscar Levin, University of Northern Colorado

Elise Lockwood, Oregon State University

2:15PM ► (480) *Puzzles, Games, and Problem-Solving in Discrete Mathematics.* **Marilyn Reba*** and **Doug Shier**, Clemson University (1145-C5-285)

2:35PM ► (481) *Using Games and Puzzles to Teach Discrete Mathematics.* **Miriam Harris-Botzum**, Lehigh Carbon Community College (1145-C5-2718)

2:55PM ► (482) *Puzzling Through Discrete Mathematics.* **Edmund A Lamagna**, University of Rhode Island (1145-C5-1293)

3:15PM (483) *A discrete math course with early graph theory.* Preliminary report. **Oscar Levin**, University of Northern Colorado (1145-C5-2402)

3:35PM ► (484) *Discrete Mathematics as a Potential Gateway Course.* Preliminary report. **William T Mahavier**, Lamar University (1145-C5-2258)

3:55PM (485) *Connecting Discrete Mathematics to School Mathematics.* **Elizabeth G Arnold***, James Madison University, **Elizabeth A Fulton** and **Elizabeth A Burroughs**, Montana State University (1145-C5-1550)

4:15PM ► (486) *A Required Discrete Mathematics Course is No Less Important for Mathematics Majors than Calculus I.* **Joseph Malkevitch**, Department of Mathematics, York College (CUNY) (1145-C5-648)

4:35PM ► (487) *Unifying sets and logic with the real world in a Liberal Arts Mathematics course.* **Christopher S Shaw**, Columbia College Chicago (1145-C5-2548)

MAA Contributed Paper Session on Integrating Research into the Undergraduate Classroom

2:15 PM – 5:50 PM **Room 302, BCC**

Organizers: **Timothy B. Flowers**, Indiana University of Pennsylvania
Shannon R. Lockard, Bridgewater State University

2:15PM ► (488) *The Collaboratory: An Undergraduate Introduction to Research.*
Jordan O Tirrell, Mount Holyoke College (1145-B1-2789)

2:35PM ► (489) *The Development and Implementation of a Mathematics Research Methods Course.*
Dandrielle C Lewis, University of Wisconsin-Eau Claire (1145-B1-1865)

2:55PM ► (490) *Contests as Inspiration: Research in the Undergraduate Classroom.*
Erika L Ward* and **Daniel Moseley**, Jacksonville University (1145-B1-1923)

3:15PM ► (491) *Mini Research Projects in a Collaborative Classroom Environment.*
Jenny Switkes, California State Polytechnic University, Pomona (1145-B1-158)

3:35PM ► (492) *Student research in the algebra classroom.*
Kassie Archer*, University of Texas at Tyler, and **L.-K. Lauderdale**, Towson University (1145-B1-2320)

3:55PM ► (493) *Mathematics reasoning diagram: a pedagogical tool for classroom teaching of mathematics research and communication.* Preliminary report.
Malcah Effron, **Andreas Karatsolis**, **Suzanne Lane**, **Ari Nieh** and **Susan Ruff***, Massachusetts Institute of Technology (1145-B1-2099)

4:15PM (494) *Student Learning Gains Derived from Research embedded in a Statistics and Probability Course.* Preliminary report.
Maria M Franco, Queensborough Community College - The City University of New York (CUNY) (1145-B1-1182)

4:35PM ► (495) *Sample Class Projects that Provide Research Experience in Undergraduate Classrooms.*
Aihua Li, Montclair State University (1145-B1-2072)

4:55PM ► (496) *From aerodynamics to wind data, genetics algorithm and 3D printing.*
Malgorzata Marciniak, **Marina Nechayeva*** and **Vladimir Przhebelskyi**, LaGuardia Community College (1145-B1-2829)

5:15PM ► (497) *A Course-Embedded Undergraduate Research Experience in a Linear Algebra/Differential equations course.* Preliminary report.
Jeffrey O Wand, California State University, Monterey Bay (1145-B1-1947)

5:35PM ► (498) *A course pathway implementing research experiences in an introductory proof class.*
Peri A Shereen, Californiai State University, Monterey Bay (1145-B1-1694)

MAA Contributed Paper Session on Mathematics and Sports, I

2:15 PM – 6:10 PM **Room 303, BCC**

Organizers: **John David**, Virginia Military Institute
Drew Pasteur, College of Wooster

2:15PM ► (499) *A Statistical Analysis of Muhlenberg College's Fourth Down Strategy.*
Luke Wiley* and **James Russell**, Muhlenberg College (1145-B5-2312)

2:35PM ► (500) *Playing to Win? Two-Point Conversion Decisions in Major College Football.* Preliminary report.
R Drew Pasteur, College of Wooster (1145-B5-2318)

2:55PM ► (501) *Determining the radius of a figure skate blade: A Model-Eliciting Activity.*
Robert Nedwick* and **Diana S Cheng**, Towson University (1145-B5-1546)

3:15PM ► (502) *Applications of hypothetical competition analysis for figure skating team events.*
Diana S Cheng*, Towson University, and **Peter Coughlin**, University of Maryland, College Park (1145-B5-1545)

3:35PM ► (503) *Sports-Based Learning: Volleyball.*
Lauren Hall* and **Tetyana Berezovski**, Saint Joseph's University (1145-B5-1681)

3:55PM ► (504) *Mathematical Models in Rhythmic Gymnastics (RG).* Preliminary report.
Tetyana Berezovski, Department of Mathematics, Saint Joseph's University, Philadelphia (1145-B5-2098)

4:15PM ► (505) *When Do You Call the Bullpen?*
Zach A. Hollis and **Dylan A Kunce***, Trine University (1145-B5-2323)

4:35PM ► (506) *Applied Sabermetrics: Using math to help a Divison I baseball team win.*
David Miller, University of Hartford (1145-B5-1027)

4:55PM ► (507) *Using baseball simulation software to investigate d(wins)/dx for various statistics x.*
Robert Franzosa, University of Maine (1145-B5-2511)

5:15PM ► (508) *Consecutive Same-Score Streaks in MLB games.* Preliminary report.
Peter Staab*, Fitchburg State University, Fitchburg, MA, and **Richard Cleary**, Babson College, Wellsley, MA (1145-B5-2707)

5:35PM ► (509) *Potential Referee Bias Inferred from Statistical Anomalies in Sports Play By Play Data.*
Andrew B Perry, Springfield College (1145-B5-1093)

MAA Contributed Paper Session on Mathematics and the Arts, II

2:15 PM – 5:30 PM **Room 306, BCC**

Organizers: **Karl Kattchee**, University of Wisconsin-LaCrosse

Douglas Norton, Villanova University

Anil Venkatesh, Ferris State University

2:15PM ► (510) *Tess-celestial.* Preliminary report.
Radmila Sazdanovic, NC State University (1145-D1-2916)

2:35PM ► (511) *Transformed by Escher: Discovering the Art and Mathematics in a Regular Division of the Plane.*
Sandy M. Spitzer*, **Julia M. Daniel** and **Alexandria H. Wilhelm**, Towson University (1145-D1-2772)

2:55PM ► (512) *Self-Diagramming Lace: Minimalist Edition.*
Susan Goldstine, St. Mary's College of Maryland (1145-D1-2110)

3:15PM ► (513) *Embroidery of a Hyperbolic Fish Pattern.* Preliminary report.
Douglas Dunham*, University of Minnesota Duluth, and **Lisa Shier**, University of Maryland (1145-D1-974)

3:35PM ► (514) *Curvahedra, Making Manifolds.*
Edmund Harriss, University of Arkansas (1145-D1-2336)

3:55PM ► (515) *Exploring Nanobiological Structures with 3D Nanotomography, 4D Printing Via Self-Assembly, and Graph Theory.* Preliminary report.
John R Jungck, University of Delaware, Newark, DE (1145-D1-1815)

4:15PM ► (516) *Hamiltonian Cycles on Möbius Strips and Other Surfaces.* Preliminary report.
Robert A Bosch*, Oberlin College, and **Ari Smith**, Oberlin College and Conservatory (1145-D1-1682)

4:35PM ► (517) *Elliptification of Rectangular Imagery.*
Chamberlain Fong, San Francisco, CA (1145-D1-2218)

4:55PM ► (518) *Factoring homographies to analyze perspective distortions.*
Fumiko Futamura*, Southwestern University, **Marc Frantz**, Indiana University Bloomington, and **Annalisa Crannell**, Franklin and Marshall College (1145-D1-2190)

5:15PM ► (519) *The Treachery of Geometric Images.* Preliminary report.
Aiden Steinle* and **Fumiko Futamura**, Southwestern University (1145-D1-2159)

MAA Contributed Paper Session on Open Educational Resources: Combining Technological Tools and Innovative Practices to Improve Student Learning, II

2:15 PM – 6:10 PM **Room 301, BCC**

Organizers: **Benjamin Atchison**, Framingham State University

Marianna Bonanome, New York City College of Technology

Margaret Dean, Borough of Manhattan Community College

Annie Han, Borough of Manhattan Community College

Michael Gage, University of Rochester

2:15PM ► (520) *What is Precalculus?: My journey in developing active learning materials.*
Philip DeOrsey, Westfield State University (1145-L1-2431)

2:35PM ► (521) *Active Preparation for Calculus: a new free and open text.* Preliminary report.
Matt Boelkins, Grand Valley State University (1145-L1-1157)

2:55PM ► (522) *An OER Cycle in a Calculus Course.*
Axel Brandt, Northern Kentucky University (1145-L1-1801)

3:15PM (523) *Challenges and Opportunities of Using WeBWork as a Free Homework System in Teaching Calculus.* Preliminary report.
Matt Sunderland, College of Staten Island, The City University Of New York (1145-L1-2882)

3:35PM Discussion.

3:55PM ► (524) *Opening the classroom: Adopting and Adapting Open Educational Resources and Open Source Software for a Discrete Computing Course.*
Carrie Diaz Eaton, Bates College (1145-L1-1255)

4:15PM ► (525) *Creating and Using Multimedia OER Modules for a Linear Algebra Course.*
Anna Davis*, Ohio Dominican University, and **Paul Zachlin**, Lakeland Community College (1145-L1-2102)

4:35PM ► (526) *Open-Ended Exploration Problems: Using WeBWorK to Break the Textbook-Problem Mold.* Preliminary report.
K. Andrew Parker, CUNY City Tech (1145-L1-1952)

4:55PM Break

5:15PM (527) *Academic apps: teaching with technology to motivate instantaneous rates of change.*
Bryan Adams*, **Dusty Turner** and **Andrew Plucker**, United States Military Academy (1145-L1-272)

5:35PM ► (528) *Virtual and Augmented Reality Applications for Math Education.* **Lee Stemkoski**, Adelphi University (1145-L1-1548)

5:55PM ► (529) *Refining Mathematical Curriculum.* **Christina M Ferrante** and **Lara M Klein***, Adelphi University (1145-L1-765)

MAA Contributed Paper Session on The Scholarship of Teaching and Learning in Collegiate Mathematics, II

2:15 PM – 5:10 PM **Room 322, BCC**

Organizers: **Tom Banchoff**, Brown University

Curtis Bennett, California State University, Long Beach

Pam Crawford, Jacksonville University

Jacqueline Dewar, Loyola Marymount University

Edwin Herman, University of Wisconsin-Stevens Point

Lew Ludwig, Denison University

2:15PM ► (530) *Student Impressions of Online Mathematics Homework.* Preliminary report.
N. Paul Schembari, East Stroudsburg University of Pennsylvania (1145-E1-2361)

2:35PM ► (531) *Data Integration in Undergraduate Mathematics Education.* Preliminary report.
Nicole Juersivich*, Nazareth College, and **Matt Hoffman**, Rochester Institute of Technology (1145-E1-442)

2:55PM (532) *Effective Practice and Feedback Methods in Calculus I.* Preliminary report.
Kristin A Camenga* and **Kimberly A Roth**, Juniata College (1145-E1-587)

3:15PM (533) *A study of student perceptions of office hours and the impact of required and elective attendance on those perceptions.*
Lake Ritter, **Jennifer Vandenbussche*** and **Christina Scherrer**, Kennesaw State University (1145-E1-1122)

3:35PM ► (534) *Supporting the Algebraic Reasoning of Calculus Students.* Preliminary report.
Katherine J. Mawhinney*, **Katrina Palmer**, **Sarah Greenwald** and **Vicky Klima**, Appalachian State University (1145-E1-1741)

3:55PM ► (535) *Better Calculus through Biology: The Biocalculus Sequence at Penn State University.*
Eric Simring, Penn State University (1145-E1-2818)

4:15PM ► (536) *Investigating students' progression through a mathematics course sequence based on instructional methods used in introductory calculus.*
Paran R Norton*, **Karen A High** and **William C Bridges**, Clemson University (1145-E1-2692)

4:35PM ► (537) *Mathematics Immersion Eases the Transition to Proof.* Preliminary report.
Robb Sinn* and **Karen Briggs**, University of North Georgia (1145-E1-2545)

4:55PM ► (538) *Teaching the Mean Value Theorem to students not intending to major in math.* Preliminary report.
Joshua A Cole, Wabash College (1145-E1-2930)

MAA Contributed Paper Session on Undergraduate Student TAs in Mathematics

2:15 PM – 5:50 PM **Room 304, BCC**

Organizers: **Aaron Peterson**, Northwestern University

Ursula Porod, Northwestern University

2:15PM ► (539) *Incorporating Learning Assistants in the Redesign of Critical Math Courses.*
Jeremiah Hower* and **Roneet Merkin**, Florida International University (1145-C1-1222)

2:35PM ► (540) *Training of Undergraduate Learning Assistants in developmental math, pre-calculus and calculus classes.* Preliminary report.
Martina Bode, University of Illinois at Chicago (1145-C1-1438)

2:55PM (541) *The University of Maine's Program to Incorporate Undergraduate Teaching Assistants into Faculty Course Reform Efforts.*
Natasha Speer*, **Erin Vinson**, **MacKenzie Stetzer** and **Laura Millay**, The University of Maine (1145-C1-2248)

3:15PM ► (542) *Quantitative Reasoning Associates at Dickinson College: Supporting Teaching and Learning.*
Sarah N Bryant*, Dickinson College, and **Emily Marshall**, Dickinson Colllege (1145-C1-1814)

3:35PM ► (543) *The Undergraduate Teaching Assistantship (UTA) in Hopkins Math.*
Richard J Brown, Johns Hopkins University (1145-C1-1232)

3:55PM (544) *Cultivating high quality undergraduate math TAs at the University of Toronto Mississauga.* Preliminary report.
Maria Wesslen, University of Toronto Mississauga (1145-C1-102)

4:15PM ► (545) *University of Maryland Undergraduate Teaching Assistantships.*
D. Levermore, **K. Okoudjou**, **R. Rosca**, **K. Williams** and **J. Wyss-Gallifent***, University of Maryland (1145-C1-2751)

4:35PM ► (546) *Undergraduate Teaching Assistant Preparation Program at Georgia Tech.* **Klara J. Grodzinsky**, Georgia Institute of Technology (1145-C1-81)

4:55PM ► (547) *A Teaching Practicum Course at the United States Air Force Academy.* **Ian Pierce**, United States Air Force Academy (1145-C1-2611)

5:15PM ► (548) *Developing a Tutor Training Course for Goucher's Quantitative Reasoning Center.* **Justine Chasmar**, Goucher College (1145-C1-1375)

5:35PM ► (549) *An Inquiry-Based Study Group Program with Undergraduate Math Leaders (TA's).* **Galina Dobrynina*** and **Debra K Borkovitz**, Boston University (1145-C1-2057)

MAA General Contributed Paper Session on Algebra, I

2:15 PM – 6:25 PM **Room 348, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

2:15PM ► (550) *On n- abelian coverings of finite groups.* **Josh Hiller*** and **Tuval Foguel**, Adelphi University (1145-VL-1080)

2:30PM ► (551) *Subgroups of Groups of Units Modulo n.* Preliminary report. **Shahriyar Roshan Zamir**, University of Minnesota Duluth (1145-VL-1378)

2:45PM (552) *On the Properties of alpha-Skew Armendariz Modules.* **Parastoo Malakooti Rad**, Qazvin Branch, Islamic Azad University, Qazvin, Iran., and **Sara Shirinkam***, University of the Incarnate Word (1145-VL-1613)

3:00PM ► (553) *Minimum Euclidean Function Over $\mathbb{Z}[\omega]$.* Preliminary report. **Erica R Bajo Calderon**, University of Central Oklahoma (1145-VL-1755)

3:15PM (554) *The combinatorics of the P-partition generating function and its irreducibility.* **Michael Weselcouch*** and **Ricky Ini Liu**, North Carolina State University (1145-VL-1950)

3:30PM ► (555) *Searching for Toric Rings with USTP.* Preliminary report. **D. Johnson**, University of Utah (1145-VL-1963)

3:45PM ► (556) *Results in Leibniz n-algebras from the category* $\mathbf{U}_n$(**Lb**). **Min Soo Kim**, Vanderbilt University (1145-VL-1978)

4:00PM ► (557) *Systems of Linear Recurrences with Non-Constant Coefficients.* **Everett Sullivan**, Lewis & Clark College (1145-VL-2042)

4:15PM (558) *The Polydegree Conjecture.* **Kaitlyn A Perry**, Wingate University (1145-VL-2049)

4:30PM (559) *GIT Fan for Mori Dream Spaces.* Preliminary report. **Jamie Peabody**, Kansas State University (1145-VL-2334)

4:45PM (560) *Finding Relations Between Invariants of Representations Using a Monte Carlo Method.* **Alison Becker**, University of Wisconsin-Milwaukee (1145-VL-2344)

5:00PM ► (561) *The elasticity and union of sets of lengths of Puiseux monoids.* **Marly Cormar**, University of Florida (1145-VL-2837)

5:15PM (562) *Product Formulas in Log Gromov-Witten Theory.* **Leo Herr**, CU Boulder (1145-VL-2996)

5:30PM (563) *A Note on Solitary Subgroups of Finite Groups.* **Orieta Liriano***, Instituto de Matemática. Universidad Autónoma de Santo Domingo, and **Ramon Esteban-Romero**, Institut Universitari de Matemàtica Pura i Aplicada, Universitat Politècnica de València, València, Spain (1145-VL-2614)

5:45PM ► (564) *On a software accessible database of faithful representations of Lie algebras.* **Cailin Foster**, Dixie State University (1145-VL-2780)

6:00PM ► (565) *Critical Groups.* Preliminary report. **Houssein El Turkey**, University of New Haven, and **Salam Turki***, Rhode Island College (1145-VL-2820)

6:15PM ► (566) *Factorizations in Puiseux algebras.* **Felix Gotti**, UC Berkeley (1145-VL-2834)

MAA General Contributed Paper Session on Analysis

2:15 PM – 6:25 PM **Room 341, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

2:15PM (567) *Existence of minimal and maximal solutions for Caputo fractional differential equations with bounded delay.* **J. Diego Ramirez**, Savannah State University (1145-VM-105)

2:30PM (568) *Families of Complex Linear Differential Equations in the Unit Disk.* **Kari E. Fowler**, University of Tampa (1145-VM-129)

2:45PM ► (569) *An unexpected random walk.* Preliminary report. **Thomas J Osler*** and **Marcus Wright**, Rowan University (1145-VM-1328)

3:00PM ► (570) *Iteration of Differentiation.* **Jakob Hofstad** and **David Walmsley***, St. Olaf College (1145-VM-1417)

3:15PM ► (571) *Extending the Gauss - Lucas Theorem.* Preliminary report.
Gabriel Prajitura, SUNY Brockport (1145-VM-1587)

3:30PM (572) *Mixing and local central limit theorem for hyperbolic dynamical systems.*
Peter Nandori, Univeristy of Maryland College Park (1145-VM-1768)

3:45PM (573) *Series where the set of Selective Sums is a Cantorval.*
Timothy D Ferdinands*, Bethel College Indiana, and **John Ferdinands**, Calvin College (1145-VM-1807)

4:00PM (574) *Rigidity of Local Quasisymmetric Maps on Fibered Spaces.*
Mark Medwid*, Rhode Island College, and **Xiangdong Xie**, Bowling Green State University (1145-VM-2001)

4:15PM (575) *Lebesgue Integration on a Banach Space with a Schauder Basis.*
Timothy I Myers, Howard University (1145-VM-2412)

4:30PM ► (576) *Maximum Principles for Matrix-Valued Analytic Functions.* Preliminary report.
Alberto A. Condori, Florida Gulf Coast University (1145-VM-2564)

4:45PM (577) *Existence of Coboundaries.*
Terrence Adams*, U.S. Government, and **Joseph Rosenblatt**, IUPUI (1145-VM-2748)

5:00PM ► (578) *Uniform Convergence and Boundary Denjoy-Wolff Points.* Preliminary report.
R Alexander Glickfield* and **Scott Kaschner**, Butler University (1145-VM-2822)

5:15PM (579) *Maximal metrics and distortion of circle diffeomorphisms.* Preliminary report.
Michael P Cohen, Carleton College (1145-VM-2862)

5:30PM (580) *Sparse Domination of Multilinear Dyadic Operators.*
Ishwari J Kunwar, Fort Valley State University (1145-VM-3004)

5:45PM (581) *Examples of spaces of analytic functions with variable exponents.*
Gerardo R Chacon*, Gallaudet University, and **Gerardo A Chacon**, Universidad Antonio Nariño (1145-VM-375)

6:00PM (582) *Weighted shifts associated with composition operators: fixed points and iteration points.*
Isabelle Chalendar, Universite Paris Est Marne la Vallee, and **George R. Exner***, Bucknell University (1145-VM-524)

6:15PM ► (583) *Partitions of Steiner Equiangular Tight Frames.*
Hieu D Nguyen*, Rowan University, and **James Rosado**, Temple University (1145-VM-857)

SIAM Minisymposium on Mathematical Models in Cancer

2:15 PM – 5:05 PM **Room 342, BCC**

Organizer: **Doron Levy**, University of Maryland, College Park

2:15PM ► (584) *Metastasis Suppression by the Primary Tumor: A Natural Law.*
Leonid Hanin, Idaho State University (1145-92-659)

2:45PM ► (585) *Linking multi-scale imaging with multi-scale modeling to predict the response of tumors to therapy.*
David A Hormuth II, **Angela M. Jarrett**, **Ernesto A. B. F. Lima**, **Chengyue Wu**, **Ryan Woodall**, **Caleb Phillips** and **Thomas Yankeelov***, The University of Texas at Austin (1145-92-693)

3:15PM ► (586) *Multiscale Modeling of Combined Traditional and Targeted Therapies Against Stem Cell Driven Cancers.* Preliminary report.
Trachette L Jackson, University of Michigan (1145-92-919)

3:45PM ► (587) *Modeling continuous levels of cell states in cancer development and drug resistance.*
Heyrim Cho*, University of Maryland, **Lisette de Pillis**, Harvey Mudd College, **Ya-Huei Kuo**, Beckman Research Institute, **Ami Radunskaya**, Pomona College, **Russell Rockne**, Beckman Research Institute, and **Doron Levy**, University of Maryland (1145-92-937)

4:15PM ► (588) *How do immune cells kill cancer cells?*
Ami Radunskaya*, Pomona College, Claremont CA, and **Joshua Sack**, California State University, Long Beach, CA (1145-92-943)

4:45PM ► (589) *Robust optimization of cancer immunotherapy.*
Jana Gevertz, The College of New Jersey (1145-92-616)

MAA Workshop

2:15 PM – 3:25 PM **Room 324, BCC**

Discussing Project Ideas with NSF/EHR Program Officers, Part I

Organizer: **Karen Allen Keene**, National Science Foundation, Division of Undergraduate Education

Presenters: **Karen Allen Keene**, National Science Foundation, Division of Undergraduate Education

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

Sandra Richardson, National Science Foundation, Division of Undergraduate Education

Tara Smith, National Science Foundation, Division of Graduate Education

Talitha Washington, National Science Foundation, Division of Undergraduate Education

Lee Zia, National Science Foundation, Division of Undergraduate Education

MAA Panel

2:15 PM – 3:35 PM **Room 349, BCC**

Mental Health in the Mathematics Profession

Organizers: **Justin Curry**, SUNY Albany
Mikael Vejdemo-Johansson, CUNY College of Staten Island

Panelists: **Justin Curry**, SUNY Albany
Julie Corrigan, Charleston
Kate Farinholt, National Alliance on Mental Illness
Rachel Levanger, University of Pennsylvania
Mikael Vejdemo-Johansson, CUNY College of Staten Island

MAA Panel

2:15 PM – 3:35 PM **Room 350, BCC**

Pursuing New Directions in Your Academic Career

Organizers: **Louis Deaett**, Quinnipiac University
Linda McGuire, Muhlenberg College
Steven Schlicker, Grand Valley State University
David Torain, Montgomery College

Panelists: **Curtis Bennett**, California State University
Jill Guerra, University of Arkansas at Fort Smith
Ron Taylor, Berry College
Suzanne Weekes, Worcester Polytechnic Institute

Association for Women in Mathematics Panel Discussion

2:15 PM – 3:40 PM **Room 316, BCC**

Promoting Inclusion in STEM.

Organizer: **Talia Fernos**, University of North Carolina Greensboro

Moderator: **Talia Fernos**, University of North Carolina, Greensboro

Panelists: **Pamela Barnett**, University of Pennsylvania
Harrison Bray, University of Michigan, Ann Arbor
Piper Harron, University of Hawaii, Manoa
Autumn Kent, University of Wisconsin, Madison

AMS Special Event

2:15 PM – 4:30 PM **Room 307, BCC**

Activities in NSF's Division of Mathematical Sciences

Organizers: **Henry Warchall**, National Science Foundation, Division of Mathematical Sciences
Catherine Paolucci, National Science Foundation, Division of Mathematical Sciences

AMS Contributed Paper Session on Systems Theory, Control, Information and Communication, and Circuits

2:30 PM – 5:25 PM **Room 334, BCC**

2:30PM (590) *Phaseless sampling and reconstruction of real-valued FRI signals.*
Cheng Cheng*, Duke University and SAMSI, and **Qiyu Sun**, University of Central Florida (1145-00-482)

2:45PM (591) *Circuit Codes With Long Bit Runs.*
Kevin M. Byrnes, Wilmington, DE (1145-94-1098)

3:00PM ► (592) *Beyond RAID 6 — an Efficient Systematic Code Protecting Against Multiple Errors, Erasures, and Silent Data Corruption.*
Mohamad Moussa* and **Marek Rychlik**, University of Arizona (1145-94-79)

3:15PM ► (593) *Combinatorial Properties of Diagonal Distance.*
Emma Lennen*, **Wade Bloomquist**, **Jose Zavala**, **Gulnoza Bobokalonova** and **Rebecca Embar**, UC Santa Barbara (1145-94-1163)

3:30PM (594) *Rank-Metric codes and q-Polymatroids.*
Elisa Gorla, University of Neuchâtel, **Relinde Jurrius**, Netherlands Defence Academy, **Hiram H. López***, Autonomous University of Aguascalientes, and **Alberto Ravagnani**, University College Dublin (1145-94-2282)

3:45PM ► (595) *Magic Card Tricks on Hamming Codes over Finite Fields.*
Hideo Nagahashi, University of Guam (1145-00-2303)

4:00PM ► (596) *Implementing Machine Learning to Improve Bertini 2.0.*
Riley Jayne Anderson, University of Mary Washington (1145-97-2084)

4:15PM ► (597) *Nonlinear control systems as collections of vector fields.* Preliminary report.
Laura Munteanu, State University of New York at Oneonta (1145-93-2031)

4:30PM (598) *Identification of Parameters in Systems Biology.*
Roby Poteau* and **Ugur Abdulla**, Florida Institute of Technology (1145-93-356)

4:45PM ► (599) *Consensus of Multi-Agent Systems: A Time Scales Approach.* Preliminary report.
Dylan R Poulsen, Washington College (1145-93-2689)

5:00PM ► (600) *Characterizations of string stability of interconnected automobile systems.*
Matthew Rose* and **Hasala Gallolu Kankanamalage**, Roger Williams University (1145-93-2769)

5:15PM (601) *Lyapunov descriptions of string stability for systems with delays.*
Hasala Gallolu Kankanamalage, Roger Williams University (1145-93-2931)

AMS Contributed Paper Session on Functional Analysis

2:45 PM – 4:55 PM **Room 311, BCC**

2:45PM (602) *Irreducible representations of some vector-valued function algebras.*
Terje Hõim*, Wilkes Honors College, Florida Atlantic University, and **D. A. Robbins**, Trinity College, Hartford, CT (1145-46-1305)

3:00PM (603) *On Jordan-Sherman-Takeda-Grothendieck type theorem for real locally C*-algebras.*
Oleg Friedman*, Lander College for Men / Touro College & University System, Flushing, NY, and **Alexander A. Katz**, St. John's University, Queens, NY (1145-46-1828)

3:15PM (604) *A conjecture of Andrew Gleason for uniform algebras on smooth manifolds.* Preliminary report.
Swarup N. Ghosh, Southwestern Oklahoma State University (1145-46-2714)

3:30PM (605) *A Self-Adjoint Operator Generated by the Krall Differential Expression with the Krall Polynomials as Eigenfunctions.*
Katie Elliott, Baylor University (1145-46-2595)

3:45PM Break

4:00PM (606) *Unique extension and expectation properties for graph and groupoid C^*-algebras.* Preliminary report.
Danny Crytser, St Lawrence University (1145-46-2040)

4:15PM (607) *Coupled Supersymmetries and Associated Fourier-Like Transforms: New Generalizations of the Quantum Harmonic Oscillator and Fourier Transform.*
Cameron Louis Williams*, State University of New York at Potsdam, **Nikhil N Pandya**, **Donald J Kouri** and **Bernhard G Bodmann**, University of Houston (1145-46-2369)

4:30PM ► (608) *Stability of fixed point of mappings in generalized cone metric spaces.*
Mujahid Abbas, Department of Mathematics, Government College University, Lahore 54000, Pakistan (1145-46-1323)

4:45PM (609) *Nowhere differentiable Lipschitz maps of* $[0,1]$ *into* $L_1[0,1]$.
Florin Catrina* and **Mikhail I Ostrovskii**, St. John's University (1145-46-987)

MAA General Contributed Paper Session on Modeling and Applications, I

2:45 PM – 3:55 PM **Room 323, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

2:45PM (610) *Optimal Airline De-ice Scheduling.*
Jakob J. Kotas*, University of Portland and University of Hawaii at Manoa, and **Andrew Bracken**, Portland, OR (1145-VF-1177)

3:00PM ► (611) *Using Global Sensitivity Analysis to Find Influential Parameters in a Wound-Healing Model.* Preliminary report.
Abdullah Ossama Ateyeh*, **Rithik Ghanta Reddy** and **Richard Schugart**, Western Kentucky University (1145-VF-1280)

3:15PM ► (612) *Efficient Iterative Methods for Finite Element Based Neurostimulation Simulations.* Preliminary report.
Edward T Dougherty*, Roger Williams University, **James C Turner**, Virginia Tech, and **Frank Vogel**, inuTech GmbH (1145-VF-1465)

3:30PM (613) *Mathematical Model for Nutrient Exchange Across the Placenta.*
Joel Odongo Olielo, **Prof. Omollo N Ongati**, School of Mathematics and Actuarial Science, JOOUST, Bondo, and **Dr. Boniface Otieno Kwach***, Department of Mathematics and Statistics, Kibabii University, Bungoma, Kenya (1145-VF-1555)

3:45PM (614) *Modeling and Design of Adsorption Based Filters: Bio-remediation of Heavy Metal Contaminated Water.*
Chris McCarthy, BMCC City University of New York (1145-VF-1580)

MAA Contributed Paper Session on Inquiry-Based Learning and Teaching, I

3:00 PM – 4:55 PM **Room 340, BCC**

Organizers: **Susan Crook**, Loras College
Eric Kahn, Bloomsburg University
Brian Katz, Augustana College
Amy Ksir, United States Naval Academy
Victor Piercey, Ferris State University
Candice Price, University of San Diego
Xiao Xiao, Utica College

3:00PM (615) *A 1st and A 10^{1st} IBL class: transformation and shared struggle.* **Phong Le** and **Rachel Grotheer***, Goucher College (1145-O5-2682)

3:20PM ► (616) *Exploring Big Ideas in Calculus 1 Through Bite-Sized IBL Lessons.* **John D Ross**, Southwestern University (1145-O5-2566)

3:40PM ► (617) *Peaks and valleys of first-time implementation of IBL methods in Calculus III and Intro to Statistics classes.* Preliminary report. **John M. Osborn**, Southwestern University (1145-O5-2211)

4:00PM ► (618) *Using Daily Prep Assignments In IBL Calculus 1.* **Erica R. Miller**, Virginia Commonwealth University (1145-O5-1883)

4:20PM ► (619) *Taking the IBL plunge: Reflections on a mass implementation in entry-level mathematics courses.* Preliminary report. **Abigail Higgins***, **Sayonita Ghosh Hajra** and **Topaz Wiscons**, California State University, Sacramento (1145-O5-1188)

4:40PM ► (620) *Developing and Implementing a Flipped Model in Statistics Course at Community College.* Preliminary report. **Shadisadat Ghaderi**, Guttman Community College, City University of New York (1145-O5-2760)

MAA Invited Address

3:20 PM – 4:10 PM **Ballrooms I & II, 400 Level, BCC**

(621) *Sailing through data: discoveries and mirages.* **Emmanuel Candes**, Stanford University (1145-A0-15)

MAA Panel

3:35 PM – 4:15 PM **Room 350, BCC**

Impacting Mathematics Instruction Through Meaningful Collaboration with Partner Discipline Faculty

Organizer: **Janet Bowers**, San Diego State University

Panelists: **Susan L. Ganter**, Embry-Riddle Aeronautical University
Rosalyn H. Hargraves, Virginia Commonwealth University
Stella Hofrenning, Augsburg University
Victor I. Piercey, Ferris State University
Kathy Williams, San Diego State University,

AWM Business Meeting

3:45 PM – 4:15 PM **Room 316, BCC**

MAA Section Officers

4:00 PM – 5:00 PM **Room 323, BCC**

Chair: **Lisa Marano**, Westchester University of Pennsylvania

Project NExT Workshop on Productive Failure

4:15 PM – 5:30 PM **Room 308, BCC**

What can we learn from our teaching mistakes?

Organizers: **Kimberly Ayers**, Pomona College
Jessica De Silva, California State University, Stanislaus
Sarah Loeb, Hampden-Sydney College
Emily Meehan, Gallaudet University

AMS Committee on the Profession Panel Discussion

4:30 PM – 6:00 PM **Room 315, BCC**

Permanent teaching faculty in research oriented departments.

Moderator: **Greg Lawler**, University of Chicago

Panelists: **Emily Braley**, Harvard University
Amy Cohen-Corwin, Rutgers, The State University of New Jersey
Gavin LaRose, University of Michigan
Greg Lawler, University of Chicago
Bob Palais, Utah Valley University
Michael Weingart, Rutgers University

Town Hall Meeting

4:30 PM – 5:50 PM **Room 339, BCC**

Spectra: Identifying Workplace Best Practices for LGBTQ Mathematicians

Organizers: **Ron Buckmire**, National Science Foundation (NSF)
David Crombecque, University of Southern California
Christopher Goff, University of the Pacific
Alexander Hoover, Tulane University
Douglas Lind, University of Washington, Seattle

MAA General Contributed Paper Session on Teaching and Learning Advanced Mathematics, I

5:00 PM – 6:25 PM **Room 305, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

5:00PM ► (622) *Content-Based Specifications Grading in a Proofs Course.* **Andrew A. Cooper**, North Carolina State University (1145-VK-145)

5:15PM ► (623) *Unicorns and Zombies and Other Analogies to Help Students with Proofs.* **C. Bryan Dawson**, Union University (1145-VK-2015)

5:30PM ► (624) *Uncovering rationales behind mathematical techniques, algorithms, and proofs.* **Marshall Gordon**, Columbia.MD (1145-VK-2101)

5:45PM ► (625) *Using Mathematical Modeling to Integrate Research into the Undergraduate Classroom.* Preliminary report. **Ahmad M Alhammouri**, Jacksonville State University (1145-VK-212)

6:00PM ► (626) *Scaffolding Proofs in a First Course in Real Analysis.* **Irina Seceleanu**, Bridgewater State University (1145-VK-248)

6:15PM ► (627) *Using Videos Created with an iPad Pro to Flip the Classroom in an Introductory course in Number Theory and Cryptology.* Preliminary report. **Cathy M Frey**, Norwich University, Vermont (1145-VK-2883)

Reception for Graduate Students and First-Time Participants

5:30 PM – 6:30 PM **Key Ballroom 7,9 & 10, 2nd Floor, Hilton**

SIGMAA on the History of Mathematics (HOM SIGMAA) Business Meeting and Reception

6:15 PM – 7:15 PM **Room 306, BCC**

Organizers: **Toke Knudsen**, State University of New York at Oneonta
Amy Shell-Gellasch, Eastern Michigan University

SIGMAA ARTS Business Meeting

6:30 PM – 7:30 PM **Room 322, BCC**

SIGMAA On Sports Business Meeting

6:30 PM – 8:00 PM **Room 303, BCC**

Speakers: **Tim Chartier**, Davidson College

MathILy, MathILy-Er Yearly Gather

7:00 PM – 8:30 PM **Peale C, 1st Floor, Hilton**

SIGMAA on the History of Mathematics (HOM SIGMAA) Guest Lecture

7:15 PM – 8:00 PM **Room 306, BCC**

Organizers: **Toke Knudsen**, State University of New York at Oneonta
Amy Shell-Gellasch, Eastern Michigan University

7:15PM (628) *Crossing the pond: European mathematicians in 1920s America.* **Karen Hunger Parshall**, University of Virginia (1145-A0-3037)

AMS Josiah Willard Gibbs Lecture

8:30 PM – 9:20 PM **Ballrooms I & II, 400 Level, BCC**

► (629) *Immunology for mathematicians.* **Alan S. Perelson**, Los Alamos National Laboratory (1145-00-2341)

Thursday, January 17

Joint Meetings Registration

7:30 AM – 4:00 PM **Pratt Street Lobby, 300 Level, BCC**

Email Center

7:30 AM – 7:00 PM **Pratt Street Lobby, 300 Level, BCC**

AMS Contributed Paper Session on Rings and Algebras

7:45 AM – 11:55 AM **Room 334, BCC**

7:45AM ► (630) *Classification of seven-dimensional solvable Lie algebras with five-dimensional nilradical.* Preliminary report.
Jacksyn Bakeberg, McGill University, **Kathryn Blaine**, Bard College, and **Firas Hindeleh***, Grand Valley State University (1145-22-572)

8:00AM (631) *Lie Triple Derivations of the Lie Algebra of Dominant Block Upper Triangular Matrices.*
Prakash Ghimire, LSU at Alexandria, Louisiana 71302 (1145-17-803)

8:15AM (632) *Annihilators of Indecomposable Bounded Modules of* Vec($\mathbb{R}$).
Tyler Kenefake, University of North Texas (1145-17-450)

8:30AM (633) *The Leibniz Multiplier of Lie and Leibniz Algebras.*
Elyse Suzanne Rogers, North Carolina State University (1145-17-1962)

8:45AM (634) *The c-nilpotent Schur Lie-multiplier of Leibniz algebras.*
Guy R Biyogmam, Georgia College & State University (1145-17-2139)

9:00AM (635) *Some Maximal Dominant Weights and their Multiplicities for Affine Lie Algebra Representations.* Preliminary report.
Suzanne Elise Crifo, North Carolina State University (1145-17-2460)

9:15AM (636) *Twisted Toroidal Lie Algebras: Present and Future.*
Chad R Mangum, Niagara University (1145-17-2559)

9:30AM (637) *An isomorphism of modules of type D_n.* Preliminary report.
Ryan Roger Moruzzi, Jr, University of California, Riverside (1145-17-437)

9:45AM (638) *Permutation Orbifolds of Fermion Vertex Superalgebras.*
Antun Milas, University at Albany, **Michael Penn***, Randolph College, and **Joshua Wauchope**, University at Albany (1145-17-2518)

10:00AM ► (639) *Finite Group Orbifolds of the Rank 2 Heisenberg Vertex Algebra.*
Jude L Quintero*, Randollph College, and **Michael Penn**, Randolph College (1145-17-1838)

10:15AM (640) *Representations of Lattice Vertex Algebras, Trace Functions, and Modular Transformations: Examples in order 3.*
Jason R Elsinger, Florida Southern College, FL (1145-06-1114)

10:30AM ► (641) *A Deformation Theory Controlled by $H^{\bullet}_{Sd}(A, A)$.* Preliminary report.
Jacob Laubacher, St. Norbert College (1145-16-969)

10:45AM (642) *Quantum Webs of type Q.* Preliminary report.
Gordon Brown, Lockheed-Martin, **Nicholas Davidson*** and **Jonathan Kujawa**, University of Oklahoma (1145-16-2610)

11:00AM (643) *The Toeplitz-Jacobson Algebra is not Spanned by Strongly Regular Elements.*
Daniel P. Bossaller*, John Carroll University, and **Sergio R. López-Permouth**, Ohio University (1145-16-1059)

11:15AM ► (644) *The moduli space of non-nilpotent complex 5-dimensional associative algebras.* Preliminary report.
Haotian Wu, University of Wisconsin-Eau Claire (1145-16-2765)

11:30AM ► (645) *Algebras associated with the Hasse graphs of polytopes.* Preliminary report.
Geoffrey Thayer Glover, University of Wisconsin - Eau Claire (1145-16-2448)

11:45AM (646) *"Z2-graded Complex Associative Algebras: Background, Deformations, and Maple v.s. SageMath" presented by Tyler Gonzales and Jory Wagner.*
Jory L Wagner, University of Wisconsin Eau Claire, and **Tyler Jules Gonzales***, University of Wisconsin-Eau Claire (1145-16-2764)

AMS-ASL Special Session on Definability and Decidability Problems in Number Theory, I

8:00 AM – 11:50 AM **Room 343, BCC**

Organizers: **Kirsten Eisenträger**, Pennsylvania State University
Deidre Haskell, McMaster University, Ontario, Canada
Jennifer Park, University of Michigan
Alexandra Shlapentokh, East Carolina University

8:00AM (647) *Roots of polynomials in fields of generalized power series.*
Julia F. Knight*, University of Notre Dame, **Karen Lange**, Wellesley College, and **Reed Solomon**, University of Connecticut (1145-03-1046)

8:30AM (648) *Kolmogorov Complexity and Diophantine Approximation.*
Jan Reimann, Pennsylvania State University (1145-11-1659)

9:00AM ► (649) *Computability and Hindman's Theorem for bounded sums.*
Barbara Csima, University of Waterloo, **Damir Dzhafarov**, University of Connecticut, **Denis Hirschfeldt**, University of Chicago, **Carl G. Jockusch**, University of Illinois at Urbana-Champaign, **Reed Solomon**, University of Connecticut, and **Linda Brown Westrick***, Penn State (1145-03-2206)

9:30AM (650) *Effective ultraproducts and applications.*
Valentina Harizanov, George Washington University (1145-03-1680)

10:00AM (651) *Hilbert's Tenth Problem as a Pseudojump Operator.*
Kenneth Kramer and **Russell Miller***, Queens College & CUNY Graduate Center (1145-03-953)

10:30AM (652) *Defining Subgroups of Mordell-Weil Groups.*
Chris Hall*, University of Western Ontario, and **Alexandra Shlapentokh**, East Carolina University (1145-11-2532)

11:00AM (653) *Diophantine problems in groups and algebras.*
Alexei Miasnikov, Stevens Institute of Technology (1145-20-2522)

11:30AM (654) *The 2020 MSRI program "Decidability, Definability and Computability in Number Theory".*
Michael F Singer, MSRI (1145-11-416)

AMS Special Session on Agent-based Modeling in Biological and Social Systems (a Mathematics Research Communities Session), I

8:00 AM – 11:50 AM **Room 333, BCC**

Organizers: **Maryann Hohn**, University of California Santa Barbara
Angelika Manhart, Imperial College, London
Christopher Miles, Courant Institute, New York University
Cole Zmurchok, Vanderbilt University

8:00AM ► (655) *Modeling and analysis of agent-based dynamics: an overview.*
Alexandria Volkening, Mathematical Biosciences Institute, Ohio State University (1145-92-1914)

9:00AM ► (656) *An interacting particle model for the Icelandic capelin.*
Alethea Barbaro, CWRU (1145-70-2553)

9:30AM ► (657) *Force-based modeling framework of individual cells used to study collective cell migration in development and cancer.*
Hildur Knutsdottir*, Johns Hopkins University, **Eirikur Palsson**, Simon Fraser University, and **Leah Edelstein-Keshet**, University of British Columbia (1145-92-2467)

10:00AM (658) *A hybrid cellular automaton model of cartilage regeneration.*
Simone Cassani* and **Sarah D Olson**, Worcester Polytechnic Institute (1145-65-1901)

10:30AM ► (659) *Collective waves from individual behavior in foraging locusts.*
Andrew J. Bernoff, Harvey Mudd College, **Michael Culshaw-Maurer**, University of California Davis, **Rebecca Everett**, Haverford College, **Maryann E. Hohn**, University of California Santa Barbara, **Christopher Strictland**, University of Tennessee, and **Jasper Weinburd***, University of Minnesota (1145-92-1819)

11:00AM (660) *A kinetic model for pedestrian dynamics.*
Marie-Therese Wolfram*, University of Warwick, **Adriano Festa**, LMI Lab, Insta Rouen, and **Andrea Tosin**, Politecnico di Torino (1145-35-345)

11:30AM ► (661) *A social force agent based model for pedestrian dynamics.* Preliminary report.
Joseph Benson*, Macalester College, **Andrew Bernoff**, Harvey Mudd College, **Mariya Bessonov**, New York City College of Technology, **Simone Cassani**, Worcester Polytechnic Institute, **Danielle Ciesielski**, Montana State University, **Daniel Cooney**, Princeton University, **Veronica Ciocanel** and **Alexandria Volkening**, Mathematical Biosciences Institute (1145-92-2432)

AMS Special Session on Algebraic and Geometric Methods in Discrete Optimization, II

8:00 AM – 11:45 AM **Room 345, BCC**

Organizers: **Amitabh Basu**, Johns Hopkins University
Jesus De Loera, University of California, Davis

8:00AM ► (662) *Optimization problems with bounded width.* Preliminary report.
Daniel Bienstock, Columbia University (1145-05-749)

9:00AM (663) *Bounded pitch inequalities for min knapsack: approximate separation and integrality gaps.*
Daniel Bienstock, **Yuri Faenza***, Columbia University, **Igor Malinovic**, EPFL, **Monaldo Mastrolilli**, IDSIA, **Ola Svensson**, EPFL, and **Mark Zuckerberg**, Maroma Optimization Technologies (1145-49-1374)

9:30AM ► (664) *Concave Integer Quadratic Programming with Totally Unimodular Matrices.*
Alberto Del Pia, University of Wisconsin-Madison (1145-90-1418)

10:00AM (665) *New families of approximations for the integer hull of a compact set.*
Akshay Gupte, Department of Mathematical Sciences, Clemson University (1145-90-2621)

10:30AM (666) *Algorithms for understanding cut generating functions.*
Robert Hildebrand*, Virginia Tech, **Matthias Koeppe**, UC Davis, and **Yuan Zhou**, University of Kentucky (1145-90-1120)

11:00AM (667) *Cutting planes from extended formulations of mixed-integer programs.* **Sanjeeb Dash**, IBM T. J. Watson Research Center (1145-90-2271)

AMS Special Session on Analysis and Geometry of Nonlinear Evolution Equations, I

8:00 AM – 11:50 AM **Room 336, BCC**

Organizers: **Marius Beceanu**, University at Albany, State University of New York
Dan-Andrei Geba, University of Rochester

8:00AM (668) *Wave decay on asymptotically flat stationary spacetimes.* **Katrina Morgan**, University of North Carolina at Chapel Hill (1145-35-2166)

8:30AM (669) *Unconditional well-posedness for the Benjamin-Ono equation.* **Razvan Mosincat**, University of Edinburgh (1145-35-1882)

9:00AM ► (670) *Magnetohydrodynamics related systems forced by noise.* **Kazuo Yamazaki**, University of Rochester (1145-35-485)

9:30AM (671) *Low Regularity Solutions for Gravity Water Waves.* **Albert Ai**, UC Berkeley (1145-35-1938)

10:00AM (672) *Almost sure wellposedness for some nonlinear dispersive equations.* **Dana Sydney Mendelson**, University of Chicago (1145-35-2472)

10:30AM (673) *Virial identity for nonlinear dispersive equations.* Preliminary report. **Shijun Zheng**, Georgia Southern University (1145-35-1206)

11:00AM (674) *A-priori Estimates for the Hartree-Fock-Bogoliubov approximation of N Bosons.* **Manoussos G Grillakis***, Department of Mathematics, University of Maryland, College Park, 20742, and **Matei Machedon**, University of Maryland, College Park (1145-35-2619)

11:30AM (675) *Local smoothing estimates for Schrodinger equations on hyperbolic space and applications.* **Andrew Lawrie**, Massachussetts Institute of Technology, **Jonas Luhrmann***, Johns Hopkins University, **Sung-Jin Oh**, Korea Institute for Advanced Study, and **Sohrab Shahshahani**, University of Massachusetts Amherst (1145-35-536)

AMS Special Session on Continued Fractions, I

8:00 AM – 11:50 AM **Room 325, BCC**

Organizers: **Geremías Polanco Encarnación**, Hampshire College
James McLaughlin, West Chester University
Barry Smith, Lebanon Valley College
Nancy J. Wyshinski, Trinity College

8:00AM ► (676) *Matrix scaling and a problem in number theory.* **Melvyn B. Nathanson**, Lehman College (CUNY) (1145-11-2233)

9:00AM ► (677) *Periodicity of Certain Generalized Continued Fractions.* **Steven H. Weintraub**, Lehigh University (1145-11-349)

10:00AM (678) *Hybrid Continued Fractions and p-adic algorithms, with some applications to cryptography and "unimaginable" numbers.* **Antonino Leonardis**, Università della Calabria (1145-11-1508)

10:30AM ► (679) *Using Continued Fractions to Solve a Family of Diophantine Equations.* **Eva G Goedhart***, Lebanon Valley College, and **Helen G Grundman**, Bryn Mawr College, American Mathematical Society (1145-11-459)

11:00AM ► (680) *Maximal and Average Behavior of Elements in (u, v)-Calkin-Wilf Trees.* Preliminary report. **Sandie Han**, **Ariane M Masuda**, **Satyanand Singh** and **Johann Thiel***, New York City College of Technology - CUNY (1145-11-2331)

11:30AM ► (681) *Nonstandard continued fractions with irrational numerator.* Preliminary report. **John R Greene*** and **Kalani Thalagoda**, University of Minnesota Duluth (1145-11-249)

AMS Special Session on Differential Equations on Fractals, I

8:00 AM – 11:50 AM **Room 346, BCC**

Organizers: **Patricia Alonso-Ruiz**, University of Connecticut
Joe Chen, Colgate University
Luke Rogers, University of Connecticut
Robert Strichartz, Cornell University
Alexander Teplyaev, University of Connecticut

8:00AM (682) *The strong maximum principle for Schrödinger operators on PCF fractals.* Preliminary report. **Marius Ionescu**, United States Naval Academy, **Kasso Okoudjou***, MIT, and **Luke Rogers**, University of Connecticut (1145-35-1656)

8:30AM (683) *Spectral Segmentation on Nearly-Self-Similar Laakso Spaces.* Preliminary report. **Francisco Marques Dos Santos Vieira** and **Benjamin Steinhurst***, McDaniel College (1145-42-1499)

9:00AM ► (684) *The "Hot Spots" Conjecture on the Vicsek Set.*
Marius V Ionescu*, United States Naval Academy, and **Thomas L Savage**, US Navy (1145-46-365)

9:30AM ► (685) *Spectral Decimation for Families of Self-Similar Symmetric Laplacians on the Sierpinski Gasket.*
Sizhen Fang, Mount Holyoke College, **Dylan A. King**, Wake Forest University, **Eun Bi Lee*** and **Robert S. Strichartz**, Cornell University (1145-31-1402)

10:00AM ► (686) *Boundary value problems on domains in Sierpinski gaskets.*
Shiping Cao*, Department of Mathematics, Cornell University, and **Hua Qiu**, Department of Mathematics, Nanjing University (1145-41-568)

10:30AM ► (687) *The Mathieu Differential Equation and Generalizations to Infinite Fractafolds.*
Shiping Cao, Cornell University, **Anthony Coniglio***, Indiana University Bloomington, **Xueyan Niu**, University of Hong Kong, **Richard Rand** and **Robert Strichartz**, Cornell University (1145-34-1340)

11:00AM (688) *Metrics on fractals with symmetry and applications to sub-Gaussian heat kernel bounds.*
Hua Qiu, Nanjing University (1145-46-1442)

11:30AM (689) *Heat equations defined by a class of fractal measures.*
Wei Tang, Hunan First Normal University, and **Sze-Man Ngai***, Georgia Southern University and Hunan Normal University (1145-28-1740)

AMS Special Session on Harmonic Analysis: Recent Developments on Oscillatory Integrals (a Mathematics Research Communities Session), I

8:00 AM – 11:50 AM **Room 330, BCC**

Organizers: **Xiumin Du**, University of Maryland
Taryn C. Flock, University of Massachusetts Amherst
Yakun Xi, University of Rochester

8:00AM (690) *Geometric problems related to Fourier restriction and decoupling.*
Philip T Gressman, University of Pennsylvania (1145-42-1024)

9:00AM (691) *Sharp estimates for Hörmander-type oscillatory integral operators according to the signature of the phase function.*
Marina Iliopoulou*, UC Berkeley, **Larry Guth**, MIT, and **Jonathan Hickman**, University of St Andrews (1145-43-2056)

9:30AM (692) *Decoupling for the moment curve in $\mathbb{R}^3$ inspired from efficient congruencing.*
Preliminary report.
Zane Kun Li, UCLA (1145-42-1083)

10:00AM (693) *Falconer problem in $\mathbb{R}^2$.*
Larry Guth, Massachusetts Institute of Technology, **Alexl Iosevich**, University of Rochester, **Yumeng Ou**, City University of New York, and **Hong Wang***, Massachusetts Institute of Technology (1145-42-1456)

10:30AM (694) *On the Bellman function for the Hardy operator and Hardy-Littlewood Maximal operator in $\mathbb{R}$.*
Chandan Biswas* and **Leonid Slavin**, University of Cincinnati (1145-42-2023)

11:00AM (695) *A Sharpened Inequality for Twisted Convolution.*
Kevin O'Neill, UC Berkeley (1145-42-273)

11:30AM (696) *Optimal $L^p \to L^q$ Estimates for Euclidean Averages Over Prototypical Hypersurfaces in $\mathbb{R}^3$.*
Jeremy Schwend, University of Wisconsin-Madison Mathematics Dept. (1145-42-2602)

AMS Special Session on Lattice Path Combinatorics and Applications, I

8:00 AM – 11:50 AM **Room 338, BCC**

Organizers: **Christian Krattenthaler**, University of Vienna, Austria
Alan Krinik, California State Polytechnic University
Randall J. Swift, California State Polytechnic University

8:00AM (697) *On factor-free Dyck words with half-integer slope.*
Michael D. Weiner*, Penn State Altoona, **Daniel Birmajer**, Nazareth College, and **Juan B. Gil**, Penn State Altoona (1145-05-1037)

8:30AM (698) *On rational Dyck paths and the enumeration of factor-free Dyck words.*
Juan B. Gil*, Penn State Altoona, **Daniel Birmajer**, Nazareth College, and **Michael D. Weiner**, Penn State Altoona (1145-05-1042)

9:00AM ► (699) *Chain decompositions for q,t-Catalan numbers.*
Nicholas A. Loehr*, Virginia Tech Department of Mathematics, **Kyungyong Lee**, University of Nebraska Lincoln, and **Li Li**, Oakland University (1145-05-609)

9:30AM ► (700) *The combinatorics of lattice paths and tilings associated with b-ary Stern polynomials.*
Larry Ericksen*, Millville, New Jersey, and **Karl Dilcher**, Dalhousie University, Halifax, Canada (1145-05-2118)

10:00AM ► (701) *Combinatorial Lattice Path Interpretations of Lucas Analogues.*
Curtis Bennett*, California State University, Long Beach, **Juan Carrillo**, Torrance, CA, **John Machecek**, York University, and **Bruce E. Sagan**, Michigan State University (1145-05-297)

10:30AM ► (702) *A Tiling Interpretation of q-Binomial Coefficients.*
Jonathan J Azose, University of Washington, and **Arthur T Benjamin***, Harvey Mudd College (1145-05-1713)

11:00AM ► (703) *Universal cycles, pattern avoiding permutations, and generalized arc sine distributions.* Preliminary report.
Anant Godbole, East Tennessee State University (1145-05-407)

11:30AM ► (704) *Ordered Set Partitions and the Delta Conjecture.* Preliminary report.
Jim Haglund* and **Emily Sergel**, University of Pennsylvania (1145-05-1750)

AMS Special Session on Mathematical Models in Ecology, Epidemiology, and Medicine, I

8:00 AM – 11:50 AM **Room 319, BCC**

Organizers: **Richard Schugart**, Western Kentucky University
Najat Ziyadi, Morgan State University

8:00AM ► (705) *Darwinian difference equation models and the evolution of semelparity versus iteroparity.* Preliminary report.
Jim Cushing, Department of Mathematics and Interdisciplinary Program in Applied Mathematics, University of Arizona (1145-92-1132)

8:30AM ► (706) *On the evolutionary dynamics of discrete-time models.* Preliminary report.
Saber Elaydi, Trinity University (1145-39-2627)

9:00AM ► (707) *Invasion by competing types in a heterogeneous environment.* Preliminary report.
Camille Hankel, Harvard University, and **Judith R. Miller***, Georgetown University (1145-92-1369)

9:30AM (708) *A Proposal for an Application of a Max-Type Difference Equation to Epilepsy.*
David M. Chan, **Candace M. Kent***, Virginia Commonwealth University, **Vlajko L. Kocic**, Xavier University of Louisiana, and **Stevo Stevic**, Mathematical Institute of the Serbian Academy of Sciences (1145-92-87)

10:00AM ► (709) *Development of a mathematical model for the role of inflammation in atherosclerosis.* Preliminary report.
Rebecca A Segal*, Department of Mathematics, Virginia Commonwealth University, **Marcella Torres**, Department of Mathematics, Virginia Commonweath University, **Jing Wang**, **Paul J Yannie**, **Shobha Ghosh**, Internal Medicine, Virginia Commonwealth University, and **Angela M Reynolds**, Department of Mathematics, Virginia Commonwealth University (1145-92-1761)

10:30AM ► (710) *Using a Mathematical Model with Individual Patient Data to Quantify Differences Between Patients with Diabetic Foot Ulcers.* Preliminary report.
Richard Schugart, Western Kentucky University (1145-92-2741)

11:00AM ► (711) *Constructing an Optimal Design Method in a Mathematical Model for the Interactions of Matrix Metalloproteinases and Their Inhibitors in a Wound.*
Ayush Prasad*, Johns Hopkins University, **Nigar Karimli** and **Richard Schugart**, Western Kentucky University (1145-92-1312)

11:30AM ► (712) *Impact of Chlorhexidine Gluconate Bathing on Hospital Acquired Infections.* Preliminary report.
Kelly Anne Reagan*, **David Chan**, Virginia Commonwealth University, and **Gonzalo Bearman**, Virginia Commonwealth University Health System (1145-92-1507)

AMS Special Session on New Directions in the Theory of Complex Multiplication, III

8:00 AM – 11:45 AM **Room 321, BCC**

Organizers: **Henri Darmon**, McGill University
Samit Dasgupta, University of California, Santa Cruz
Benedict Gross, Harvard University

8:00AM (713) *Explicit formulae for Gross-Stark units and Hilbert's 12th problem.*
Mahesh R Kakde, King's College London (1145-11-428)

9:00AM (714) *Towards a p-adic theory of singular moduli for real quadratic fields.*
Jan Vonk*, University of Oxford, and **Henri Darmon**, McGill University (1145-11-495)

10:00AM ► (715) *Average values of higher Green's functions and their factorizations.*
Yingkun Li, Technische Universität Darmstadt (1145-11-430)

11:00AM (716) *A new direction in the theory of complex multiplication.*
Vinayak Vatsal, University of British Columbia (1145-11-438)

AMS Special Session on Problems in Partial Differential Equations, I

8:00 AM – 11:50 AM **Room 337, BCC**

Organizers: **Alex Himonas**, University of Notre Dame
Curtis Holliman, The Catholic University of America

8:00AM (717) *Singularities and global solutions in the Schrödinger Hartree equation.* **Anudeep Kumar Arora*** and **Svetlana Roudenko**, Florida International University (1145-35-1179)

8:30AM (718) *Linear Stability Analysis of the Relativistic Vlasov-Maxwell System in an Axisymmetric Domain.* **Zhiyuan Zhang**, Brown University (1145-35-696)

9:00AM (719) *The homogeneous complex Monge-Ampère equation and uniform estimates for holomorphic maps into a complex manifold.* Preliminary report. **Kate Brubaker**, Purdue University (1145-32-2131)

9:30AM (720) *Well-posedness of initial-boundary value problems for NLS and KdV via the Fokas Method.* **Alex A. Himonas**, Department of Mathematics University of Notre Dame, **Dionyssios Mantzavinos**, Department of Mathematics University of Kansas, and **Fangchi Yan***, Department of Mathematics University of Notre Dame (1145-35-984)

10:00AM (721) *Initial-Boundary Value Problems for the Reaction-Diffusion Equation.* **Alex A. Himonas**, University of Notre Dame, **Dionyssios Mantzavinos***, University of Kansas, and **Fangchi Yan**, University of Notre Dame (1145-35-779)

10:30AM (722) *Nonlinear equations with random time-dependent potentials.* **Marius Beceanu***, University at Albany SUNY, **Juerg Froehlich**, Institute for Advanced Study, and **Avy Soffer**, Rutgers (1145-34-810)

11:00AM (723) *Ill-Posedness for a Camassa-Holm-type equations with cubic nonlinearities.* **Curtis A Holliman***, The Catholic University of America, and **Alex A Himonas**, The University of Notre Dame (1145-35-1085)

11:30AM (724) *Singularity Formation in General Relativity.* **Jared Speck**, Vanderbilt University (1145-35-880)

AMS Special Session on Quantum Symmetries: Subfactors and Fusion Categories (a Mathematics Research Communities Session), I

8:00 AM – 11:50 AM **Room 331, BCC**

Organizers: **Cain Edie-Michell**, Vanderbilt University
Lauren Ruth, Vanderbilt University
Yilong Wang, Louisiana State University

8:00AM (725) *Classifying pointed braided finite tensor categories.* **Costel G Bontea***, Colby College, and **Dmitri Nikshych**, University of New Hampshire (1145-18-2425)

8:30AM (726) *Classification of spin models on Yang-Baxter planar algebras.* **Joshua R Edge**, Indiana University - Bloomington (1145-08-461)

9:00AM ► (727) *Classification of subfactors by skein theory.* **Zhengwei Liu**, Harvard University (1145-46-1863)

9:30AM (728) *Modular data for Drinfel'd centers of near-group fusion categories obtained via the modular graft construction.* Preliminary report. **Marcel Bischoff**, Ohio University, and **Henry Tucker***, UC San Diego (1145-18-2763)

10:00AM (729) *Towards fusion rules for permutation extensions of modular tensor categories.* Preliminary report. **Colleen Delaney*** and **Eric Samperton**, UC Santa Barbara (1145-81-2168)

10:30AM (730) *On TQFT representations of mapping class groups with boundary.* **Shuang Ming*** and **Greg Kuperberg**, Department of mathematics, University of California, Davis (1145-20-503)

11:00AM (731) *On Higer Gauss Sums of Modular Categories.* **Siu-Hung Ng**, Louisiana State University (1145-18-2208)

11:30AM (732) *Fusion rules for $\mathbb{Z}/2\mathbb{Z}$ permutation gauging.* **Cain Edie-Michell**, Vanderbilt University, **Corey Jones**, The Ohio State University, and **Julia Plavnik***, Indiana University (1145-18-2027)

AMS Special Session on Recent Advances and Trends in Computable Structure Theory (in honor of J. Remmel), II

8:00 AM – 11:50 AM **Room 344, BCC**

Organizers: **Jennifer Chubb**, University of San Francisco
Tim McNicholl, Iowa State University

8:00AM (733) *Investigating relationship between Logic Programming and Recursion Theory - Jeffrey B. Remmel contributions.* **Victor W. Marek**, University of Kentucky (1145-03-1431)

9:00AM ► (734) *Injection structures and the Ershov hierarchy.* **Francis Adams**, Georgia State University (1145-03-681)

9:30AM (735) *Random Structures.* Preliminary report. **Wesley Calvert**, Southern Illinois University (1145-03-1420)

10:00AM (736) *Which Classes of Structures Are Both Pseudo-elementary and Definable by an Infinitary Sentence?*
Barbara F Csima*, **Nancy A Day**, University of Waterloo, and **Matthew Harrison-Trainor**, Victoria University of Wellington (1145-03-1671)

10:30AM (737) *Classifications of definable subsets of equivalence and injection structures.*
Karen M. Lange, Wellesley College (1145-03-1394)

11:00AM (738) *A new metatheorem.*
Antonio Montalban, U.C. Berkeley (1145-03-1180)

11:30AM (739) *Revisiting Remmel's analysis of computably categoricity for linear orders.* Preliminary report.
Reed Solomon, University of Connecticut (1145-03-1092)

AMS Special Session on Recent Advances in Homological and Commutative Algebra, I

8:00 AM – 11:50 AM **Room 318, BCC**

Organizers: **Neil Epstein**, George Mason University
Claudiu Raicu, Notre Dame University
Alexandra Seceleanu, University of Nebraska

8:00AM (740) *Big polynomial rings and Stillman's Conjecture.*
Daniel Erman*, University of Wisconsin-Madison, **Steven V Sam**, University of California, San Diego, and **Andrew Snowden**, University of Michigan (1145-13-262)

8:30AM (741) *Asymptotic Syzygies for Products of Projective Space.*
Juliette Bruce, University of Wisconsin - Madison (1145-14-303)

9:00AM ► (742) *A Case of Eisenbud-Green-Harris Conjecture.* Preliminary report.
Sema Gunturkun*, University of Connecticut, and **Mel Hochster**, University of Michigan (1145-13-782)

9:30AM (743) *Tensor-Multinomial Sums of Ideals and Applications.*
Irena Swanson, Reed College, and **Robert Marshawn Walker***, University of Michigan-Ann Arbor (1145-13-1424)

10:00AM (744) *The containment problem for symbolic powers and hyperplane arrangements.*
Benjamin J Drabkin, University of Nebraska - Lincoln (1145-13-1594)

10:30AM (745) *Points and Differential Forms.* Preliminary report.
Bill F Trok, University of Kentucky (1145-14-2326)

11:00AM (746) *Defining equations of the Rees algebra for a family of ideals.* Preliminary report.
Whitney I Liske, University of Notre Dame (1145-13-757)

11:30AM (747) *Cohen-Macaulayness of Rees algebras of modules.* Preliminary report.
Alessandra Costantini, Purdue University (1145-13-1446)

AMS Special Session on Recent Progress in Multivariable Operator Theory, I

8:00 AM – 11:50 AM **Room 320, BCC**

Organizers: **Dmitry Kaliuzhnyi-Verbovetsky**, Drexel University
Hugo Woerdeman, Drexel University

8:00AM (748) *The core variety and representing measures in the truncated moment problem.*
Grigoriy Blekherman, Georgia Institute of Technology, and **Lawrence Fialkow***, State University of New York (1145-47-329)

8:30AM (749) *Limits of iterates of spherical Aluthge transforms.* Preliminary report.
Raul E Curto, The University of Iowa (1145-47-845)

9:00AM (750) *On a minimal solution of the indefinite multidimensional truncated moment problem.*
David P. Kimsey, Newcastle University (1145-47-888)

9:30AM (751) *Classifying cyclic row contractions.*
Raphael Clouatre* and **Edward Timko**, University of Manitoba (1145-47-580)

10:00AM (752) *Portraits of Rational Inner Functions.*
Kelly Bickel*, Bucknell University, **James Eldred Pascoe**, University of Florida, and **Alan Sola**, Stockholm University (1145-47-538)

10:30AM (753) *The Polya class in several variables.* Preliminary report.
Greg Knese, Washington University in St. Louis (1145-47-828)

11:00AM (754) *Weak products of complete Pick spaces.*
Alexandru Aleman, Lund University, **Michael Hartz***, FernUniversität in Hagen, **John E. McCarthy**, Washington University in St. Louis, and **Stefan Richter**, University of Tennessee (1145-46-644)

11:30AM (755) *The Hardy H^1 space of a complete Pick space on the ball.*
Alexandru Aleman, Lund University, **Michael Hartz**, University of Hagen, **John E McCarthy***, Washington University, and **Stefan Richter**, University of Tennessee (1145-32-628)

AMS Special Session on Riordan Arrays, I

8:00 AM – 11:45 AM **Room 347, BCC**

Organizers: **Alexander Burstein**, Howard University
Dennis Davenport, Howard University

Asamoah Nkwanta, Morgan State University

Lou Shapiro, Howard University

Leon Woodson, Morgan State University

8:00AM (756) *Elements of Finite Order in the Riordan Group.* **Marshall M. Cohen**, Morgan State University (1145-05-1198)

8:30AM ► (757) *On Combinatorial Interpretations of Shapiro's Identities Involving some Elements of the Bell Subgroup.* Preliminary report. **Melkamu Zeleke***, **Mahendra Jani**, William Paterson University of New Jersey, and **Louis W. Shapiro**, Howard University (1145-05-1569)

9:00AM (758) *Involutions and Pseudoinvolutions in the Riordan Group.* Preliminary report. **Alexander Burstein**, Howard University, **Hana Kim**, Sungkyunkwan University, and **Louis W. Shapiro***, Howard University (1145-05-1977)

10:00AM (759) *On Sequence Characterization of Riordan Arrays.* **Tian-Xiao He**, Illinois Wesleyan University (1145-05-1496)

10:30AM ► (760) *On some complementary Riordan arrays.* **Ana Luzon**, Universidad Politécnica de Madrid. España (1145-05-1241)

11:00AM (761) *A new aspect of Riordan arrays.* **Gi-Sang Cheon**, Sungkyunkwan University (1145-15-1090)

AMS Special Session on Stochastic Differential Equations and Applications, I

8:00 AM – 11:45 AM **Room 326, BCC**

Organizer: **Carey Caginalp**, University of Pittsburgh

8:00AM (762) *Mathematical Problems Arising from Hedge Fund Fee Structures.* **David Saunders*** and **Fei Meng**, University of Waterloo (1145-60-791)

9:00AM (763) *On hedging and pricing in general complete and incomplete markets.* Preliminary report. **Srdjan Stojanovic**, University of Cincinnati (1145-91-742)

10:00AM (764) *Competing Diffusive Particle Systems and Models of Large Equity Markets: A Survey.* **Adrian D. Banner**, Intech Investment Management, LLC (1145-60-957)

11:00AM (765) *Arbitrage Theory Via Numeraires.* **Ioannis Karatzas**, Department of Mathematics, Columbia Uiniversity, New York, NY 10027 and Intech, One Palmer Square, Princeton, NJ 08542 (1145-60-677)

AMS Special Session on The Mathematics of Gravity and Light (a Mathematics Research Communities Session), I

8:00 AM – 11:50 AM **Room 329, BCC**

Organizers: **Sougata Dhar**, University of Maine

Chad R. Mangum, Niagara University

Nadine Stritzelberger, University of Waterloo

8:00AM ► (766) *Light ring stability in ultra-compact objects.* **Pedro Vieira Pinto da Cunha***, University of Aveiro & IST-Lisbon University, **Emanuele Berti**, Johns Hopkins University, and **Carlos Herdeiro**, University Aveiro (1145-83-1121)

8:30AM ► (767) *New developments in optical geometry.* **Marcus C. Werner**, Yukawa Institute for Theoretical Physics, Kyoto University (1145-83-1103)

9:00AM ► (768) *Optical Geometry and the Isoperimetric Problem.* Preliminary report. **Henri P Roesch***, Columbia University, and **Marcus C Werner**, Kyoto University (1145-83-1135)

9:30AM (769) *Gravitational Lensing in Stationary Spacetimes: A Finsler Geometry Approach.* **Nishanth Gudapati***, Harvard University, and **Marcus Werner**, Kyoto University (1145-53-1783)

10:00AM (770) *Cosmic Shadows, Other Worlds, and a Fifth Dimension.* **Arlie O Petters**, Duke University, Durham, NC (1145-83-1960)

10:30AM (771) *An astrophysical perspective on the mathematics of gravity and light.* **Charles R. Keeton**, Rutgers, the State University of New Jersey (1145-85-2609)

11:00AM (772) *A Refinement for the Upper Bound on the Number of Cusps in the Case of Single-Plane Microlensing.* **Sougata Dhar**, University of Maine, **Jessica Stewart Kelly***, Christopher Newport University, and **Arlie Petters**, Duke University (1145-83-2135)

11:30AM (773) *Friedmann's Equation and the Creation of the Universe.* **Arthur E. Fischer**, University of California, Santa Cruz (1145-83-2652)

AMS Special Session on The Mathematics of Historically Black Colleges and Universities (HBCUs) in the Mid-Atlantic, I

8:00 AM – 11:50 AM **Room 314, BCC**

Organizers: **Edray Goins**, Purdue University

Janis Oldham, North Carolina A&T

Talithia Washington, Howard University

Scott Williams, University at Buffalo, State University of New York

8:00AM ► (774) *The Identification of Variables Associated with Student Outcomes on Praxis II Mathematics Content Exams at a South Central VA HBCU.* Preliminary report.
Cheryl M Adeyemi* and **Gerald Burton**, Virginia State University (1145-97-2738)

8:30AM ► (775) *Pseudo almost periodic solutions for a Nicholson's blowflies model with mortality term.*
Gaston Mandata N'Guerekata, Morgan State University (1145-34-1003)

9:00AM ► (776) *Complex Variables, Mesh Generation, and 3D Web Graphics: Research and Technology Behind the Dynamic Visualizations in the NIST Digital Library of Mathematical Functions.*
Bonita V Saunders, National Institute of Standards & Technology (NIST) (1145-30-1432)

9:30AM ► (777) *Mathematics Research at Howard University: Pure and Applied Mathematics.* Preliminary report.
Abdul-Aziz Yakubu, Howard University (1145-00-1360)

10:00AM ► (778) *A Capstone Companion to Mathematics.*
Caleb J Ashley, University of Michigan (1145-00-1726)

10:30AM ► (779) *Inscribing n-gons.*
Kendra E Pleasant, Morgan State University (1145-05-2810)

11:00AM ► (780) *Cardiovascular dynamics during orthostatic stress assessed via pulsatile and non-pulsatile models.* Preliminary report.
Nakeya D Williams, The United States Military Academy at West Point (1145-92-2295)

11:30AM (781) *On the Structure of Generalized Symmetric Spaces of* $\mathrm{SL}_n(\mathbb{F}_q)$.
Catherine Buell, Fitchburg State University, **Aloysius Helminck**, University of Hawaii at Manoa, **Vicky Klima**, Appalachian State University, **Jennifer Schaefer**, Dickinson College, **Carmen Wright***, Jackson State University, and **Ellen Ziliak**, Benedictine University (1145-20-2087)

AMS Special Session on Women in Topology, I

8:00 AM – 11:50 AM **Room 327, BCC**

Organizers: **Jocelyn Bell**, Hobart and William Smith Colleges

Rosemary Guzman, University of Chicago

Candice Price, University of San Diego

Arunima Ray, Max Planck Institute for Mathematics, Germany

8:00AM (782) *Operations of Infinite Rank in Concordance.*
Juanita Pinzon-Caicedo*, North Carolina State University, and **Matthew Hedden**, Michigan State University (1145-57-563)

8:30AM (783) *Trisections of Surface Bundles over Surfaces.* Preliminary report.
Marla Williams, University of Nebraska (1145-54-1931)

9:00AM (784) *Taut Foliations, Positive 3-Braids, and the L-Space Conjecture.*
Siddhi Krishna, Boston College (1145-57-286)

9:30AM (785) *Taut sutured handlebodies as twisted homology products.*
Margaret Nichols, University of Chicago (1145-57-972)

10:00AM (786) *Knot concordance in 3-manifolds.*
Eylem Zeliha Yildiz, Michigan State University Department of Mathematics (1145-54-640)

10:30AM (787) *Using 2-torsion to obstruct topological isotopy.*
Hannah Schwartz, Bryn Mawr College (1145-54-369)

11:00AM (788) *Patterns and Higher Order Stability in the Coefficients of the Colored Jones Polynomial.*
Katherine Walsh Hall, University of Connecticut (1145-57-1045)

11:30AM (789) *Genus one knots and their derivatives.*
Carolyn A Otto, University of Wisconsin-Eau Claire (1145-57-651)

MAA Invited Paper Session on Inspiring Diversity in Mathematics: Culture, Community, and Collaboration

8:00 AM – 11:20 AM **Room 317, BCC**

Organizers: **Pamela Harris**, Williams College

Alicia Prieto Langarcia, Youngstown State University

Chad Topaz, Williams College

8:00AM (790) *Working to inspire diversity-skeptics.*
Helen G. Grundman, American Mathematical Society (1145-AG-1733)

8:30AM ► (791) *Diversity in mathematics through a data science lens.*
Chad M. Topaz*, Williams College, and **Shilad Sen**, Macalester College (1145-AG-592)

9:00AM ► (792) *Equity in the mathematics classroom.*
Michael Young, Iowa State University (1145-AG-2285)

9:30AM ► (793) *Facing the Mirror: Acknowledgement in our Practices.*
Aris Benjamin Winger, Georgia Gwinnett College (1145-AG-1266)

10:00AM ► (794) *Undergraduate Research as the Greatest Equalize.*
Alicia Prieto Langarica, Youngstown State University (1145-AG-593)

10:30AM ► (795) *Two Math Mamas Tell Their Stories.*
Becky E. Hall*, Western Connecticut State University, and **Carrie Diaz Eaton**, Digital and Computational Studies, Bates College (1145-AG-1303)

11:00AM (796) *LATHISMS: showcasing the contributions of Latinx and Hispanics to the mathematical sciences.*
Gabriel E Sosa*, Amherst College, **Alexander Diaz-Lopez**, Villanova University, **Pamela Harris**, Williams College, and **Alicia Prieto-Langarica**, Youngstown State University (1145-AG-1419)

MAA Invited Paper Session on Research in Improving Undergraduate Mathematical Sciences Education: Examples Supported by the National Science Foundation's IUSE: EHR Program

8:00 AM – 10:50 AM **Room 323, BCC**

Organizers: **Ron Buckmire**, National Science Foundation (NSF); Directorate for Education and Human Resources (EHR); Division of

Karen Keene, National Science Foundation (NSF); Directorate for Education and Human Resources (EHR); Division of

Sandra Richardson, National Science Foundation (NSF); Directorate for Education and Human Resources (EHR); Division of

Talitha Washington, National Science Foundation (NSF); Directorate for Education and Human Resources (EHR); Division of

Lee Zia, National Science Foundation (NSF); Directorate for Education and Human Resources (EHR); Division of

8:00AM ► (797) *Report on TIMES Grant: Characterizing, Supporting, and Evaluating Inquiry-Oriented Instruction in Undergraduate Mathematics.*
Estrella Johnson*, Virginia Tech, **Nicholas Fortune**, Western Kentucky University, **Karen Keene**, North Carolina State University, and **Christine Andrews-Larson**, Florida State University (1145-AK-1382)

8:30AM ► (798) *Raising Calculus to the Surface: Using physical manipulatives to discovering multivariable calculus concepts.*
Aaron D Wangberg*, Winona State University, Winona, MN, **Brian Fisher**, Lubbock Christian University, Lubbock, TX, **Jason Samuels**, CUNY - BMCC, **Tisha Hooks**, Winona State University, Winona, MN, and **Elizabeth Gire**, Oregon State University, Corvallis, OR (1145-AK-2319)

9:00AM ► (799) *Evolution of the College Mathematics Instructor Development Source (CoMInDS) Project: What We Learned and How Things Changed.*
Jack Bookman*, Duke University, and **Natasha Speer**, The University of Maine (1145-AK-1106)

9:30AM ► (800) *The Progress through Calculus Project: A National Study of Precalculus through Calculus 2 Programs.*
Naneh Apkarian*, Western Michigan University, **Jessica Hagman**, Colorado State University, **Chris Rasmussen**, San Diego State University, **David Bressoud**, Macalester College, **Estrella Johnson**, Virginia Tech, **Sean Larsen**, Portland State University, **Jessica Gehrtz**, Colorado State University, **Kristen Vroom**, Portland State University, and **Matthew Voigt**, San Diego State University (1145-AK-2450)

10:00AM ► (801) *Student Engagement in Mathematics through an Institutional Network for Active Learning (SEMINAL).* Preliminary report.
Wendy Smith*, University of Nebraska Lincoln, **Chris Rasmussen**, San Diego State University, **David C. Webb**, **Robert Tubbs**, University of Colorado Boulder, **Matthew Voigt**, San Diego State University, and **Howard Gobstein**, Association of Public and Land-Grant Universities (1145-AK-786)

10:30AM (802) *UTMOST: Undergraduate Teaching of Mathematics with Open Software and Textbooks.*
Robert A. Beezer*, University of Puget Sound, **David W. Farmer**, American Institute of Mathematics, **Thomas W. Judson**, Stephen F. Austin State University, **Susan Lynds**, University of Colorado, **Vilma Mesa**, University of Michigan, and **Kent Morrison**, American Institute of Mathematics (1145-AK-2181)

AMS Contributed Paper Session on General Topology, Algebraic Topology, and Topology of Manifolds

8:00 AM – 11:25 AM **Room 313, BCC**

8:00AM (803) *Topologies on the Rings of Measurable functions.*
Soumyadip Acharyya*, Embry-Riddle Aeronautical University, Worldwide, **Sudip Kumar Acharyya**, **Sagarmoy Bag**, University of Calcutta, India, and **Joshua Sack**, California State University Long Beach (1145-54-215)

8:15AM ► (804) *Macular Degeneration Classification through Topology and Convolutional Neural Networks.*
David B. Damiano, College of the Holy Cross, **Ellen Gasparovic**, Union College, **Michael J. Marlett***, College of the Holy Cross, and **Robert Righi**, Union College (1145-54-2677)

8:30AM (805) *The Topological Complexity of Finite Models of Spheres.*
Shelley B Kandola, University of Minnesota (1145-54-2895)

8:45AM (806) *Kunneth Formulae in Persistent Homology.*
Hitesh Gakhar* and **Jose A. Perea**, Michigan State University (1145-55-1486)

9:00AM ► (807) *Using Order Parameters and Persistent Homology to Analyze Biological Aggregations.* Preliminary report.
Lu Xian*, **Lori Ziegelmeier** and **Maitrayee Deka**, Macalester College (1145-55-2067)

9:15AM ► (808) *Capturing Persistent Homotopic Information.* Preliminary report.
Ivan Dungan, Francis Marion University (1145-55-2596)

9:30AM ► (809) *Filtration and Stability Of Mapper graphs for Point Cloud Data.*
Wako Tasisa Bungula, University of Iowa (1145-55-504)

9:45AM (810) *Singular Based Matrices for Virtual 2-Strings.* Preliminary report.
David Freund, Harvard University (1145-57-2055)

10:00AM (811) *The finite group actions on the projective plane.* Preliminary report.
Ryo Ohashi, King's College (1145-57-311)

10:15AM (812) *Counting the Number of Quasiplatonic Topological Actions of the Cyclic Group on Surfaces.*
Charles Camacho Anthony Charles, Oregon State University (1145-57-799)

10:30AM ► (813) *Simplicial Complexes and Configuration Spaces.*
Andrew A Cooper*, North Carolina State University, **Vin de Silva**, Pomona College, and **Radmila Sazdanovic**, North Carolina State University (1145-57-2871)

10:45AM (814) *Rankings, combinatorial Hodge theory and statistics.* Preliminary report.
Alan Durfee, Mount Holyoke College (1145-57-2897)

11:00AM ► (815) *Build your own topology: A history of some of the axioms of a topology with applications to the classroom.* Preliminary report.
Nicholas Scoville, Ursinus College (1145-01-142)

11:15AM ► (816) *Immersed Möbius bands in knot complements and representatives of $\mathbb{Z}_2$-homology classes.*
Mark C Hughes*, Brigham Young University, and **Seungwon Kim**, National Institute of Mathematical Sciences (1145-57-2106)

AMS Contributed Paper Session on Integral Equations, Operational Calculus, and Harmonic Analysis

8:00 AM – 10:10 AM **Room 335, BCC**

8:00AM (817) *The Algebraic Structure of a Topological Semihypergroups.*
Norbert N. Youmbi, Saint Francis University (1145-43-2561)

8:15AM (818) *Levy Processes in the Cartan Group.* Preliminary report.
John E Haga, Wentworth Institute of Technology (1145-43-2294)

8:30AM (819) *Incorporating Unbounded Operators into Feynman's Operational Calculus.* Preliminary report.
Lance Nielsen, Creighton University (1145-44-2628)

8:45AM (820) *On the Cauchy Problem for Integro-Differential Equations in the Scale of Generalized Hölder Spaces.*
Fanhui Xu* and **Remigijus Mikulevicius**, University of Southern California (1145-45-335)

9:00AM (821) *Embedding Inequalities for a Family of Integral Operators and Applications.*
Mathew Gluck, Towson University (1145-45-598)

9:15AM (822) *Existence of Traveling Fronts and Pulses in Lateral Inhibition Neuronal Networks with Sigmoidal Firing Rate Functions.*
Alan Dyson, Lehigh University (1145-45-1905)

9:30AM ► (823) *On fast multipole methods for Volterra integral equations with highly oscillatory kernels.*
Qingyang Zhang*, Central South University, Changsha city,Hunan province,China, and **Shuhuang Xiang**, Central South University, Changsha city, Hunan Province,China (1145-45-1388)

9:45AM ► (824) *Superconvergence of Jacobi spectral methods for Weakly singular Volterra Integral Equations.*
Kapil Kant* and **Gnaneshwar Nelakanti**, Department of Mathematics, Indian Institute of Technology Kharagpur, Kharagpur 721 302, India (1145-45-388)

10:00AM ► (825) *Convergence Results of Newton Iteration Method for nonlinear Fredholm Hammerstein Integral Equations.*
Samiran Chakraborty* and **Gnaneshwar Nelakanti**, IIT Kharagpur (1145-45-1742)

AMS Contributed Paper Session on Number Theory, I

8:00 AM – 11:25 AM **Room 311, BCC**

8:00AM ► (826) *On Gaps in the Closures of Images of Divisor Functions.*
Niven T Achenjang*, Stanford University, and **Aaron Berger**, Massachusetts Institute of Technology (1145-11-1271)

8:15AM ► (827) *Linear divisibility sequences and cyclotomic polynomials.*
Sergiy Koshkin, University of Houston-Downtown (1145-11-826)

8:30AM (828) *Products of polynomials at prime arguments.* Preliminary report.
Craig S Franze*, The Ohio State University, and **Pin Hung Kao**, Flagler College (1145-11-2655)

8:45AM (829) *Arithmetic Dynamics of* $f(x) = x^d + c$.
Chatchawan Panraksa, Mahidol University (1145-11-2279)

9:00AM ► (830) *Linear Functions (modulo n) and Associated Algebraic Structure.* Preliminary report.
Robert M. Sulman, S.U.N.Y. Oneonta (1145-11-1426)

9:15AM ► (831) *Mean, median, and mode factorization lengths in numerical semigroups.*
Stephan Ramon Garcia, Pomona College (1145-11-673)

9:30AM ► (832) *Primes and Perfect Powers in the Catalan Triangle.*
Eric M Jovinelly, University of Notre Dame (1145-11-2594)

9:45AM ► (833) *Riesel and Sierpiński numbers in special sequences.* Preliminary report.
Carrie E. Finch-Smith, Washington and Lee University (1145-11-444)

10:00AM (834) *Almost gap balancing numbers.*
Jeremiah Bartz*, **Bruce Dearden** and **Joel Iiams**, University of North Dakota (1145-11-1903)

10:15AM ► (835) *An Extension of Tree-Based Methods for Hofstadter-Like Recurrences.* Preliminary report.
Nathan H. Fox, The College of Wooster (1145-11-1667)

10:30AM ► (836) *Primality Test with Singular Curves.* Preliminary report.
Gulhan Ayar, Karamanoglu Mehmetbey University, **Kubra Nari*** and **Enver Ozdemir**, Istanbul Technical University (1145-11-1467)

10:45AM ► (837) *A Family of Congruences for Rogers–Ramanujan Subpartitions.* Preliminary report.
Nicolas Allen Smoot, Research Institute for Symbolic Computation, Linz (1145-11-1731)

11:00AM ► (838) *A Technique in Partitions.*
Angelica Castillo and **Brandt Kronholm***, University of Texas Rio Grande Valley (1145-11-1487)

11:15AM ► (839) *A Quasipolynomial Decomposition of Partitions into at most m parts and the Coefficients of Gaussian Polynomials.* Preliminary report.
Brandt Kronholm and **Arturo J. Martinez***, University of Texas Rio Grande Valley (1145-11-1497)

AMS Contributed Paper Session on Partial Differential Equations, II

8:00 AM – 11:40 AM **Room 312, BCC**

8:00AM (840) *The Heat Equation on the Poincare' Upper Half-Plane.*
Michelle DeDeo, University of North Florida (1145-35-1285)

8:15AM (841) *Nonconvexity and Compact Containment of Mean Value Sets for General Elliptic Operators.*
Niles Armstrong* and **Ivan Blank**, Kansas State University (1145-35-2731)

8:30AM (842) *Multiplicity of Positive Radial Solutions to Elliptic Equations in an Annulus.* Preliminary report.
Jaffar Ali Shahul Hameed*, Florida Gulf Coast University, and **Seshadev Padhi**, Birla Institute of Technology Ranchi (1145-35-2756)

8:45AM (843) *Uniqueness and convergence on equilibria of the Keller-Segel system with subcritical mass.*
Jun Wang, Fuculty of Science, Jiangsu University, China (1145-35-3026)

9:00AM (844) *On an inverse source problem for a parabolic equation with an integral constraint.*
Sedar Ngoma, SUNY Geneseo (1145-35-2192)

9:15AM (845) *Dynamics in Chemotaxis Models of Parabolic-Elliptic Type on Bounded Domain with Time and Space Dependent Logistic Sources.*
Tahir Bachar Issa* and **Wenxian Shen**, Auburn University (1145-35-1036)

9:30AM (846) *Determining Approximated Critical Domains for Coupled Semilinear Parabolic Equations with a Localized Source.*
W. Y. Chan, Texas A&M University - Texarkana (1145-35-515)

9:45AM (847) *Some Inverse Problems For Hyperbolic Partial Differential Equations.*
Zachary J Bailey, University of Delaware (1145-35-905)

10:00AM ► (848) *A Scalar Conservation Law for Plume Migration in Carbon Sequestration.*
Elisabeth MM Brown* and **Michael Shearer**, North Carolina State University (1145-35-2901)

10:15AM (849) *Interface Development for the Nonlinear Degenerate Multidimensional Parabolic Equations Modeling Reaction-Diffusion Processes.*
amna Ali S. Abu Weden*, Florida Inistitute of Technology, and **ugur Abdulla**, Florida Institute of Technology (1145-35-322)

10:30AM (850) *Analysis of interfaces for the nonlinear double degenerate parabolic equation of turbulent filtration with absorption.*
Ugur G Abdulla and **Adam L Prinkey***, Florida Institute of Technology (1145-35-174)

10:45AM (851) *Analysis of Interfaces for the Nonlinear Degenerate Diffusion Equation with Convection.*
Ugur G. Abdulla and **Lamees K. Alzaki***, Florida Institute of Technology (1145-35-217)

11:00AM (852) *Periodic Problems for Higher Order Nonlinear Hyperbolic Equations.*
Audison Beaubrun* and **Tariel Kiguradze**, Florida Institute of Technology (1145-35-1225)

11:15AM (853) *Differential manifolds near a traveling front for multi-dimensional reaction diffusion systems.*
Xinyao Yang*, Xi'an Jiaotong-Liverpool University, and **Yuri Latushkin**, University of Missouri, Columbia (1145-35-308)

11:30AM (854) *On Nonlocal Keller-Segel Type Equations.*
Suleyman Ulusoy, American University of Ras Al Khaimah (1145-35-1107)

MAA Contributed Paper Session on Inequalities and Their Applications

8:00 AM – 10:35 AM **Room 302, BCC**

Organizers: **Titu Andreescu**, University of Texas at Dallas
Henry J. Ricardo, Westchester Area Math Circle

8:00AM ► (855) *Convex Functions and Their Applications to Inequalities.* Preliminary report.
Risto Atanasov, Western Carolina University (1145-F1-2136)

8:20AM ► (856) *Golden-Mean Sunflower Inequalities.*
Andrew Simoson, King University, (1145-F1-645)

8:40AM ► (857) *Unpublished Solutions of Some Problem Proposals in General Mathematics Journals Involving Inequalities.* Preliminary report.
Mohammad K. Azarian, University of Evansville (1145-F1-108)

9:00AM ► (858) *Recasting the Proof of Parseval's Equation.* Preliminary report.
Joshua Michael Siktar, Carnegie Mellon University (1145-F1-554)

9:20AM (859) *Generalized weighted trapezoid and Grüss type inequalities on time scales.*
Eze R Nwaeze, Tuskegee University (1145-F1-351)

9:40AM ► (860) *Extending Hlawka's Inequality.* Preliminary report.
Marius Munteanu, SUNY Oneonta (1145-F1-2311)

10:00AM ► (861) *On some Integral means.*
Fariba Khoshnasib-Zeinabad, Earlham College/UTDallas (1145-F1-342)

10:20AM ► (862) *A Quantitative method for choosing optimal Daubechies wavelets.*
Eric Stachura*, Kennesaw State University, and **Andrew K Hunter**, University of Pennsylvania (1145-F1-320)

MAA Contributed Paper Session on Mathematics and the Life Sciences: Initiatives, Programs, Curricula

8:00 AM – 11:15 AM **Room 305, BCC**

Organizers: **Timothy D. Comar**, Benedictine University
Raina Robeva, Sweet Briar College
Carrie Diaz Eaton, Unity College

8:00AM (863) *A model for cross-institutional collaboration: how the intercollegiate biomathematics alliance (IBA) is pioneering a new paradigm in response to diminishing resources in academia.*
Hannah Highlander*, University of Portland, and **Olcay Akman**, Illinois State University (1145-G5-2579)

8:20AM ► (864) *Integrating mathematics and microbiology: a case study to improve learning outcomes and foster faculty collaboration.*
Filippo Posta*, Estrella Mountain Community College, and **Galyna Kufryk**, Grand Canyon University (1145-G5-1393)

8:40AM ► (865) *Algebraic mathematical biology for undergraduate studies and research in the life sciences.*
Raina S. Robeva, Sweet Briar College (1145-G5-2845)

9:00AM ► (866) *Building Relevance and Connection: Using Medical Simulation to Enhance Students' Connections between Calculus and Biology.* Preliminary report.
Melissa A Stoner, Salisbury University (1145-G5-2392)

9:20AM (867) *Better Calculus through Biology: The Biocalculus Sequence at Penn State University.* Preliminary report.
Andrew M. Baxter, **Eric Simring**, **Amine Benkiran** and **Andrew Belmonte***, Penn State University, University Park (1145-G5-2174)

9:40AM ► (868) *Incorporating relevant life science projects into Calculus class: Michaelis - Menten Kinetics and more.*
Yanping Ma*, Loyola Marymount University, and **Curtis Bennett**, CSU Long Beach (1145-G5-1635)

10:00AM ► (869) *Introducing Mathematical Modeling to High School Students through Population Dynamics.*
Jessica Oehrlein, Columbia University (1145-G5-1152)

10:20AM ► (870) *X-Lab: interdisciplinary research combining math, biology, computer science, and business.*
Meghan M. De Witt, St. Thomas Aquinas College (1145-G5-2033)

10:40AM (871) *Undergraduate Research in Mathematical Biology Using Impulsive Models.*
Timothy D Comar, Benedictine University (1145-G5-1620)

11:00AM ► (872) *Active participation in current faculty research inspires student achievement.* Preliminary report.
Majid Masso, George Mason University (1145-G5-352)

MAA General Contributed Paper Session on Algebra, II

8:00 AM – 9:25 AM **Room 348, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

8:00AM ► (873) *A Curious Possible Prime Pattern.*
Benjamin M. Bolker, McMaster University, Hamilton Ontario, **Eleanor J. B. Bolker**, Phillips Exeter Acadamy, Exeter NH, and **Ethan D. Bolker***, UMass Boston, Boston MA (1145-VL-1178)

8:15AM ► (874) *On skew polynomial rings over locally nilpotent rings.*
Fei Yu Chen, University of California, Berkeley, **Hannah Hagan**, Vanderbilt University, and **Allison Wang***, California Institute of Technology (1145-VL-823)

8:30AM (875) *G-Algebra Structure on the Higher Order Hochschild Cohomology over S^2.*
Samuel R. Carolus* and **Mihai D. Staic**, Bowling Green State University (1145-VL-931)

8:45AM (876) *Twisting functors and generalized Verma modules.*
Ian M Musson, University of Wisconsin-Milwaukee (1145-VL-199)

9:00AM ► (877) *Construction of a $2n$-Starter from a 2-Starter, and New Solutions to the Oberwolfach Problem.* Preliminary report.
Daniel A McGinnis* and **Eirini Poimenidou**, New College of Florida (1145-VL-1318)

9:15AM (878) *Galois groups of doubly even octic polynomials.*
Chad Awtrey, Elon University (1145-VL-64)

MAA General Contributed Paper Session on Graph Theory, I

8:00 AM – 11:40 AM **Room 341, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

8:00AM ► (879) *An Application of Ramsey Numbers.*
Drake P Olejniczak, Western Michigan University (1145-VP-1013)

8:15AM ► (880) *The Chromatic Number of a Two Dimensional Lattice.*
Manuel A Davila*, **Cynthia M Ramirez** and **Gwen Ostergren**, California State University Los Angeles (1145-VP-1021)

8:30AM ► (881) *Spectral characterizations of anti-regular graphs.*
Cesar O. Aguilar*, **Joon-yeob Lee**, **Eric Piato** and **Barbara J. Schweitzer**, SUNY Geneseo (1145-VP-106)

8:45AM ► (882) *Graph labeling and social intervals.*
Ethan Berkove*, Lafayette College, and **Mike Brilleslyper**, United States Air Force Academy (1145-VP-1265)

9:00AM ► (883) *Limit Characterizations of Graphs: An Extension to Multigraphs.*
Joshua J Steier*, **Kristi Luttrell** and **John T Saccoman**, Seton Hall University (1145-VP-132)

9:15AM (884) *A tight upper bound on the spectral radius of bottleneck matrices of graphs.*
Jason J Molitierno, Sacred Heart University (1145-VP-995)

9:30AM ► (885) *A Graphical Game, Southwesterly Snakes.*
Emily N Hoard, Murray State University (1145-VP-1345)

9:45AM (886) *A Generalization of the Harary-Sachs Theorem for Hypergraphs.*
Gregory J Clark* and **Joshua Cooper**, University of South Carolina (1145-VP-1396)

10:00AM (887) *Semidefinite Programming Relaxations of the Traveling Salesman Problem.*
Samuel C Gutekunst* and **David P Williamson**, Cornell University (1145-VP-1447)

10:15AM (888) *s-hamiltonian and s-hamiltonian connected line graphs of claw-free graphs.*
Hong-Jian Lai, West Virginia University, **Mingquan Zhan**, Millersville University of Pennsylvania, **Taoye Zhang***, Penn State University, Scranton Campus, and **Ju Zhou**, Kutztown University of Pennsylvania (1145-VP-1448)

10:30AM ► (889) *Diffusion of Innovations on Strongly Regular Graphs.*
Michael Kerckhove* and **Hassan Naveed**, University of Richmond (1145-VP-1463)

10:45AM ► (890) *Colorful Cacti.* Preliminary report.
Kathleen Ryan*, **Nicholas Speranza** and **Henry Wickus**, DeSales University (1145-VP-1576)

11:00AM ► (891) *On Some Properties of Pebbling Configuration Graphs.*
Max Lind*, Downingtown, PA, and **Eugene Fiorini**, Muhlenberg College (1145-VP-2004)

11:15AM ► (892) *Counting Vertices in Tessellations of the Hyperbolic Plane.*
Tucker L Dowell* and **Xiaoya Zha**, Middle Tennessee State University (1145-VP-2935)

11:30AM ► (893) *A characterization of the resonance graph of an outer plane bipartite graph.* Preliminary report.
Zhongyuan Che, Penn State University, Beaver Campus (1145-VP-500)

Project NExT Workshop

8:00 AM – 6:00 PM **Room 308, BCC**

PME Council Meeting

8:00 AM – 11:30 AM **Orioles, 2nd Floor, Marriott Inner Harbor**

Employment Center

8:00 AM – 5:30 PM **Exhibit Hall E, 100 Level, BCC**

MAA Contributed Paper Session on Research in Undergraduate Mathematics Education (RUME), I

8:20 AM – 11:55 AM **Room 340, BCC**

Organizers: **Stacy Brown**, California State Polytechnic University
Megan Wawro, Virginia Tech
Aaron Weinberg, Ithaca College

8:20AM ► (894) *Positive Impacts of Discovery Learning Assessments.*
Kayla K. Blyman, **Bryan Adams**, **Kristin M. Arney**, **Lisa Bromberg*** and **David A. del Cuadro-Zimmerman**, United States Military Academy – West Point (1145-J5-2678)

8:40AM ► (895) *Examining Student Engagement with Student-Driven Activities.* Preliminary report.
Andrew J Krause*, **Willie W Wong**, **Mark Iwen** and **Ryan Maccombs**, Michigan State University (1145-J5-2969)

9:00AM ► (896) *Taking the long view: The influence of professional development workshops on instructors' teaching practice, ten years out.*
Sandra L. Laursen*, **Charles N. Hayward** and **Tim Archie**, University of Colorado Boulder (1145-J5-2927)

9:20AM ► (897) *Responsiveness: An underlying and enacted disposition.* Preliminary report.
Jessica R Gehrtz, Colorado State University (1145-J5-2966)

9:40AM ► (898) *Detailing shifts in relational dimensions of Latinx students' mathematics classroom experiences between high school and college.*
Luis A Leyva, Vanderbilt University - Peabody College of Education & Human Development, and **Alexandria Cervantes***, California State University - Monterey Bay (1145-J5-2933)

10:00AM ► (899) *Concept Construction and Abstracted Quantitative Structures.*
Kevin C. Moore*, **Irma E. Stevens**, **Biyao Liang** and **Halil I. Tasova**, University of Georgia (1145-J5-1564)

10:20AM (900) *Developing an advanced viewpoint on school mathematics in the learning of collegiate mathematics: Through the lens of a transformative transition framework.*
Younhee Lee, Pennsylvania State University (1145-J5-2578)

10:40AM ► (901) *The Role of Improper Fraction Schemes in STEM Students' Conception of Measurement.*
Brady A. Tyburski*, **Andrew Darling**, **Cameron Byerley**, Colorado State University, **Steven Boyce** and **Jeffrey Grabhorn**, Portland State University (1145-J5-2710)

11:00AM ► (902) *Characterizing Two Undergraduate Students' Quantitative Comparisons of Covarying Quantities' Magnitudes.*
Halil I. Tasova*, **Biyao Liang**, **Irma E. Stevens** and **Kevin C. Moore**, University of Georgia (1145-J5-1210)

11:20AM (903) *The effect of technology on students understanding of college algebra.*
Razieh Shahriari*, University of Arkansa, and **Bernard Madison**, University of Arkansas (1145-J5-1514)

11:40AM ► (904) *Integration of Introductory Mathematics into General Biology by Reciprocal Course Content Exchange.*
Qingxia Li*, Fisk University, **Thomas Gross**, Western Kentucky University, and **Patricia McCarroll**, Fisk University (1145-J5-118)

AMS Special Session on Number Theoretic Methods in Hyperbolic Geometry (a Mathematics Research Communities Session), I

8:30 AM – 11:50 AM **Room 332, BCC**

Organizers: **Samantha Fairchild**, University of Washington
Junxian Li, Universität Göttingen
Richard Vradenburgh, University of Virginia

8:30AM ► (905) *Examples of badly approximable vectors over number fields.* Preliminary report.
Robert Hines, University of Colorado, Boulder (1145-11-776)

9:00AM (906) *Discrete Representations of the Braid Groups.*
Nancy C Scherich, University of California, at Santa Barbara (1145-54-829)

9:30AM (907) *Some Non-Abelian Covers of Knot Complements.*
Tim Morris, Temple University (1145-54-2256)

10:00AM (908) *Bounded gaps between primes and the length spectra of arithmetic hyperbolic 3-orbifolds.*
Benjamin Linowitz, Oberlin College, **D. B. McReynolds**, Purdue University, **Paul Pollack**, University of Georgia, and **Lola Thompson***, Oberlin College (1145-11-2705)

11:00AM (909) *Arithmeticity of Fully Augmented Links.*
Christian R Millichap*, Furman University, **Jeffrey Meyer** and **Rolland Trapp**, California State University, San Bernardino (1145-57-768)

11:30AM (910) *Does the primitive length spectrum fully characterize arithmetic surfaces?* Preliminary report.
Christian Millichap, Furman University, **Bakul Sathaye***, Wake Forest University, and **Salman Siddiqi**, University of Michigan (1145-51-1983)

SIAM Minisymposium on Data Assimilation: Theory and Practice

8:30 AM – 11:20 AM **Room 342, BCC**

Organizer: **John Harlim**, Pennsylvania State University

8:30AM ► (911) *Transportation Particle Filter for high-dimensional geophysical applications.*
Peter Jan van Leeuwen, Colorado State University and University of Reading (UK) (1145-60-819)

9:00AM (912) *Overcoming model and observation error in data assimilation using manifold learning.*
Tyrus Berry*, George Mason University, **John Harlim**, Pennsylvania State University, **Timothy Sauer**, George Mason University, and **Franz Hamilton**, North Carolina State University (1145-65-860)

9:30AM (913) *Local ensemble Kalman filter in high dimension.*
Xin T Tong, National University of Singapore (1145-60-873)

10:00AM (914) *Fitness of the ensemble approach in ensemble-var data assimilation system.*
Kayo Ide, Univeristy of Maryland (1145-86-2202)

10:30AM (915) *Joint state and parameter estimation for non-linear stochastic energy balance models.*
Fei Lu, Johns Hopkins University (1145-62-1702)

11:00AM (916) *On the Charney Conjecture of Data Assimilation Employing Temperature Measurements Alone: The Paradigm of 3D Planetary Geostrophic Model.*
Aseel Farhat, Florida State University, **Evelyn M. Lunasin***, United States Naval Academy, and **Edriss S. Titi**, Texas A&M University (1145-35-1299)

MAA Contributed Paper Session on The EDGE (Enhancing Diversity in Graduate Education) program: Pure and Applied talks by Women Math Warriors, I

8:45 AM – 10:00 AM **Room 322, BCC**

Organizers: **Laurel Ohm**, University of Minnesota,
Shanise Walker, Iowa State University,

8:45AM (917) *Cops and Robbers: Beyond Graphs.*
Miriam Parnes, Wesleyan University (1145-I1-2490)

9:05AM (918) *Beyond Cyclotomics: Exploring New Base Rings for Ideal Lattice Cryptography.* Preliminary report.
Katharine Ahrens, North Carolina State University (1145-I1-1277)

9:25AM (919) *Connections between commutators, derivations, and the Heisenberg Commutation Relation.*
Lara Ismert, University of Nebraska-Lincoln (1145-I1-865)

9:45AM ► (920) *Theoretical justification and error analysis for slender body theory.*
Laurel A Ohm, University of Minnesota (1145-I1-2097)

MAA Invited Address

9:00 AM – 9:50 AM **Ballrooms I & II, 400 Level, BCC**

► (921) *A Dream Deferred: 50 Years of Blacks in Mathematics.*
Edray Herber Goins, Pomona College (1145-A0-1603)

AMS Special Session on Research in Mathematics by Early Career Graduate Students, I

9:00 AM – 11:20 AM **Room 328, BCC**

Organizers: **Marat Markin**, California State University, Fresno
Morgan Rodgers, California State University, Fresno
Khang Tran, California State University, Fresno
Oscar Vega, California State University, Fresno

9:00AM (922) *Integral means of univalent functions on an annulus.* Preliminary report.
Fareeda Begum, University of Canterbury, Christchurch, New Zealand (1145-30-125)

9:30AM ► (923) *On a generalization of Wilson's Theorem.* Preliminary report.
Mutasim Mim, St. John's University, New York, NY (1145-11-565)

10:00AM (924) *Computing Eigenmodes of Laplace-Beltrami Operator by Using Radial Basis Functions.*
Vladimir Delengov*, Claremont Graduate University, and **Chiu-Yen Kao**, Claremont McKenna College (1145-65-1171)

10:30AM (925) *Modulus on Networks and Metric Spaces, and the Essential Metric.*
Jared E Hoppis, Kansas State University (1145-00-1262)

11:00AM (926) *On the Nature of Expansions on Compact and Totally Bounded Metric Spaces and More.* Preliminary report.
Edward S. Sichel, California State University, Fresno (1145-46-1269)

MAA Minicourse #8: Part A

9:00 AM – 11:00 AM **Holiday Ballroom 5, 2nd Floor, Hilton**

Dance and Mathematics
Presenter: **Karl Schaffer**, De Anza College

MAA Minicourse #5: Part A

9:00 AM – 11:00 AM **Holiday Ballroom 1, 2nd Floor, Hilton**

IBL SIGMAA Minicourse: Introduction to Inquiry-Based Learning
Presenters: **Susan Crook**, Loras University
Eric Kahn, Bloomsberg University
Brian Katz, Augustana College
Victor Piercey, Ferris State University
Candice Price, University of San Diego
Xiao Xiao, Utica College

MAA Minicourse #2: Part B

9:00 AM – 11:00 AM **Holiday Ballroom 2, 2nd Floor, Hilton**

Start Teaching Statistics using R and RStudio
Presenters: **Shonda Kuiper**, Grinnell College
Randall Pruim, Calvin College

MAA Contributed Paper Session on Humanistic Mathematics

9:00 AM – 11:55 AM **Room 301, BCC**

Organizers: **Gizem Karaali**, Pomona College
Eric Marland, Appalachian State University

9:00AM (927) *Mathematics and Fairness: Using Gerrymandering to Connect Mathematics to Sociopolitical Issues.*
Kyle Evans*, Trinity College, and **Adam Giambrone**, Elmira College (1145-E5-2339)

9:20AM ► (928) *Polish Émigré Mathematicians and Their American Colleagues: Effects of the Great Depression and World War II on Employment in the Mathematical Sciences.* Preliminary report.
Emelie A. Kenney, Siena College (1145-E5-473)

9:40AM ► (929) *The Rhetoric of Mathematical Logicism, Intuitionism, and Formalism.*
J. Travis Shrontz, Huntsville, AL (1145-E5-812)

10:00AM ► (930) *Comparing Ways of Knowing Across Disciplines.*
Matt DeLong, Marian University (1145-E5-2519)

10:20AM ► (931) *Developing a Humanistic STEM Minor.* Preliminary report.
Beverly L. Wood* and **Debra Bourdeau**, Embry-Riddle Aeronautical University (1145-E5-187)

10:40AM ► (932) *Humanizing Calculus.*
Alexander J Barrios, Carleton College (1145-E5-477)

11:00AM ► (933) *Art, Literature & Letters in the Calculus Classroom: An Overview.*
Della Dumbaugh, University of Richmond (1145-E5-2104)

11:20AM ► (934) *Add Poems to Math Class.*
JoAnne Growney, Regularly posting at "Intersections – Poetry with Mathematics" at https://poetrywithmathematics.blogspot.com (1145-E5-1252)

MAA Contributed Paper Session on Introducing Mathematical Modeling through Competitions, II

9:00 AM – 11:15 AM **Room 304, BCC**

Organizers: **Chris Arney**, United States Military Academy
William Bauldry, Appalachian State University
Amanda Beecher

9:00AM ► (935) *A Beginner's Guide to Building a Science Modeling Club.*
Courtney L Davis, Pepperdine University (1145-G1-1995)

9:20AM ► (936) *MCM strategies for smaller colleges.*
Wai Wah Lau*, Seattle Pacific University, and **Tara Kats**, Nestle and Starbucks Coffee (1145-G1-1423)

9:40AM ► (937) *Insights and strategies for starting local Mathematical Contest for Modeling contests.*
Maria-Veronica Ciocanel, Mathematical Biosciences Institute, The Ohio State University (1145-G1-692)

10:00AM ► (938) *The 24-hour Mathematical Modeling Challenge.*
Benjamin Galluzzo*, Clarkson University, and **Karen M Bliss**, Virginia Military Institute (1145-G1-2878)

10:20AM ► (939) *Judging the ICM, A View from Within.*
Jessica M. Libertini*, Virginia Military Institute, and **Amanda Beecher**, Ramapo College of New Jersey (1145-G1-597)

10:40AM ► (940) *Modeling Competitions: Perspectives of Student and Faculty.*
Patrice G Tiffany* and **Emma Regenauer**, Manhattan College (1145-G1-2658)

11:00AM ► (941) *Student Competition Using Differential Equation Modeling - SCUDEM for Students and Faculty.*
Brian Winkel, SIMIODE Director, Cornwall NY (1145-G1-104)

SIGMAA on Business, Industry, and Government (BIG SIGMAA) Business Meeting

9:00 AM – 10:00 AM **Room 306, BCC**

MAA Panel

9:00 AM – 10:20 AM **Room 349, BCC**

Connecting High School and Post High School Mathematics

Organizer: **Gail Burrill**, Michigan State University

Panelists: **Dave Barnes**, National Council of Teachers of Mathematics
Gail Burrill, Michigan State University
Karen Graham, University of New Hampshire
Yvonne Lai, University of Nebraska
Dan Teague, North Carolina School of Science and Mathematics

MAA Workshop

9:00 AM – 10:20 AM **Room 324, BCC**

Making it Happen: Modeling in Your Differential Equations Course

Organizer: **Brian Winkel**, SIMIODE

Presenters: **Audrey Malagon**, West Virginia University
Rachel Rossetti, Agnes Scott College
Brian Winkel, SIMIODE
Dina Yagodich, Frederick University

MAA Panel

9:00 AM – 10:20 AM **Room 350, BCC**

Preparing Math and Stats Students for Industry Careers

Organizers: **Namyong Lee**, Minnesota State University
Debra Mimbs, Lee University
Thomas Wakefield, Youngstown State University

Panelists: **Allen Butler**, Daniel H. Wagner Associates, Inc
Michael Dorff, Brigham Young University
Gretchen Koch-Noble, Federal Government
Aaron Luttman, Department of Energy
Debra Mimbs, Lee University

MAA General Contributed Paper Session on Number Theory, I

9:30 AM – 11:55 AM **Room 348, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

9:30AM ► (942) *Ternary Sequences and the Pell Numbers.*
Ralph P Grimaldi, Rose-Hulman Institute of Technology (1145-VS-676)

9:45AM ► (943) *An entropy-derived lower bound for the size of a set whose subset sums include the first n powers of 2.*
David Petrie Moulton, Google (1145-VS-2338)

10:00AM ► (944) *Circles and Squares: A Look at Gauss's Circle Problem.*
Jeremy Nathan Glasner, Washington & Jefferson College (1145-VS-2415)

10:15AM ► (945) *Algorithmic approach to Goldbach and Twin Primes Conjectures.*
Juan G Orozco, Austin, TX (1145-VS-113)

10:30AM ► (946) *Pondering a Putnam problem on partitions.*
Timothy B Flowers, Indiana University of Pennsylvania (1145-VS-1230)

10:45AM (947) *Odd Coverings of Subsets of the Integers.*
James Hammer, **Joshua Harrington***, Cedar Crest College, and **Kristina Marotta**, Georgia Institute of Technology (1145-VS-1334)

11:00AM ► (948) *Polynomial Extensions of a Putnam Delight.*
Tom Koshy and **Zhenguang Gao***, Framingham State University (1145-VS-1397)

11:15AM (949) *Quaternary Lattices of Discriminant 4p.*
Lisa Kaylor, Wesleyan University (1145-VS-1637)

11:30AM ► (950) *Extensions on Conway's Wizard Problem.* Preliminary report.
Byungchul Cha, **Adam Claman**, Department of Mathematics, Muhlenberg College, **Joshua Harrington**, Department of Mathematics, Cedar Crest College, **Ziyu Liu**, Department of Mathematics, Mount Holyoke College, **Barbara Maldonado**, Department of Mathematics, University of Houston, **Alexander Miller**, Department of Mathematics, Kutztown University of Pennsylvania, **Ann Palma**, Department of Mathematics, Muhlenberg College, **Tony W. H. Wong**, Department of Mathematics, Kutztown University of Pennsylvania, and **Hongkwon Yi***, Department of Mathematics, University of California, Berkeley (1145-VS-2221)

11:45AM (951) *Products of values of certain quadratics forms.*
Erhan Gürel, Middle East Technical University, Northern Cyprus Campus (1145-VS-2310)

Exhibits and Book Sales

9:30 AM – 5:30 PM **Exhibit Hall F, 100 Level, BCC**

MAA Contributed Paper Session on Innovative and Effective Ways to Teach Linear Algebra, I

10:00 AM – 11:35 AM **Room 303, BCC**

Organizers: **Sepideh Stewart**, University of Oklahoma
Gil Strang, Massachusetts Institute of Technology
David Strong, Pepperdine University
Megan Wawro, Virginia Tech

10:00AM ► (952) *Exploring Applications of Linear Algebra through Low-Stakes Discovery Learning Assessments.*
Kayla K. Blyman, United States Military Academy - West Point (1145-F5-2877)

10:20AM ► (953) *Linear Algebra and Deep Learning.* Preliminary report.
Gilbert Strang, Massachusetts Institute of Technology (1145-F5-1261)

10:40AM ► (954) *Teaching Linear Algebra through its Applications.* Preliminary report.
Minah Oh, James Madison University (1145-F5-574)

11:00AM (955) *Using Matlab Apps to Explore Linear Algebra.*
Crista Arangala, Elon University (1145-F5-1668)

11:20AM ► (956) *Motivating Students with Applications.*
Steven Schlicker, Grand Valley State University (1145-F5-1845)

Estimathon!

10:00 AM – NOON **Room 339, BCC**

A mindbending mixture of math and trivia.
Organizer: **Andy Niedermaier**, Jane Street Capital

MAA Poster Session

10:00 AM – NOON **Exhibit Hall G, 100 Level, BCC**

Mathematical Outreach Programs
Organizer: **Betsy Yanik**, Emporia State University

AWM-AMS Noether Lecture

10:05 AM – 10:55 AM **Ballrooms I & II, 400 Level, BCC**

(957) *Dynamics of systems with low complexity.*
Bryna Kra, Northwestern University (1145-37-48)

SIGMAA Officers Meeting

10:30 AM – NOON **Room 322, BCC**

Organizer: **Andrew Miller**, Belmont University

MAA Contributed Paper Session on Mathematics and the Arts, III

10:35 AM – 11:10 AM **Room 306, BCC**

Organizers: **Karl Kattchee**, University of Wisconsin-LaCrosse

Douglas Norton, Villanova University
Anil Venkatesh, Ferris State University

10:35AM *Profiles of Prime Suspects.*
► (958) **Thomas Britt**, Associate Professor at George Mason University (1145-D1-2022)

10:55AM *The Sierpinski Triangle's Italian*
► (959) *Ancestors.* Preliminary report.
Mike Huber, Muhlenberg College (1145-D1-267)

MAA Workshop

10:35 AM – 11:55 AM **Room 324, BCC**

For Faculty on Fostering Student Engagement: Experience Classroom Practices from the MAA IP Guide

Organizer: **Carolyn Yackel**, Mercer University

Presenters: **James Alvarez**, University of Texas at Arlington
April Strom, Scottsdale Community College

MAA Project NExT Lecture on Teaching and Learning

11:10 AM – NOON **Room 309/310, BCC**

► (960) *Reflections on teaching calculus for the first time, 45 times.*
David Bressoud, Macalester College (1145-A0-134)

SIAM Invited Address

11:10 AM – NOON **Ballrooms I & II, 400 Level, BCC**

(961) *Development of Mathematical Methods for Next Generation Stent Design*
Suncica Canic, University of California Berkeley (1145-92-21)

AMS Colloquium Lectures: Lecture II

1:00 PM – 1:50 PM **Ballrooms I & II, 400 Level, BCC**

► (962) *Complex multiplication: past, present, future.*
Benedict H. Gross, University of California San Diego (1145-11-34)

AMS-ASL Special Session on Definability and Decidability Problems in Number Theory, II

1:00 PM – 3:20 PM **Room 343, BCC**

Organizers: **Kirsten Eisenträger**, Pennsylvania State University
Deidre Haskell, McMaster University, Ontario, Canada
Jennifer Park, University of Michigan
Alexandra Shlapentokh, East Carolina University

1:00PM *Undecidable Propositions in Number*
► (963) *Theory: Are All of Them Monsters?*
Martin D Davis, NYU - Courant (1145-03-586)

1:30PM *Local-global principles and diophantine*
(964) *definability.*
Travis William Morrison, University of Waterloo, Institute for Quantum Computing (1145-11-2197)

2:00PM *Diophantine problem in free Lie algebras.*
(965) **Olga Kharlampovich**, Hunter College, CUNY (1145-17-2028)

2:30PM *On the strong elementary equivalence vs*
► (966) *Isomorphism problem.*
Florian Pop, University of Pennsylvania (1145-03-1661)

3:00PM *Decidability, Diophantine Approximation*
(967) *and Ostrowski numeration systems.*
Philipp C K Hieronymi, University of Illinois at Urbana-Champaign (1145-03-1492)

AMS Special Session on Agent-based Modeling in Biological and Social Systems (a Mathematics Research Communities Session), II

1:00 PM – 3:50 PM **Room 333, BCC**

Organizers: **Maryann Hohn**, University of California Santa Barbara
Angelika Manhart, Imperial College, London
Christopher Miles, Courant Institute, New York University

1:00PM *Network reconstruction from temporal*
(968) *data for coupled oscillators.*
Henry Adams, Colorado State University, **Veronica Ciocanel**, Mathematical Biosciences Institute, Ohio State University, **Kelsey Houston-Edwards**, Olin College, **Lauren Lazarus***, Trinity College, **Mark J. Panaggio**, Hillsdale College, **Bin Xu**, University of Notre Dame, and **Chad Topaz**, Williams College (1145-37-1421)

1:30PM *Using topological data analysis to assess*
► (969) *biological models.*
M. Ulmer, Google Research, **Lori Ziegelmeier**, Macalester College, and **Chad M. Topaz***, Williams College (1145-92-516)

2:00PM *Assessing the impact of motivation and*
► (970) *ability on team-based productivity using an agent-based model.*
Rachael Miller Neilan*, Duquesne University, **Josef Di Pietrantonio**, Renssalaer Polytechnic Institute, and **James Schreiber**, Duquesne University (1145-91-655)

2:30PM *Uses of Agent Based Modeling for Social*
► (971) *Science Hypothesis Development.*
Carmen A Iasiello, George Mason University (1145-91-2478)

3:00PM (972) *Agent-based Modeling as Policy support Tool for Emergent Social Systems: Case Studies in Informal Markets for Housing and Organs.*
Amit Patel*, University of Massachusetts Boston, **Naoru Koizumi**, **Brian Wilson**, George Mason University, and **Namesh Killemsetty**, University of Massachusetts Boston (1145-91-2647)

3:30PM ► (973) *Parasites and the Evolution of Sociality: How Social Complexity and Grooming Efficiency Affect the Selective Pressures on Group Organization.*
Heather Z Brooks*, UCLA, **Nina H Fefferman**, University of Tennessee Knoxville, **Maryann E Hohn**, UC Santa Barbara, **Candice R Price**, University of San Diego, **Ami E Radunskaya**, Pomona College, **Suzanne S Sindi**, UC Merced, **Nakeya D Williams**, United States Military Academy West Point, and **Shelby N Wilson**, Morehouse College (1145-92-2044)

AMS Special Session on Algebraic and Geometric Methods in Discrete Optimization, III

1:00 PM – 3:45 PM **Room 345, BCC**

Organizers: **Amitabh Basu**, Johns Hopkins University

Jesus De Loera, University of California, Davis

1:00PM (974) *IP bounds on pebbling numbers of Cartesian-product graphs.*
Franklin Kenter and **Daphne Skipper***, US Naval Academy (1145-90-952)

1:30PM ► (975) *Hilbert's Nullstellensatz, the Positivstellensatz and Vizing's Conjecture.* Preliminary report.
Susan Margulies*, United States Naval Academy, **Angelika Wiegele**, **Elisabeth Gaar** and **Daniel Krenn**, Alpen-Adria-Universität Klagenfurt (1145-05-2073)

2:00PM ► (976) *A Proof of the Strict Monotone 5-step Conjecture.*
Walter Morris*, Department of Mathematical Sciences, George Mason University, and **Mac Gallagher**, Milwaukee, Wisconsin (1145-05-544)

2:30PM (977) *A Polyhedral Model for Enumeration and Optimization over the Set of Circuits.*
Steffen Borgwardt* and **Charles Viss**, University of Colorado Denver (1145-90-959)

3:00PM (978) *On sparse (reflexive) generalized inverses.*
Jon Lee, University of Michigan (1145-15-374)

AMS Special Session on Analysis and Geometry of Nonlinear Evolution Equations, II

1:00 PM – 3:50 PM **Room 336, BCC**

Organizers: **Marius Beceanu**, University at Albany, State University of New York

Dan-Andrei Geba, University of Rochester

1:00PM (979) *Almost sure boundedness of iterates for semilinear wave equations.*
Magdalena Czubak, University of Colorado Boulder (1145-34-2144)

1:30PM (980) *On long time instability of the zero solution to a certain Nonlinear Schrodinger equation.*
Gigliola Staffilani*, Massachusetts Institute of Technology, and **Bobby Wilson**, University of Washington (1145-35-464)

2:00PM (981) *On the asymptotic behavior of solutions to the Einstein equations and related equations.*
Hans Lindblad, Johns Hopkins University (1145-35-2836)

2:30PM ► (982) *Local energy estimates for wave equations on asymptotically flat backgrounds.*
Jason Metcalfe, University of North Carolina - Chapel Hill (1145-35-1645)

3:00PM (983) *Long-time behavior of nonlinear waves near plane symmetry.*
Leonardo Abbrescia and **Willie W-Y Wong***, Michigan State University (1145-35-1246)

3:30PM (984) *Quasilinear wave equations on Kerr black holes.*
Mihai Tohaneanu, University of Kentucky (1145-35-1915)

AMS Special Session on Continued Fractions, II

1:00 PM – 3:50 PM **Room 325, BCC**

Organizers: **Geremías Polanco Encarnación**, Hampshire College

James McLaughlin, West Chester University

Barry Smith, Lebanon Valley College

Nancy J. Wyshinski, Trinity College

1:00PM (985) *Orthogonal polynomials associated with a continued fraction of Hirschhorn.*
Gaurav Bhatnagar*, University of Vienna, Austra, and **Mourad E. H. Ismail**, University of Central Florida (1145-33-769)

2:00PM ► (986) *Continued fractions from b-ary Stern polynomials.*
Larry Ericksen*, Millville, New Jersey, and **Karl Dilcher**, Dalhousie University (1145-11-2021)

2:30PM (987) *Matrix Representation for Higher-Order Euler Polynomials.*
Lin Jiu*, Dalhousie University, and **Diane Shi**, Tianjin University (1145-11-567)

3:00PM ► (988) *Some Experimental Evidence Supporting the Littlewood Conjecture.* Preliminary report.
Rich Burge, Garden Valley CA (1145-11-46)

3:30PM ► (989) *Mathematical Diffraction and the Complex Roots of a Nonlattice Dirichlet Polynomial.* Preliminary report.
Edward Voskanian, Universtiy of California, Riverside (1145-46-2513)

AMS Special Session on Harmonic Analysis: Recent Developments on Oscillatory Integrals (a Mathematics Research Communities Session), II

1:00 PM – 3:50 PM **Room 330, BCC**

Organizers: **Xiumin Du**, University of Maryland
Taryn C. Flock, University of Massachusetts Amherst
Yakun Xi, University of Rochester
Taryn Flock

1:00PM (990) *A symmetrization inequality shorn of symmetry.* Preliminary report.
Michael Christ* and **Dominique Maldague**, UC Berkeley (1145-42-2156)

2:00PM (991) *Special cases of multilinear oscillatory integrals.* Preliminary report.
Dominique Maldague*, UC Berkeley, **Dong Dong**, University of Maryland, College Park, and **Dominick Villano**, University of Pennsylvania (1145-42-1549)

2:30PM (992) *Decay property of multilinear oscillatory integrals.*
Zhen Zeng, University of Pennsylvania (1145-42-1672)

3:00PM (993) *Oscillatory Loomis-Whitney.* Preliminary report.
Maxim Gilula, Michigan State University (1145-42-1825)

3:30PM (994) *Variation-norm estimates for certain singular oscillatory integrals.*
Joris Roos*, University of Wisconsin-Madison, **Shaoming Guo** and **Po-Lam Yung** (1145-42-2557)

AMS Special Session on Lattice Path Combinatorics and Applications, II

1:00 PM – 3:50 PM **Room 338, BCC**

Organizers: **Christian Krattenthaler**, University of Vienna, Austria
Alan Krinik, California State Polytechnic University
Randall J. Swift, California State Polytechnic University

1:00PM (995) *Limit laws for lattice paths with catastrophes.*
Cyril Banderier, Université de Paris Nord, and **Michael Wallner***, Université de Bordeaux (1145-05-1573)

1:30PM (996) *Two-sided loop-erased random walk.*
Greg Lawler, University of Chicago (1145-60-2551)

2:00PM ► (997) *Generalized ballot box problem and fluctuations within a strip.*
Alan Krinik*, California State Polytechnic University, Pomona, **Gerardo Rubino**, INRIA, Campus de Beaulieu 35042 Rennes, France, **Chon In (Dave) Luk**, **Jeffrey Yeh**, **Samuel Lyche**, California State Polytechnic University, Pomona, **Lyheng Phey**, California State University, Long Beach, **John Kath**, Claremont Graduate University, **Christine Hoogendyk**, California State Polytechnic University, Pomona, and **Malachi C. Demmin**, California State University, Pomona (1145-05-1605)

2:30PM ► (998) *Toward an Understanding of Skewed-Top Corridors.* Preliminary report.
Shaun V. Ault* and **Joanne A. Wardell**, Valdosta State University (1145-05-1932)

3:00PM (999) *New duals of MacMahon's theorem.*
Tri Lai, University of Nebraska - Lincoln (1145-05-1449)

3:30PM (1000) *Extracting coefficients of symmetric rational functions.*
Yuliy Baryshnikov, University of Illinois, **Stephen Melczer**, **Robin Pemantle***, University of Pennsylvania, and **Armin Straub**, University of South Alabama (1145-05-600)

AMS Special Session on Mathematical Models in Ecology, Epidemiology, and Medicine, II

1:00 PM – 3:50 PM **Room 319, BCC**

Organizers: **Richard Schugart**, Western Kentucky University
Najat Ziyadi, Morgan State University

1:00PM ► (1001) *The modeling of Ventilator-Induced Lung Injury focusing on age-dependent stretched-induced inflammation at the cellular level: an Agent Based Model and ODE model.*
Sarah Minucci, **Rebecca Heise**, **Michael Valentine**, **Franck Kamga Gninzeko** and **Angela Reynolds***, Virginia Commonwealth University (1145-92-1780)

1:30PM (1002) *Parameter identifiability of a respiratory mechanics model in an idealized preterm infant.*
Laura Ellwein Fix, Virginia Commonwealth University (1145-92-879)

2:00PM (1003) *A simplified model of air-driven film transport in human airways.*
H. Reed Ogrosky*, Virginia Commonwealth University, **Roberto Camassa** and **Jeffrey Olander**, University of North Carolina (1145-92-1034)

2:30PM (1004) *Sexually Transmitted Diseases and Longterm Relationships: Pair vs Non-pair formation models.*
Katharine Gurski, Howard University (1145-92-1598)

3:00PM ► (1005) *Dynamic Ecological System Analysis.*
Huseyin Coskun, University of Georgia (1145-92-312)

3:30PM (1006) *Vector Feeding Preference in a Periodic Environment: Modeling The Andean Cutaneous Leishmaniasis in Peru.*
Rocio Marilyn Caja Rivera, University of Notre Dame (1145-92-163)

AMS Special Session on Number Theoretic Methods in Hyperbolic Geometry (a Mathematics Research Communities Session), II

1:00 PM – 3:50 PM **Room 332, BCC**

Organizers: **Samantha Fairchild**, University of Washington
Junxian Li, Universität Göttingen
Richard Vradenburgh, University of Virginia

1:00PM (1007) *Systole Growth Up Congruence Covers.*
Jeffrey S Meyer*, California State University, San Bernardino, **Sara Lapan**, University of California, Riverside, and **Benjamin Linowitz**, Oberlin College (1145-53-1992)

1:30PM (1008) *Orderability of Dehn Fillings.*
Xinghua Gao, UIUC (1145-51-1701)

2:00PM (1009) *Which hyperbolic knot complements have hidden symmetries?*
Eric Chesebro, University of Montana, **Jason DeBlois*** and **Priyadip Mondal**, University of Pittsburgh (1145-57-1547)

3:00PM (1010) *Zariski dense surface subgroups in $SL(5, Z)$ and the restricted Hitchin component for triangle groups.*
Elise A. Weir, University of Tennessee, Knoxville (1145-51-1974)

3:30PM (1011) *Finding nonsimple geodesics in Hyperbolic 3-manifolds.* Preliminary report.
Andrea Heald*, University of Washington, and **Rebekah Palmer**, Temple University (1145-51-1941)

AMS Special Session on Problems in Partial Differential Equations, II

1:00 PM – 3:50 PM **Room 337, BCC**

Organizers: **Alex Himonas**, University of Notre Dame
Curtis Holliman, The Catholic University of America

1:00PM (1012) *Where Do Solutions to Conservation Laws Live?* Preliminary report.
Barbara Lee Keyfitz, The Ohio State University (1145-35-1095)

1:30PM (1013) *Breathers and the dynamics of solutions in KdV type equations.*
Gustavo Ponce*, University of California-Santa Barbara, and **Claudio Munoz**, Departamento de Ingenieria Matematicas, Universidad de Chile (1145-35-185)

2:00PM (1014) *Large Data Scattering for Supercritical Generalized KdV.*
Felipe Linares, IMPA, Rio de Janeiro (1145-35-887)

2:30PM (1015) *On the supercritical gKdV equation.*
Luiz G Farah, Universidade Federal de Minas Gerais (UFMG) - Brazil (1145-35-1187)

3:00PM (1016) *Well-posedness issues for generalized Boussinesq equations.* Preliminary report.
Dan Andrei Geba* and **Evan Witz**, University of Rochester (1145-35-1454)

3:30PM (1017) *Lower bounds on the radius of spatial analyticity for nonlinear evolution equations.*
Alex A. Himonas, University of Notre Dame (1145-35-1087)

AMS Special Session on Recent Advances and Trends in Computable Structure Theory (in honor of J. Remmel), III

1:00 PM – 3:50 PM **Room 344, BCC**

Organizers: **Jennifer Chubb**, University of San Francisco
Tim McNicholl, Iowa State University

1:00PM ► (1018) *Reminiscences of Jeff Remmel.*
Anil Nerode, Department of Mathematics, Cornell University (1145-03-2704)

2:00PM (1019) *On the Degrees of Categoricity of Semi-Atomic L^p Spaces.*
Tyler A. Brown* and **Timothy H. McNicholl**, Iowa State University (1145-03-1399)

2:30PM (1020) *Lowness for isometric isomorphism.*
Johanna N.Y. Franklin*, Hofstra University, and **Timothy H. McNicholl**, Iowa State University (1145-03-2439)

3:00PM (1021) *On Σ-definable preorderings over the reals.*
Andrey Morozov, Sobolev Institute of Mathematics SB RAS (1145-03-1209)

3:30PM (1022) *Countable ω-models of KP and paths through computable ω-branching trees.* Preliminary report.
Julia Knight, University of Notre Dame, **Dan Turetsky**, Victoria University of Wellington, and **Rose Weisshaar***, University of Notre Dame (1145-03-1575)

AMS Special Session on Recent Advances in Homological and Commutative Algebra, II

1:00 PM – 3:50 PM **Room 318, BCC**

Organizers: **Neil Epstein**, George Mason University
Claudiu Raicu, Notre Dame University
Alexandra Seceleanu, University of Nebraska

1:00PM (1023) *The Behavior of the F-signature under Small Birational Modifications.*
Kevin Tucker*, University of Illinois at Chicago, **Karl Schwede**, **Thomas Polstra**, University of Utah, and **Linquan Ma**, Purdue University (1145-13-2711)

1:30PM (1024) *Local Cohomology of Thickenings.* Preliminary report.
Jennifer Kenkel, University of Utah (1145-13-1078)

2:00PM (1025) *Iterated local cohomology groups and Lyubeznik numbers for determinantal rings.*
András C Lőrincz*, Purdue University, and **Claudiu Raicu**, University of Notre Dame (1145-13-877)

2:30PM (1026) *On completion of graded D-modules.*
Nicholas Switala* and **Wenliang Zhang**, University of Illinois-Chicago (1145-13-463)

3:00PM (1027) *Invariants of closure operators in Stanley-Reisner rings.*
Thomas M. Ales, George Mason University (1145-13-2151)

3:30PM (1028) *Higher Nerves of Simplicial Complexes.*
Hailong Dao, **Joseph Doolittle**, **Ken Duna**, University of Kansas, **Bennet Goeckner**, University of Washington, **Brent Holmes*** and **Justin Lyle**, University of Kansas (1145-13-2340)

AMS Special Session on Recent Advances in Regularity Lemmas, III

1:00 PM – 3:45 PM **Room 346, BCC**

Organizers: **Gabriel Conant**, University of Notre Dame
Rehana Patel
Julia Wolf, University of Bristol, UK

1:00PM (1029) *A stable arithmetic regularity lemma in finite abelian groups.*
Caroline Terry*, University of Chicago, and **Julia Wolf**, University of Cambridge (1145-03-1474)

2:00PM (1030) *An Improved Lower Bound for Arithmetic Regularity.*
Kaave Hosseini*, **Shachar Lovett**, UC San Diego, **Guy Moshkovitz**, Harvard University, and **Asaf Shapira**, Tel-Aviv University (1145-05-1698)

2:30PM (1031) *Independent sets in algebraic hypergraphs.*
Anton Bernshteyn*, Carnegie Mellon University, **Michelle Delcourt**, University of Waterloo, and **Anush Tserunyan**, University of Illinois at Urbana-Champaign (1145-05-1520)

3:00PM (1032) *Regularity theorems in group environments.* Preliminary report.
Anand Pillay, University of Notre Dame (1145-05-1669)

AMS Special Session on Recent Progress in Multivariable Operator Theory, II

1:00 PM – 3:50 PM **Room 320, BCC**

Organizers: **Dmitry Kaliuzhnyi-Verbovetsky**, Drexel University
Hugo Woerdeman, Drexel University

1:00PM (1033) *C^*-algebras and the Category of Stochastic Maps.*
Benjamin P Russo*, Farmingdale State College SUNY, and **Arthur Parzygnat**, University of Connecticut (1145-47-573)

1:30PM (1034) *Noncommutative varieties and the classification of some universal operator algebras.*
Orr Moshe Shalit, Technion - Israel Institute of Technology (1145-47-346)

2:00PM (1035) *Rings of germs of nc functions.* Preliminary report.
Victor Vinnikov, Ben Gurion University of the Negev (1145-47-370)

2:30PM (1036) *Noncommutative polynomials describing convex sets.*
Igor Klep, Department of Mathematics, The University of Auckland, New Zealand (1145-46-1054)

3:00PM (1037) *The Free Grothendieck Theorem.*
Meric Augat, University of Florida (1145-16-795)

3:30PM (1038) *Free bianalytic maps between spectraballs.* Preliminary report.
Scott Mccullough, University of Florida, Mathematics (1145-47-541)

AMS Special Session on Research in Mathematics by Early Career Graduate Students, II

1:00 PM – 3:20 PM **Room 328, BCC**

Organizers: **Marat Markin**, California State University, Fresno
Morgan Rodgers, California State University, Fresno

Khang Tran, California State University, Fresno

Oscar Vega, California State University, Fresno

1:00PM ► (1039) *Image deblurring using higher order Galerkin approximations with domain stretching.* Preliminary report. **Miandra Ann Ellis*** and **Rosemary Anne Renaut**, School of Mathematical and Statistical Sciences, Arizona State University (1145-65-1428)

1:30PM ► (1040) *Working in Reverse: Inverse Optimization Methods in Pyomo.* Preliminary report. **Stephanie Ann Allen**, University of Maryland, College Park (1145-90-1850)

2:00PM ► (1041) *Stochastic filtering on the grassmannian.* Preliminary report. **Lauren N Crider**, Arizona State University (1145-53-2521)

2:30PM (1042) *A price-decision and order-making mechanism for a retail beverage store during sales dealer's promotion period.* **Napoleon Martin*** and **Hyounkyun Oh**, Savannah State University (1145-91-2668)

3:00PM ► (1043) *Opinion Dynamics with Confidence Threshold.* Preliminary report. **Mela Hardin*** and **Nicolas Lanchier**, Arizona State University (1145-60-1981)

AMS Special Session on Riordan Arrays, II

1:00 PM – 3:50 PM **Room 347, BCC**

Organizers: **Alexander Burstein**, Howard University

Dennis Davenport, Howard University

Asamoah Nkwanta, Morgan State University

Lou Shapiro, Howard University

Leon Woodson, Morgan State University

1:00PM (1044) *Riordan digraphs and their primitivity.* **Gi-Sang Cheon**, **Ji-Hwan Jung***, **Bumtle Kang**, Applied Algebra and Optimization Research Center, Sungkyunkwan University, and **Suh-Ryung Kim**, Department of Mathematics Education, Seoul National University (1145-05-1537)

1:30PM (1045) *Stretched Motzkin paths bounded from below and their applications.* **Hana Kim***, Applied Algebra and Optimization Research Center, Sungkyunkwan University, **Louis W Shapiro**, Howard University, and **Gi-Sang Cheon**, Sungkyunkwan University (1145-05-1451)

2:00PM (1046) *Generalized Catalan Numbers Associated with a Family of Pascal-like Triangles.* Preliminary report. **Paul Barry**, Waterford Institute of Technology, Waterford, Ireland (1145-05-1500)

3:00PM ► (1047) *Riordan Group Techniques on Linear Chord Statistics.* Preliminary report. **Naiomi T. Cameron**, Lewis & Clark College (1145-05-2293)

3:30PM ► (1048) *Characteristic curves for a family of linear PDEs and the exponential map in the Lie group of Riordan matrices.* **Manuel A. Morón**, Universidad Complutense de Madrid. Spain (1145-22-1346)

AMS Special Session on Stochastic Differential Equations and Applications, II

1:00 PM – 3:45 PM **Room 326, BCC**

Organizer: **Carey Caginalp**, University of Pittsburgh

1:00PM (1049) *The Rate of Convergence of Strong Euler Approximation for Lévy-driven SDEs.* **Fanhui Xu*** and **Remigijus Mikulevicius**, University of Southern California (1145-60-334)

2:00PM ► (1050) *Volatility Maxima as a Forecaster of Trading Price Extrema.* **Gunduz Caginalp**, Math Dept, Univ of Pittsburgh (1145-60-526)

3:00PM ► (1051) *A Dynamical Systems Approach to Cryptocurrency.* **Carey Caginalp**, University of Pittsburgh (1145-91-1625)

AMS Special Session on The Mathematics of Gravity and Light (a Mathematics Research Communities Session), II

1:00 PM – 2:50 PM **Room 329, BCC**

Organizers: **Sougata Dhar**, University of Maine

Chad R. Mangum, Niagara University

Nadine Stritzelberger, University of Waterloo

3:00PM Open Problem Discussion.

1:00PM (1052) *Quantum fluctuations, light, and the small scale structure of spacetime.* **Steven Carlip**, University of California ar Davis (1145-83-415)

1:30PM (1053) *Influence of a plasma on the shadows of black holes.* **Volker Perlick***, ZARM, University of Bremen, **Oleg Yu. Tsupko** and **G. S. Bisnovatyi-Kogan**, Space Research Institute, Moscow, Russia (1145-83-1104)

2:00PM (1054) *Static, equipotential photon surfaces have no hair.* **Carla Cederbaum**, University of Tuebingen, Germany (1145-83-1115)

2:30PM (1055) *Constructive Gravity – How to unlock the hidden information about gravity that is encoded in a matter action.* **Frederic P. Schuller**, Friedrich Alexander University Erlangen-Nuremberg (Germany) (1145-83-1987)

AMS Special Session on The Mathematics of Historically Black Colleges and Universities (HBCUs) in the Mid-Atlantic, II

1:00 PM – 3:50 PM **Room 314, BCC**

Organizers: **Edray Goins**, Purdue University
Janis Oldham, North Carolina A&T
Talithia Washington, Howard University
Scott Williams, University at Buffalo, State University of New York

1:00PM (1056) *My Choice to Change the World: An Exploration of My Journey from the Spelman College Mathematics Department to an Urban Public HBCU in the Nation's Capital.*
Leona A. Harris, University of the District of Columbia (1145-01-1666)

1:30PM (1057) *The research of 20 Ph.D. students at Howard University.*
Neil Hindman, Howard University (1145-05-1072)

2:00PM (1058) *Motivating Students in Mathematics: Women Who Count.*
Shelly M. Jones, Central Connecticut State University (1145-01-2941)

2:30PM (1059) *Episodes in the Life of a Genius: J. Ernest Wilkins Jr.*
Asamoah Nkwanta*, Morgan State University, and **Janet E. Barber**, Stratford University (1145-01-1562)

3:00PM (1060) *A Lott of History.*
Dawn A Lott, Delaware State University (1145-01-1821)

3:30PM (1061) *The National Association of Mathematicians (NAM), The First Fifty Years (1969-2019): Contributions and Influences as an Advocate and a Catalyst for Improvement.*
Johnny L. Houston, Elizabeth City State University (1145-01-2580)

AMS Special Session on Women in Topology, II

1:00 PM – 3:50 PM **Room 327, BCC**

Organizers: **Jocelyn Bell**, Hobart and William Smith Colleges
Rosemary Guzman, University of Chicago
Candice Price, University of San Diego
Arunima Ray, Max Planck Institute for Mathematics, Germany

1:00PM (1062) *Hereditarily Good Properties.*
Joan E Hart*, University of Wisconsin Oshkosh, and **Kenneth Kunen**, University of Wisconsin Madison (1145-54-759)

1:30PM (1063) *Searching for v_n self-maps at the prime 2: an algebraic approach.*
Leanne Elizabeth Merrill, Western Oregon University (1145-55-1347)

2:00PM (1064) *Obstructions to Riemannian smoothings of locally CAT(0) manifolds.*
Bakul Sathaye, Wake Forest University (1145-57-1973)

2:30PM (1065) *New examples of pseudomodular jigsaw groups.* Preliminary report.
Carmen Galaz-Garcia, University of California, Santa Barbara (1145-54-961)

3:00PM (1066) *Constructions of Lefschetz fibrations using cyclic group actions.*
Nur Saglam*, UCR, and **Anar Akhmedov**, UMN (1145-57-985)

3:30PM (1067) *Topological Symmetry Groups of the Heawood Graph.*
Erica Flapan, Pomona College, **Emille Davie Lawrence***, University of San Francisco, and **Robin Wilson**, California State Polytechnic University, Pomona (1145-57-2045)

MAA Invited Paper Session on Modular Forms: Aesthetics and Applications

1:00 PM – 3:50 PM **Room 317, BCC**

Organizer: **Amanda Folsom**, Amherst College

1:00PM (1068) *Ramanujan's Lost Notebook: The Continuing Mystery.*
George E Andrews, The Pennsylvania State University (1145-AE-900)

1:30PM (1069) *The Andrews Smallest Parts Partition Function.*
Madeline Locus Dawsey*, Emory University, and **Riad Masri**, Texas A&M University (1145-AE-635)

2:00PM (1070) *Modular billiards and Diophantine approximation.*
Nickolas Andersen* and **William Duke**, UCLA (1145-AE-1125)

2:30PM (1071) *Congruences for modular forms and generalized Frobenius partitions.*
Marie Jameson, University of Tennessee (1145-AE-1946)

3:00PM (1072) *Ramanujan and Recent Work on the Riemann Hypothesis and Related Problems.* Preliminary report.
Ken Ono, Emory University (1145-AE-646)

3:30PM (1073) *Congruent numbers and modular local polynomials.*
Larry G Rolen, Vanderbilt University (1145-AE-668)

MAA Minicourse #11: Part A

1:00 PM – 3:00 PM **Holiday Ballroom 2, 2nd Floor, Hilton**

How to Run Successful Math Circles for Students and Teachers

Presenters: **Jane H. Long**, Stephen F. Austin State University
Gabriella Pinter, University of Wisconsin Milwaukee
Diana White, University of Colorado Denver and National Association of Math Circles

MAA Minicourse #9: Part B

1:00 PM – 3:00 PM **Holiday Ballroom 3, 2nd Floor, Hilton**

Mathematical Art from Complex Analysis

Presenter: **Frank Farris**, Santa Clara University

MAA Minicourse #10: Part A

1:00 PM – 3:00 PM **Holiday Ballroom 1, 2nd Floor, Hilton**

Object Based Learning and the Smithsonian Learning Lab

Presenter: **Amy Shell-Gellasch**, Eastern Michigan University

AMS Contributed Paper Session on Difference and Functional Equations

1:00 PM – 2:40 PM **Room 334, BCC**

1:00PM (1074) *Two delocalization results for quasi-periodic Schrödinger operators.* **Alexander Y Gordon**, University of North Carolina at Charlotte (1145-39-1544)

1:15PM (1075) *A generalized h-fractional Gronwall's inequality and its applications for nonlinear h-fractional difference systems with "maxima".* **Allan Peterson**, University of Nebraska-Lincoln (1145-39-2514)

► 1:30PM (1076) *Global asymptotic behavior of some classes of nonlinear periodically forced delay difference equations.* **Vlajko L. Kocic**, Xavier University of Louisiana (1145-39-909)

1:45PM (1077) *Solutions to Particular Discrete Fractional Equations.* Preliminary report. **Areeba Ikram**, Colorado School of Mines (1145-39-2978)

2:00PM (1078) *Application of the Contraction Mapping Theorem for existence and uniqueness of solutions to nonlinear, fractional difference boundary value problems.* **Kevin Ahrendt**, Colorado School of Mines (1145-39-2981)

2:15PM (1079) *Synchrony And Anti-Synchrony For Difference-Coupled Vector Fields On Graph Network Systems.* **John M Neuberger**, **Nandor Sieben*** and **James W Swift**, Northern Arizona University (1145-01-2148)

2:30PM (1080) *Nevanlinna Theory and Tropical Difference Polynomial Equations.* **Kari E. Fowler**, University of Tampa (1145-39-130)

AMS Contributed Paper Session on Mechanics, Optics, and Electromagnetic Theory

1:00 PM – 2:40 PM **Room 335, BCC**

► 1:00PM (1081) *Kantorovich Duality and Optimal Transport Problems on Magnetic Graphs.* **Sawyer Jack Robertson**, University of Oklahoma (1145-70-1491)

► 1:15PM (1082) *Entropy and L^p Convergence of the Pseudo-Inverses for CDFs of Solutions to the Radially Symmetric Aggregation Equation With Power Law Potential.* Preliminary report. **Robert Paul Volkin**, Case Western Reserve University (1145-70-2403)

► 1:30PM (1083) *Isometric Immersions, Energy Minimization, Periodic Patterns, and the Geometry of Leaves.* Preliminary report. **Maximilian K Rezek*** and **John Gemmer**, Wake Forest University (1145-74-306)

1:45PM (1084) *A Hybrid Finite Element Method for Nonlocal Models of Mechanics and Failure of Biological Tissue.* **Charles L. Talbot**, University of North Carolina at Chapel Hill (1145-74-2983)

2:00PM (1085) *A Biot model for the determination of material parameters of cancellous bone from acoustic measurements.* **Hua Chen***, Department of Mathematical Sciences, University of Delaware, **Robert P Gilbert**, Institute of Mechanics and Materials, Ruhr–Universitat Bochum, Germany, and **Philippe Guyenne**, Department of Mathematical Sciences, University of Delaware (1145-74-1900)

► 2:15PM (1086) *Exterior acoustic and electromagnetic control through active surface sources.* **Daniel T Onofrei**, University of Houston (1145-78-2642)

► 2:30PM (1087) *Topologically-mixed vector soliton instability.* Preliminary report. **Alexey Sukhinin**, North Dakota State University (1145-78-1077)

AMS Contributed Paper Session on Numerical Analysis, I

1:00 PM – 3:40 PM **Room 313, BCC**

1:00PM (1088) *Computation Of Two-Dimensional Fourier Transforms For Noisy Band-Limited Signals.* **Weidong Chen**, Minnesota State University, Mankato (1145-65-970)

1:15PM (1089) *Some New Developments of Polynomial Preserving Recovery on Hexagon Pattern and Chervon Pattern.*
Lewei Zhao*, Wayne State University, Mathematics Department, **Hao Pan**, Shandong Agricultural University, Applied Math Department, and **Zhimin Zhang**, Wayne State University, Mathematics Department (1145-65-924)

1:30PM ► (1090) *Computational Serendipity and Tensor Product Finite Element Differential Forms.*
Tyler Kloefkorn*, **Andrew Gillette** and **Victoria Sanders**, University of Arizona (1145-65-234)

1:45PM (1091) *Physically-Constrained Data-Driven Corrected Reduced Order Modeling of Fluid Flows.*
Muhammad Jaman Mohebujjaman*, **Traian Iliescu**, Virginia Tech, and **Leo G. Rebholz**, Clemson University (1145-65-122)

2:00PM (1092) *A Discontinuous Galerkin Method for the Aw-Rascle Traffic Flow Model on Networks.*
Joshua Buli*, University of California, Riverside, and **Yulong Xing**, Ohio State University (1145-65-128)

2:15PM (1093) *Gradient Method in Hilbert-Besov Spaces for the Optimal Control of Parabolic Free Boundary Problems.*
Ugur Abdulla, **Vladislav Bukshtynov** and **Ali Hagverdiyev***, Florida Institute of Technology (1145-65-151)

2:30PM ► (1094) *Locally-implicit Lax-Wendroff schemes for quasi-exponential moment-closure approximations of kinetic models.*
James A Rossmanith* and **Lopamudra Palodhi**, Iowa State University (1145-65-652)

2:45PM ► (1095) *Accurate and Efficient Calculation of Singular Electrostatic Potentials in Charge-Dielectric Spherical Systems.*
Caylah N Retz, University of North Carolina at Charlotte (1145-65-178)

3:00PM ► (1096) *Efficiency of a Moving Mesh System with a Curvature-type Monitor and an Application to Burgers' Equation.*
Preliminary report.
Marianne Debrito, Lawrence Technological University, **Annaliese Keiser***, Bowling Green State University, **Joan Remski** and **Taima Younes**, University of Michigan-Dearborn (1145-65-963)

3:15PM (1097) *A Domain Decomposition Approach based on Difference Potentials Method for Chemotaxis Models in 3D.*
Yekaterina Epshteyn and **Qing Xia***, The University of Utah (1145-65-2175)

3:30PM (1098) *Exponential integrators for stiff PDEs and their application to atmospheric models.*
Preliminary report.
Luan Vu Thai, Department of Mathematics, Southern Methodist University (1145-65-2720)

AMS Contributed Paper Session on Partial Differential Equations, III

1:00 PM – 3:10 PM **Room 312, BCC**

1:00PM ► (1099) *A power series solution to partial differential equation problrms.*
Preliminary report.
H. Semiyari, American University, Washington DC (1145-35-1895)

1:15PM (1100) *Localized method of particular solutions with polynomial basis functions.*
Xinxiang Li, Shanghai University, Shanghai, China, **Thir R. Dangal***, Alcorn State University, Lorman, MS 39096, and **Bin Lei**, School of Civil Engineering and Architecture, Nanchang University (1145-35-2465)

1:30PM Break

1:45PM (1101) *Simulation of groundwater flow captured by the horizontal reactive media well using cell-based smoothed radial point interpolation method.*
Wen Li*, Department of Mathematics, Clarkson University, **G.R. Liu**, Department of Aerospace Engineering and Engineering Mechanics, University of Cincinnati, **Guangming Yao**, Department of Mathematics, Clarkson University, and **Michelle Crimi**, Engineering and Management, Clarkson University (1145-35-1805)

2:00PM ► (1102) *A Mathematical Model For Meat Cooking.*
Preliminary report.
Sean Deyo, University of Florida, **Shawtaroh Granzier-Nakajima***, University of Arizona, **Patricia Puente**, Texas Woman's University, **H AH Shehadeh**, James Madison University, **Kevin Tully**, Wheaton College, and **J J B Webb**, James Madison University (1145-35-2167)

2:15PM (1103) *Active Control of Acoustic Fields using Almost Non-Radiating Sources.*
Neil Jerome A. Egarguin*, University of Houston and the University of the Philippines Los Banos, **Daniel Onofrei** and **Eric Platt**, University of Houston (1145-35-2712)

2:30PM (1104) *On the active control of Helmholtz Fields on mutually disjoint exterior domains.*
Eric Brian Platt, University of Houston: Mathematics Department (1145-35-2734)

2:45PM (1105) *A Lower-Triangular Mass Matrix Approach to Explicit Time Advancement for Continuous Triangular Finite Element Methods.*
Jay M Appleton* and **Brian T Helenbrook**, Clarkson University (1145-35-2591)

3:00PM (1106) *Asymptotic Analysis of Shout Options Close to Expiry.*
Ghada Alobaidi, American University of Sharjah (1145-35-1749)

MAA Contributed Paper Session on Formative and Summative Assessment of Mathematical Communication and Conceptual Understanding, I

1:00 PM – 4:15 PM **Room 306, BCC**

Organizers: **Jessica OShaughnessy**, Shenandoah University

Jana Talley, Jackson State University

1:00PM (1107) *A discursive approach to teaching introductory calculus to foster students' mathematical communication and assessment of conceptual understanding in university mathematics.* **Beste Gucler**, University of Massachusetts Dartmouth (1145-H1-1174)

► 1:20PM (1108) *Formative and Summative Assessments in an Intro to Proof course.* **Jessie A Hamm**, Winthrop University (1145-H1-2853)

► 1:40PM (1109) *Writing Prompts as Formative Assessment in Calculus II.* Preliminary report. **Larissa B. Schroeder**, University of Hartford (1145-H1-2115)

2:00PM (1110) *Term Paper Two Ways: Assessing Communication and Comprehension with Multiple Audiences.* **Malcah Effron**, MIT (1145-H1-691)

► 2:20PM (1111) *Developing Mathematics Professionals.* Preliminary report. **Emma Smith Zbarsky**, Wentworth Institute of Technology (1145-H1-2430)

► 2:40PM (1112) *Using mastery-based assessment in lower level mathematics courses.* Preliminary report. **Jason R Elsinger**, Florida Southern College, FL (1145-H1-1116)

► 3:00PM (1113) *Pre-Planning and Modifications for Implementing Mastery Based Testing in Calculus.* **Amanda J Mangum**, Niagara University (1145-H1-2872)

► 3:20PM (1114) *Going Gradeless: Strategies for Promoting Conceptual Understanding in Pre-Service Teachers.* Preliminary report. **Christina Therkelsen** and **Susan Gregson***, University of Cincinnati (1145-H1-1392)

► 3:40PM (1115) *Exploration of Precalculus Concepts using Project-based Assessment Techniques.* **Girija Sarada Nair-Hart**, University of Cincinnati Clermont College (1145-H1-2496)

► 4:00PM (1116) *A psychometric approach to transitioning assessments from the open response to multiple choice in differential and integral calculus.* Preliminary report. **Amit A Savkar***, Associate Prof in Resi, Director Assessment and Teaching, and **Briana Hennessy**, Graduate Student NEAG School of Education (1145-H1-2766)

MAA Contributed Paper Session on Innovative and Effective Ways to Teach Linear Algebra, II

1:00 PM – 4:15 PM **Room 304, BCC**

Organizers: **Sepideh Stewart**, University of Oklahoma

Gil Strang, Massachusetts Institute of Technology

David Strong, Pepperdine University

Megan Wawro, Virginia Tech

► 1:00PM (1117) *Learning determinants from Cramer and Cauchy: a TRIUMPHS Primary Source Project.* **Daniel E. Otero***, Xavier University (Cincinnati, OH), and **Colin McKinney**, Wabash College (1145-F5-1057)

1:20PM (1118) *Helping Students Master Linear Algebra Through Writing.* **James Hamblin**, Shippensburg University (1145-F5-1020)

► 1:40PM (1119) *Sum and Intersection of Subspaces in Introductory Linear Algebra.* **Connor Thomas Ahlbach**, University of Washington, Seattle (1145-F5-923)

► 2:00PM (1120) *Flipping Linear Algebra: Teaching a Majors-Level Linear Algebra Course in a Flipped Learning Environment.* **Jeff A Suzuki**, Brooklyn College (1145-F5-317)

► 2:20PM (1121) *Two True/False Questions on Linear Independence and an Application to a Set Theory Problem.* Preliminary report. **Fang Chen**, Emory University/Oxford College (1145-F5-201)

► 2:40PM (1122) *Pedagogical Strategies to Enhance Learning in a Linear Algebra Course.* **Katiuscia C. B. Teixeira**, University of Central Florida (1145-F5-2089)

► 3:00PM (1123) *Discovering Ill-Conditioned Systems Via Plane Deformations.* **J Donato Fortin**, Johnson & Wales University - Charlotte (1145-F5-2535)

► 3:20PM (1124) *Teaching linear algebra through dialogues.* **Winfried Just**, Ohio University (1145-F5-2645)

► 3:40PM (1125) *Advanced uses of the TI-Nspire in a Linear Algebra Course.* **Ton Boerkoel**, DigiPen Institute of Technology (1145-F5-2422)

4:00PM ► (1126) *Highlights from a workshop on teaching and learning Linear Algebra: Outcomes and future endeavors.* Preliminary report. **Sepideh Stewart**, University of Oklahoma (1145-F5-2694)

MAA Contributed Paper Session on Integrated STEM Instruction in Undergraduate Mathematics

1:00 PM – 3:55 PM **Room 322, BCC**

Organizers: **Jeneva Clark**, University of Tennessee, Knoxville
Anant Godbole, East Tennessee State University

1:00PM ► (1127) *A Renovated Calculus Class: Active and Applied.* **Jody Sorensen**, Augsburg University (1145-H5-2512)

1:20PM ► (1128) *Exploring Integration through a BioCalculus Task: Implications for STEM Education.* **Candice M. Quinn**, **Joshua Reid***, **Jeremy Strayer** and **Grant Gardner**, Middle Tennessee State University (1145-H5-2917)

1:40PM ► (1129) *Integrating geoscience contexts into first year mathematics courses – creating new pathways to success.* **Theresa A. Jorgensen***, University of Texas at Arlington, **W. Ashley Griffith**, **Elizabeth M. Griffith**, The Ohio State University, **Rebekah Aududdell**, University of Texas at Arlington, **Christopher Conwell** and **Ji-Eun Kim**, The Ohio State University (1145-H5-2783)

2:00PM ► (1130) *Learning How Our World Works: STEM Activities in a Mathematical Reasoning Course.* Preliminary report. **Jeneva Clark**, University of Tennessee, Knoxville (1145-H5-2874)

2:20PM (1131) *Incorporating Science Modules into a Basic Skills Math Course.* **John H Wilson*** and **Sarah Murray**, Centre College (1145-H5-2589)

2:40PM (1132) *Motivation Intervention Through Calculus Tasks with Science and Engineering Applications.* **Enes Akbuga**, University of Michigan (1145-H5-2537)

3:00PM ► (1133) *Making the "M" in STEM salient through a robotics activity.* **Patricia Vela**, Agnes Scott College (1145-H5-2386)

3:20PM ► (1134) *Capacity Building in STEM Careers with Emphasis on Mathematical Modeling.* Preliminary report. **Ryan Nivens***, **Ariel Cintron-Arias** and **Calvin B Purvis**, East Tennessee State University (1145-H5-1411)

3:40PM ► (1135) *Mathematics for Sustainability.* **Jacob Duncan**, Winona State University (1145-H5-1288)

MAA Contributed Paper Session on Mathematics and Sports, II

1:00 PM – 4:15 PM **Room 303, BCC**

Organizers: **John David**, Virginia Military Institute
Drew Pasteur, College of Wooster

1:20PM ► (1136) *New Applications of the Linear Regression Formulas to the MLB, NBA, and NFL.* **Stanley Rothman**, Quinnipiac University (1145-B5-126)

1:40PM ► (1137) *When Good Golfers Go Bad.* Preliminary report. **Roland Minton**, Roanoke College (1145-B5-2428)

2:00PM ► (1138) *What would eliminating the kickoff in the NFL mean?* Preliminary report. **Megan Olivia Powell**, University of North Carolina Asheville (1145-B5-2003)

2:20PM ► (1139) *Basketball Shooting Efficiency and the Shot Clock.* Preliminary report. **Jeffrey W Heath*** and **Chase Cavanaugh**, Centre College (1145-B5-2928)

2:40PM ► (1140) *A Geometric Method for Corresponding Images of Athletes from a Camera Array.* Preliminary report. **James Brian Hall*** and **Dante Salas**, Intel Corporation (1145-B5-2855)

3:00PM ► (1141) *Getting to the top: less pain, more gain.* **Kristopher A. Pruitt*** and **Michael A. Brilleslyper**, United States Air Force Academy (1145-B5-1156)

3:20PM ► (1142) *An iterative Markov ranking method.* **Stephen Devlin**, **Molly Creagar***, University of San Francisco, **Thomas Treloar** and **Sam Cassels**, Hillsdale College (1145-B5-2687)

3:40PM ► (1143) *A probability model for predicting the outcome of International soccer games in overtime and beyond.* Preliminary report. **Reza O Abbasian***, **John T Sieben** and **Apryl Canales**, Texas Lutheran University (1145-B5-1076)

4:00PM ► (1144) *NCAA Basketball Conference Champions: Does it Help with the Madness?* **Michael A Furuto*** and **Ryan Orphan**, University of Hawai'i - West O'ahu (1145-B5-754)

MAA Contributed Paper Session on Open Educational Resources: Combining Technological Tools and Innovative Practices to Improve Student Learning, III

1:00 PM – 4:15 PM **Room 305, BCC**

Organizers: **Benjamin Atchison**, Framingham State University
Marianna Bonanome, New York City College of Technology

Margaret Dean, Borough of Manhattan Community College

Annie Han, Borough of Manhattan Community College

Michael Gage, University of Rochester

1:00PM (1145) *Creating and using Open Educational Resources and STEM Applications for Algebra and Trigonometry Courses.* **Marianna Bonanome**, The New York City College of Technology, CUNY (1145-L1-1751)

► 1:20PM (1146) *Creative use of online tools to enhance teaching of Mathematics.* **Victor Sirelson**, New York City College of Technology (1145-L1-1521)

► 1:40PM (1147) *Engaging College Algebra and Trigonometry students with OERs.* Preliminary report. **Ariane Masuda***, New York City College of Technology, CUNY, and **Lucie Mingla**, Borough of Manhattan Community College and New York City College of Technology, CUNY (1145-L1-1094)

2:00PM (1148) *The evolution of an introductory Statistics course with Algebra for non-Stem majors.* **Jean Richard***, **Ke Xin**, **Bernard Beecher**, **Luio Prado**, **Shahin Uddin** and **Daniela Bardac-Vlada**, Borough of Manhattan Community College - CUNY (1145-L1-2982)

2:20PM (1149) *Open Educational Resources for a Co-requisite Course: Introductory Statistics with Algebra.* **Ke Xin***, **Jean Richard**, **Bernard Beecher**, **Lucio Prado**, **Daniela Bardac-Vlada** and **Shahin Uddin**, Borough of Manhattan Community College - CUNY (1145-L1-2967)

2:40PM (1150) *Developing a OER/ZTC for Quantitative Reasoning.* **Johannes C. Familton*** and **Ke Xin**, Borough of Manhattan Community College (1145-L1-968)

3:00PM (1151) *Quick Adaptation and Effective Use of OER Homework Platform in Algebra, Precalculus and Quantitative Reasoning Courses.* **Yevgeniy Milman**, Borough of Manhattan Community College - CUNY (1145-L1-2775)

3:20PM (1152) *Incorporating Open Educational Resources and Active Learning Strategies in the mathematics Gateways courses at an urban community college.* **Jorge Florez*** and **Jae K. Lee**, Borough of Manhattan Community College of The City University of New York (1145-L1-707)

► 3:40PM (1153) *The Influence of Technology on Mathematics Anxiety in Developmental Mathematics Courses.* Preliminary report. **Sun Young Ban**, Teachers College Columbia University (1145-L1-1494)

► 4:00PM (1154) *An investigation into college algebra students' learning logarithm concepts using smartphone apps.* **Razieh Shahriari** and **Nama Namakshi***, University of Arkansas (1145-L1-542)

MAA Contributed Paper Session on Research in Undergraduate Mathematics Education (RUME), II

1:00 PM – 3:55 PM **Room 340, BCC**

Organizers: **Stacy Brown**, California State Polytechnic University

Megan Wawro, Virginia Tech

Aaron Weinberg, Ithaca College

► 1:00PM (1155) *Making Graduate Student Instructor Observation Protocols Actionable via Post-Observation Feedback.* **Sean P Yee**, University of South Carolina, **Kimberly Cervello Rogers***, Bowling Green State University, **Jessica Deshler**, West Virginia University, **Robert Petrulis**, EPRE Consulting, **Christopher D. Potvin**, Bowling Greene State University, and **James Sweeney**, University of South Carolina (1145-J5-376)

1:20PM (1156) *Calculus TAs' teaching practice and reflections.* **Jungeun Park**, University of Delaware (1145-J5-1031)

1:40PM (1157) *Is Statistics Just Math? The Developing Epistemological Views of Graduate Teaching Assistants.* **Kelly P Findley**, Florida State University (1145-J5-501)

► 2:00PM (1158) *Mathematics Graduate Teaching Assistants and Their Growth as Teachers.* **Claire Gibbons**, Oregon State University (1145-J5-1066)

2:20PM (1159) *A Working Framework for Observing and Interpreting Preservice Secondary Teachers' Development of MKT in Undergraduate Mathematics Courses.* **Jeremy F. Strayer***, Middle Tennessee State University, **Yvonne X. Lai**, University of Nebraska - Lincoln, **Alyson E. Lischka**, **Candice M. Quinn**, Middle Tennessee State University, and **Cynthia O. Anhalt**, The University of Arizona (1145-J5-1972)

2:40PM (1160) *What do we know about courses in Geometry for Secondary Teachers?* **Amanda M Milewski***, **Patricio Herbst**, **Claudine Margolis** and **Enes Abugka**, University of Michigan (1145-J5-2556)

3:00PM (1161) *Pre-service teachers' conceptions of area of a rectangle.*
Betsy McNeal, Ohio State University, **Sayonita Ghosh Hajra*** and **Yajenny Patricia Pacheco Enamorado**, California State University Sacramento (1145-J5-588)

3:20PM (1162) *Ways in which students transfer and apply definitions from Euclidean to Taxicab geometry: 2nd Cycle of Data Collection and Analysis.* Preliminary report.
Aubrey Kemp*, California State University, Bakersfield, and **Draga Vidakovic**, Georgia State University (1145-J5-384)

3:40PM (1163) *Dynamic Geometry Tasks for Inquiry-Oriented Axiomatic Geometry.*
Younggon Bae, Michigan State University (1145-J5-343)

MAA Contributed Paper Session on Revitalizing Complex Analysis

1:00 PM – 2:35 PM **Room 302, BCC**

Organizers: **Michael Brilleslyper**, United States Air Force Academy
Russell Howell, Westmont College
Beth Schaubroeck, United States Air Force Academy

1:00PM (1164) *A Transition / Proofs Course Based on the Complex Numbers.*
Robert L. Sachs, George Mason University, Fairfax VA (1145-I5-1616)

1:20PM (1165) *Getting real about truly complex theorems.*
Paul Zorn, St. Olaf College (1145-I5-2600)

1:40PM (1166) *Properties of complex-valued harmonic polynomials.* Preliminary report.
Michael Dorff, Brigham Young University, and **Beth Schaubroeck***, U. S. Air Force Academy (1145-I5-1281)

2:00PM (1167) *When the Fundamental Theorem of Algebra goes Awry.*
Kyle D Hansen*, Westmont College, **Mike Brilleslyper**, United States Air Force Academy, and **Russell W Howell**, Westmont College (1145-I5-1235)

2:20PM (1168) *Riemann Surfaces and Other Projects on Mathematica.*
William Johnston, Butler University (1145-I5-1585)

MAA Contributed Paper Session on The EDGE (Enhancing Diversity in Graduate Education) program: Pure and Applied talks by Women Math Warriors, II

1:00 PM – 3:35 PM **Room 323, BCC**

Organizers: **Laurel Ohm**, University of Minnesota,
Shanise Walker, Iowa State University,

1:00PM (1169) *A Floer homology invariant for 3-orbifolds via bordered Floer theory.*
Biji Wong, CIRGET (1145-I1-229)

1:20PM (1170) *Welded Knots and the Infinitesimal Alexander Module.* Preliminary report.
Sherilyn Tamagawa, University of California, Santa Barbara (1145-I1-667)

1:40PM (1171) *The tree cover number and positive semidefinite maximum nullity of a graph.*
Chassidy Bozeman, St. Olaf College (1145-I1-2470)

2:00PM (1172) *Saving the World with Modeling Integration.* Preliminary report.
Marisa J Hughes* and **Elizabeth P Reilly**, Johns Hopkins University Applied Physics Lab (1145-I1-2841)

2:20PM (1173) *Classifying the H-orbits of the Symmetric Space of* $\mathrm{SL}_2(\mathbb{F}_q)$ *for* $\mathrm{char}(\mathbb{F}_q) \neq 2$. Preliminary report.
Catherine Buell, Fitchburg State University, **Vicky Klima**, Appalachian State University, **Jennifer Schaefer**, Dickinson College, **Carmen Wright***, Jackson State University, and **Ellen Ziliak**, Benedictine University (1145-I1-2637)

2:40PM (1174) *Free Quasigroup Conjugates and s-peri-Catalan Numbers.*
Stefanie G. Wang*, Trinity College, and **Jonathan D.H. Smith**, Iowa State University (1145-I1-2531)

3:00PM (1175) *A Roundtable with the EDGE Book Editors – Part 1: How to Write a Successful Mathematics Book Proposal.*
Susan D'Agostino*, Johns Hopkins University, **Sarah Bryant**, Dickinson College, **Amy Buchmann**, University of San Diego, **Michelle Guinn**, Belmont University, and **Leona Harris**, University of the District of Columbia (1145-I1-774)

3:20PM (1176) *A Roundtable with the EDGE Book Editors, Part 2: How to Proceed After Your Successful Book Proposal Earns a Book Contract.*
Susan D'Agostino*, Johns Hopkins University, **Sarah Bryant**, Dickinson College, **Amy Buchmann**, University of San Diego, **Michelle Guinn**, Belmont University, and **Leona Harris**, University of the District of Columbia (1145-I1-775)

MAA Contributed Paper Session on Touch it, Feel it, Learn it: Tactile Learning Activities in the Undergraduate Mathematics Classroom, III

1:00 PM – 4:15 PM **Room 339, BCC**

Organizers: **Chris Oehrlein**, Oklahoma City Community College
Ann Trenk, Wellesley College
Laura Watkins, Glendale Community College

1:00PM (1177) *Hands on Calculus: Manipulatives Integral to Integration.*
Sylvia Gutowska* and **Clarence Baney**, Community College of Baltimore County (1145-J1-2113)

► 1:20PM (1178) *Using Toy Cars to Teach Calculus Concepts.*
Nicole R. Kroeger, SC Governor's School for Science and Mathematics (1145-J1-363)

► 1:40PM (1179) *A search and rescue activity to explore multivariable concepts.*
Silvia Saccon, Bard College (1145-J1-2234)

2:00PM (1180) *Tactile Learning Activities: Keeping It Simple in Calculus.*
Lisa Driskell, Colorado Mesa University (1145-J1-2649)

► 2:20PM (1181) *Embodied Venn Diagrams: Bringing Sets to Life.* Preliminary report.
Sarah A. Nelson, Lenoir-Rhyne University (1145-J1-2733)

► 2:40PM (1182) *Using Cuisenaire Rods to Develop Student Understanding of Statistical Distributions.*
Jay A Malmstrom, Oklahoma City Community College (1145-J1-903)

3:00PM (1183) *Flowcharts, Playing Cards, and Pulse Rates: Hypothesis Testing in an Introductory Statistics Course.*
Marina Skyers, Penn State Brandywine (1145-J1-551)

► 3:20PM (1184) *A G.U.E.S.T. Course in Statistics.*
Lindsey Fox, University of Tennessee (1145-J1-2747)

► 3:40PM (1185) *Group theory via a rectangle tethered up to homotopy by strings or strip: from middle school to general education to abstract algebra.*
David Pengelley, Oregon State University (1145-J1-583)

► 4:00PM (1186) *A block-headed approach to binomial expansions.*
Stephen M. Walk, St. Cloud State University (1145-J1-2890)

MAA General Contributed Paper Session on Modeling and Applications, II

1:00 PM – 3:55 PM **Room 348, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

► 1:00PM (1187) *Wavelets and machine learning based music information retrieval.*
Mitchell Collin Will*, **Leland Roberts**, **Ralph Venezia** and **Xiaodi Wang**, Western Connecticut State University (1145-VF-1823)

► 1:15PM (1188) *N-Patch Model of Arabian Oryx Population Dynamics.*
Eva Strawbridge, James Madison University (1145-VF-1871)

► 1:30PM (1189) *Multimodal Data Fusion in 3D Printing Quality Prediction.*
Xiaotong Gui*, Pomona College, Department of Mathematics, **Xinru Liu**, Wheaton College, Department of Mathematics and Computer Science, **Qi Tian** and **Weihong Guo**, Rutgers University, Department of Industrial Engineering (1145-VF-1897)

► 1:45PM (1190) *The Role of Tortuosity in Filtration Efficiency.*
Ian Griffiths, Oxford University, Mathematical Institute, **Peter Stewart**, University of Glasgow, School of Mathematics and Statistics, **Ivan Mitevski***, Columbia University, **Ines Vujkovac** and **Matthew Illingworth**, New Jersey Institute of Technology (1145-VF-2351)

► 2:00PM (1191) *Don't get tangled or weigh me down: testing the limits of jellyfish locomotion.* Preliminary report.
Nicholas A Battista*, **Jason Miles** and **Christopher Jakuback**, The College of New Jersey (1145-VF-2362)

► 2:15PM (1192) *From Conceptual to Computational: the Cost and Benefit of Lizard Thermoregulation Revisited.*
John G. Alford*, Sam Houston State University, and **William I. Lutterschmidt**, Texas Research Institute for Environmental Studies (1145-VF-2396)

► 2:30PM (1193) *Maximizing asymptotic growth subject to random season durations.* Preliminary report.
D Brian Walton, James Madison University (1145-VF-2458)

2:45PM (1194) *Advertisement detection using Wavelet-based Machine Learning Algorithm.*
Stephanie Maria Skelly*, **Mackensie A King** and **Xiaodi Wang**, Western Connecticut State University (1145-VF-2666)

► 3:00PM (1195) *Stabilizing effects of patch-use and migration in semi-discrete host-parasitoid models.*
Brooks K Emerick, Kutztown University (1145-VF-2524)

3:15PM (1196) *An Economic Order Quantity Model for Bundled Items with Imperfect Quality Components and Probabilistic Lead Times.*
Noura Yassine, Beirut Arab University (1145-VF-2542)

► 3:30PM (1197) *Effects of surface free energy on morphological stability in epitaxial crystal growth.* Preliminary report.
Khoa D Dinh, University of Tennessee (1145-VF-2643)

3:45PM ► (1198) *Using Graph Theory to Model Connectivity in the Human Brain.* Preliminary report.
Elaine Terry, Saint Joseph's University (1145-VF-1191)

MAA General Contributed Paper Session on Teaching and Learning Advanced Mathematics, II

1:00 PM – 3:40 PM **Room 341, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

1:00PM ► (1199) *Spotting "Fake" Theorems: Promoting Student Understanding of Disproof Using Dynamic Geometry Environments (DGEs).*
Tuyin An, Georgia Southern University (1145-VK-2924)

1:15PM ► (1200) *Finding the Right Angle: Experiences in Teaching Geometry, Takes 2 and 3.*
Shannon R Lockard, Bridgewater State University (1145-VK-3006)

1:30PM ► (1201) *Student Perceptions on an Expository Approach to Mathematics.* Preliminary report.
Kevin Bombardier, University of Iowa (1145-VK-354)

1:45PM (1202) *Teaching "Proof": Helping Students Learn from Their Mistakes.*
Jenna P Carpenter, Campbell University (1145-VK-694)

2:00PM ► (1203) *Mathematics Experiments — Learning and Investigating Mathematics with the Help of Computers.*
Shangzhi Li, Beihang University, Beijing, China (1145-VK-724)

2:15PM ► (1204) *Conditional Probability: Overcoming the Base Rate Fallacy.*
Nathan J. Jewkes, North Carolina State University (1145-VK-1361)

2:30PM ► (1205) *On Fun and Games: Designed for Learning.*
Michael Renne, Oregon State University (1145-VK-2232)

2:45PM ► (1206) *Student Response to an Interdisciplinary Minor in Mathematics and the Effect of Inquiry Based Learning on Student Success.* Preliminary report.
Joseph E Hibdon, Northeastern Illinois University (1145-VK-2827)

3:00PM ► (1207) *Mathematics Education for Pre-service Elementary Teachers in Shanghai since 1985.*
Hong Yuan, The City University of New York, Borough of Manhattan Community College (1145-VK-2885)

3:15PM ► (1208) *Using Directed Acyclic Graphs to Improve Classroom Instruction.*
Aaron Carl Smith, Seminole County Public Schools (1145-VK-140)

3:30PM ► (1209) *The Making of a Senior Design Course in Applied Mathematics.* Preliminary report.
Youssef Qranfal* and **Steve Morrow**, Wentworth Institute of Technology (1145-VK-2371)

SIAM Minisymposium on Human Factors in Mathematics Education

1:00 PM – 3:50 PM **Room 342, BCC**

Organizers: **Ron Buckmire**, Occidental College
Rachel Levy, Mathematical Association of America
Suzanne L Weekes, Worcester Polytechnic Institute

1:00PM ► (1210) *Who Does The Math?: On the Diversity and Demographics of the Mathematics Community.*
Ron Buckmire, Occidental College (1145-97-1810)

1:30PM ► (1211) *From free-range advising to life coaching? The dynamics of mentoring.* Preliminary report.
Reinhard Laubenbacher, Jackson Laboratory for Genomic Medicine and UConn Health (1145-97-999)

2:00PM (1212) *Teaching students with ADHD, learning disabilities and autism: Commonly recommended accommodations and why they are recommended.*
Marcia F Wiedefeld, Loyola University Maryland (1145-00-2035)

2:30PM ► (1213) *Linguistic diversity in mathematics education.*
Emily Meehan, Gallaudet University (1145-97-2176)

3:00PM ► (1214) *Recognizing and Responding to STEM Students in Distress.*
Lesley M McGee, Worcester Polytechnic Institute (1145-00-1335)

3:30PM ► (1215) *Discussion.*
Suzanne L Weekes*, Worcester Polytechnic Institute, **Ron Buckmire**, Occidental College, and **Rachel Levy**, Mathematical Association of America (1145-00-3001)

AMS Committee on Education Guided Discussion

1:00 PM – 2:30 PM **Room 315, BCC**

Evidence-based teaching: how do we all get there?

Organizers: **David Pengelley**, Oregon State University
Dev Sinha, University of Oregon
Ravi Vakil, Stanford University

MAA Panel

1:00 PM – 2:20 PM **Room 350, BCC**

Advising and Mentorship: Fostering Successful Students

Organizers: **Ashley Johnson**, University of North Alabama
Alicia Prieto Langarcia, Youngstown State University

Panelists: **Jacqueline Jensen-Vallin**, Lamar University
Hristo Kojouharov, University of Texas at Arlington
Marianne Korten, Kansas State University
Calandra Tate Moore, Department of Defense
Michael Young, Iowa State University

MAA Panel

1:00 PM – 2:20 PM **Room 349, BCC**

Coping Professionally with Unprofessional Behavior

Organizers: **Jennifer Beineke**, Western New England University
Zsuzsanna Szaniszlo, Valparaiso University

Panelists: **Amy Cohen-Corwin**, Rutgers, The State University of New Jersey
Lloyd Douglas, Independent Consultant
Rick Gillman, Valparaiso University
Paula Russo, Trinity College

Project NExT Workshop on Standards-based Grading

1:00 PM – 2:15 PM **Room 308, BCC**

Tools and Tips for Successful Implementation

Organizers: **Alexander Barrios**, Carleton College
William Cipolli, Colgate University
Brittney Falahola, Stephen F. Austin State University
Daniel Rodman, Taylor University

The Dolciani Award Lectures

1:00 PM – 1:30 PM **Room 301, BCC**

Organizers: **Herbert A. Medina**, Loyola Marymount University
Tina Straley

Summer Program for Women in Mathematics (SPWM) Reunion

1:00 PM – 3:00 PM **Peale C, 1st Floor, Hilton**

AMS Contributed Paper Session on Number Theory, II

1:30 PM – 3:55 PM **Room 311, BCC**

1:30PM (1216) *A Formula for the Number of Monic Degree m Polynomials in $\mathbb{F}_q[x]$ with Discriminant d.*
Michael J Seaman, California Institute of Technology (Senior Undergraduate) (1145-11-1532)

1:45PM (1217) *Local h polynomials and the monodromy conjecture.*
Matt Larson*, Yale University, **Sam Payne**, University of Texas Austin, and **Alan Stapledon**, University of Sydney (1145-11-1483)

2:00PM (1218) *Heuristics for cyclic fields: totally positive units and narrow class groups.*
Benjamin Breen*, **John Voight**, Dartmouth College, and **Ila Varma**, UC San Diego (1145-11-2697)

2:15PM (1219) *A New Condition Equivalent to the Ankeny-Artin-Chowla Conjecture.*
Joshua Harrington, Cedar Crest College, and **Lenny Jones***, Shippensburg University (1145-11-1566)

2:30PM (1220) *Formulas for Chebotarev densities of Galois extensions of number fields.*
Katharine Woo*, Stanford University, and **Naomi Sweeting**, University of Chicago (1145-11-1033)

2:45PM (1221) *Cyclic Eisenstein polynomials of p-power degree.*
Chad Awtrey, Elon University (1145-11-63)

3:00PM (1222) *Harmonic analysis on the p-adic unit ball.*
Naveen Somasunderam, Oregon State University, Corvallis (1145-11-988)

3:15PM (1223) *Class and Type Numbers of Orders in Central Simple Algebras.*
Angelica Babei, Dartmouth College (1145-11-2449)

3:30PM (1224) *Metacommutation of Primes in Central Simple Algebras.*
Sara Chari, Dartmouth College (1145-11-2696)

3:45PM (1225) *Difference Divisible Sets in Hurwitz Quaternions.* Preliminary report.
Peter Floodstrand Blanchard, University of Iowa (1145-11-2847)

AMS Special Session on Quantum Symmetries: Subfactors and Fusion Categories (a Mathematics Research Communities Session), II

2:00 PM – 4:50 PM **Room 331, BCC**

Organizers: **Cain Edie-Michell**, Vanderbilt University

Lauren Ruth, Vanderbilt University

Yilong Wang, Louisiana State University

2:00PM (1226) *Topological phases of matter and subfactors.*
Yasuyuki Kawahigashi, The University of Tokyo (1145-46-755)

3:00PM (1227) *Modular quantum groups at even roots of 1.* Preliminary report.
Cris Negron, Massachusetts Institute of Technology (1145-16-455)

3:30PM (1228) *Symmetry breaking from anyon condensation.* Preliminary report.
Marcel Bischoff*, Ohio University, **Corey Jones**, **Yuan-Ming Lu** and **David Penneys**, The Ohio State University (1145-18-1647)

4:00PM (1229) *Classification of super-modular categories by rank.*
Qing Zhang, Texas A&M University (1145-18-2038)

4:30PM (1230) *Permutation gauging of modular categories.*
Corey Jones, The Ohio State University (1145-18-1791)

AMS Special Session on Symbolic Dynamics, III

2:00 PM – 3:50 PM **Room 321, BCC**

Organizers: **Van Cyr**, Bucknell University

Bryna Kra, Northwestern University

2:00PM (1231) *Slow Entropy of Some Parabolic Flows.*
Adam Kanigowski, Penn State University, **Kurt Vinhage**, University of Chicago, and **Daren Wei***, Penn State University (1145-37-29)

2:30PM (1232) *Finitary isomorphisms of Poisson point processes.*
Terry Soo and **Amanda Wilkens***, University of Kansas (1145-37-1612)

3:00PM (1233) *Pressure and escape rates for random subshifts of finite type.* Preliminary report.
Kevin McGoff, UNC Charlotte (1145-37-1010)

3:30PM (1234) *Statistics of escaping trajectories in homogeneous spaces.*
Federico Rodriguez Hertz and **Zhiren Wang***, Penn State University (1145-37-2128)

MAA General Contributed Paper Session on Teaching and Learning Developmental Mathematics

2:00 PM – 3:40 PM **Room 301, BCC**

Organizers: **Emelie Kenney**, Siena College

Kim Roth, Juniata College

Melvin Royer, Indiana Wesleyan University

► 2:00PM (1235) *Overcoming Math Anxiety: A Twelve Step Approach.* Preliminary report.
Gary C Hall, Lipscomb University (1145-VH-1007)

► 2:15PM (1236) *Graspable Math in the Algebra Classroom.* Preliminary report.
Anne Turner, Naperville North High School (1145-VH-1309)

► 2:30PM (1237) *Developmental Mathematics Reform: Analyzing Experiences in Corequisite College Algebra at an Urban Community College.* Preliminary report.
Jennifer Zakotnik-Gutierrez, University of Northern Colorado (1145-VH-1444)

► 2:45PM (1238) *Intermediate Algebra: A Retelling of an Old Story.* Preliminary report.
Brendan Kelly*, Harvard, **Emina Alibegovic**, Rolland Hall, **Rebecca Noonan-Heale**, **Anna Schoening** and **Amanda Cangelosi**, University of Utah (1145-VH-2857)

► 3:00PM (1239) *Creating an Engaging Environment and Revolutionizing Teaching and Learning in Introductory Statistics.* Preliminary report.
Dushanthi N Herath* and **Guangwei Fan**, Maryville University, St. Louis, MO (1145-VH-2401)

► 3:15PM (1240) *Representational Adaptivity in Multiplying Polynomials.*
Cameron Sweet, Saint Martin's University (1145-VH-2558)

► 3:30PM (1241) *Meeting Students Where They Are: Successful Co-requisite Course Design.* Preliminary report.
Francisco J. Savina* and **Rebecca Hartzler**, University of Texas at Austin (1145-VH-2560)

MAA Poster Session: Projects Supported by the NSF Division of Undergraduate Education

2:00 PM – 4:00 PM **Exhibit Hall G, 100 Level, BCC**

Organizer: **Jon Scott**, Montgomery College

► 2:00PM (1242) *URI Robert Noyce Teacher Scholarship Program.*
Anne M. Seitsinger, **Cornelis de Groot***, **David Byrd**, **Bryan Dewsbury**, **Jay Fogleman** and **Kathleen Peno**, University of Rhode Island

2:00PM (1243) *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 (1244) *Using Bricklayer Coding and Visual Art to Engage Students in Learning Mathematics.*
Betty Love*, **Michael Matthews**, **Victor Winter** and **Michelle Friend**, University of Nebraska – Omaha

2:00PM (1245) *Project SMILES: Student-Made Interactive Learning with Educational Songs for Introductory Statistics.*
John J. Weber III*, Perimeter College at Georgia State University, **Lawrence M. Lesser**, University of Texas at El Paso, and **Dennis K. Pearl**, Pennsylvania State University

2:00PM (1246) *Promoting Reasoning in Undergraduate Mathematics (PRIUM).*
William Martin*, **Josef Dorfmeister**, **Benton Duncan**, **Friedrich Littman**, North Dakota State University, **Draga Vidakovic**, **Guantao Chen** and **Valerie Miller**, Georgia State University

2:00PM (1247) *SSTEM: Using Computational Science to Enhance Learning and Commitment to STEM.*
Maria Zack*, **Katherine Maloney**, **Lori Carter**, **Paul Schmelzenbach** and **Dawne Page**, Point Loma Nazarene University

2:00PM (1248) *Framing Lee Academics for Mathematics, Education and Social Sciences Success (a SUMMIT-P collaboration).*
Caroline Maher-Boulis*, **Jason Robinson**, **Bryan Poole** and **John Hearn**, Lee University

2:00PM (1249) *Undergraduate Curriculum Guide for the Mathematical Sciences.*
Martha Siegel*, Towson University, **Carol Schumacher**, Kenyon College, **Doug Ensley** and **J. Michael Pearson**, Mathematical Association of America

2:00PM (1250) *Improving the Preparation of Graduate Students to Teach Undergraduate Mathematics.*
Jack Bookman*, Duke University, **Shandy Hauk**, Wested, and **Natasha Speer**, University of Maine

2:00PM (1251) *Ambitious Math and Science Teaching Fellows.*
Thomas Dick*, **Rebekah Elliott** and **Nick Cabot**, Oregon State University

2:00PM (1252) *Progress through Calculus.*
David Bressoud*, Macalester College, **Jess Ellis**, Colorado State University, **Sean Larsen**, Portland State University, **Chris Rasmussen**, San Diego State University, and **Rachel Levy**, Mathematical Association of America

2:00PM (1253) *Heartland: The Carver Bridge to STEM Success Program.*
Heidi Berger*, **Mark Brodi**, **Derek Lyons** and **Clint Meyer**, Simpson College

2:00PM (1254) *NSF Scholarship Program in Science and Mathematics at Kennesaw State University.*
Ana-Maria Croicu, Kennesaw State University

2:00PM (1255) *Discovering the Art of Mathematics: Inquiry Based Learning in Mathematics for Liberal Arts.*
Philip Hotchkiss*, **Christine Von Renesse**, **Julian Fleron** and **Volker Ecke**, Westfield State University

2:00PM (1256) *Project DIRACC: Developing and Investigating a Rigorous Approach to Conceptual Calculus.*
Fabio Milner*, **Pat Thompson** and **Mark Ashbrook**, Arizona State University

2:00PM (1257) *Transforming Instruction in Undergraduate Mathematics via Primary Historical Sources (TRIUMPHS).*
Jerry Lodder*, New Mexico State University, **Kathleen Clark**, Florida State University, **Janet Barnett**, Colorado State University-Pueblo, **Dominic Klyve**, Central Washington University, **Nicholas Scoville**, Ursinus College, **Daniel Otero**, Xavier University, and **Diana White**, University of Colorado at Denver-Downtown

2:00PM (1258) *CAREER: Developing Undergraduate Combinatorial Curriculum In Computational Settings.*
Elise Lockwood, Oregon State University

2:00PM (1259) *Open Resources for the Mathematics Curriculum.*
Jim Fowler*, Ohio State University, **Petra Bonfert-Taylor**, Dartmouth, **David Farmer**, American Institute of Mathematics, and **Sarah Eichhorn**, University of Texas at Austin

2:00PM (1260) *A Data-Driven, Multidisciplinary Curriculum Providing Access to the Data Analytics Economy through Project-based Learning.*
Lisa Dierker* and **Jennifer Rose**, Wesleyan University

2:00PM (1261) *Mathematics Graduate Student Peer-Mentorship Program: Impact and Adaptability.*
Kimberly Cervello Rogers*, Bowling Green State University, **Sean P. Yee**, University of South Carolina, and **Jessica Deshler**, West Virginia University

2:00PM (1262) *Transforming Undergraduate Statistics Education at Primarily Undergraduate Institutions through Experiential Learning.*
Tracy Morris*, **Cynthia Murray** and **Tyler Cook**, University of Central Oklahoma

2:00PM (1263) *Talented Teachers in Training for Texas Phase II.*
Lesa Beverly*, **Keith Hubbard**, **Dennis Gravatt** and **Chrissy Cross**, Stephen F. Austin State University

2:00PM (1264) *Science and Mathematics Attraction, Retention, and Training for Texas (SMART Texas).*
Keith Hubbard* and **Nola Schmidt**, Stephen F. Austin State University

2:00PM (1265) *Scholarly Leaders Originating as Practicing Educators in Two-Year College Mathematics (Project SLOPE).* **Megan Breit-Goodwin***, Anoka-Ramsey Community College, **Ann Sitomer**, Portland State University, **Kathleen Quardokus Fisher**, Florida International University, and **Jacqueline Dewar**, Loyola Marymount University

2:00PM (1266) *Exploring Mathematics Graduate Teaching Assistants' Developmental Stages for Teaching.* **Mary Beisiegel**, Oregon State University

2:00PM (1267) *Collaborative Research: Maplets for Calculus.* **Philip B. Yasskin***, **Joseph Martinsen**, **Matthew Weihing**, **Akash Rao**, Texas A&M University, **Douglas B. Meade**, University of South Carolina, and **Matthew Barry**, Texas A&M Engineering Extension Service

2:00PM (1268) *Merging the Qualitative and the Quantitative (a SUMMIT-P Collaboration).* **Victor Piercey***, **Rhonda Bishop** and **Mischelle Stone**, Ferris State University

2:00PM (1269) *Student Success Through the Mathematics S-STEM Program at the University of Texas at Arlington.* **Jianzhong Su*** and **Tuncay Aktosun**, University of Texas at Arlington

2:00PM (1270) *Calculus and Virtual Reality (CalcVR).* **Nicholas Long*** and **Jeremy Becnel**, Stephen F. Austin State University

2:00PM (1271) *Hood College Noyce STEM Teacher Education Partnership (NSTEP).* **Ann Stewart***, **Jennifer Cuddapah** and **Christopher Stromberg**, Hood College

2:00PM (1272) *Building Community Through Systemic Initiative for Modeling Investigations and Opportunities with Differential Equations (SIMIODE).* **Brian Winkel***, SIMIODE, **Richard C. Harwood**, George Fox University, **Audrey Malagon**, Virginia Wesleyan University, **Therese Shelton**, Southwestern University, and **Patrice Tiffany**, Manhattan College

2:00PM (1273) *Enhancing Explorations in Functions for Preservice Secondary Mathematics Teachers.* **James A.M. Álvarez***, **Theresa Jorgensen** and **Kathryn Rhoads**, The University of Texas at Arlington

2:00PM (1274) *GP-IMPACT: Integrating Geoscience to Engage Majors with Mathematics (iGEM).* **Theresa Jorgensen***, The University of Texas at Arlington, **W. Ashley Griffith**, , The Ohio State University, **Elizabeth Griffith**, The Ohio State University, and **Nakia Pope**, Alamo Colleges

2:00PM (1275) *Mentoring Students through Computational Science Research Projects: Report on the iPics S-STEM grant program.* Preliminary report. **Thomas R Hagedorn***, Department of Mathematics and Statistics, The College of New Jersey, and **Monisha Pulimood**, Department of Computer Science, The College of New Jersey

2:00PM (1276) *Sustainability of Mathematics Education: Robert Noyce Mathematics Scholarship Program at TAMIU.* **Rohitha Goonatilake**, **Juan J. Arellano Jr.***, **Puneet S. Gill** and **Runchang Lin**, Texas A&M International University

2:00PM (1277) *Attracting and Retaining Scholars in the Mathematical Sciences.* **Alexandra Kurepa***, **A. Giles Warrack**, **Guoqing Tang** and **Janis Oldham**, North Carolina Agricultural & Technical State University

2:00PM (1278) *Attaining Excellence in Secondary Mathematics Clinical Experiences with a Lens on Equity.* **Marilyn Strutchens***, Auburn University, and **Ruthmae Sears**, University of South Florida

2:00PM (1279) *Challenging, Operationalizing, and Understanding Racialized and Gendered Events (COURAGE) in Undergraduate Mathematics.* **Luis A. Leyva***, Vanderbilt University, **Daniel Battey**, **Keith Weber**, **Nora Hyland**, **Kristen Amman**, **Emily Wolf**, **Ruby Quea**, **Daniel Lopez** and **Cierra McClendon**, Rutgers University

2:00PM (1280) *ASSESSMENT: Transforming the Silent Killer of Learning to an Active Booster of Learning.* **Frank Wattenberg***, **Kristin Arney**, **John Bacon**, **Kayla Blyman**, **Lisa Bromberg**, **David Delcuadro-Zimmerman**, **David Harness**, **Scott Warnke** and **Sarah Wohlberg**, United States Military Academy

2:00PM (1281) *Guide to Evidenced-Based Instructional Practices in Undergraduate Mathematics.* **Doug Ensley***, Mathematical Association of America, **Martha Abell**, Georgia Southern University, **Linda Braddy**, Tarrant County College, **Lew Ludwig**, Denison University, and **Hortensia Soto**, University of Northern Colorado

2:00PM (1282) *The Mathematical Education of Teachers as an Application of Undergraduate Mathematics.* **Doug Ensley***, Mathematical Association of America, **James Alvarez**, University of Texas at Arlington, **Beth Burroughs**, Montana State University, **Nancy Neudauer**, Pacific University, and **James Tanton**, Mathematical Association of America

2:00PM (1283) *Professional Development Emphasizing Data-Centered Resources and Pedagogies for Instructors of Undergraduate Introductory Statistics.*
Jenna Carpenter*, Campbell University, **Mike Brilleslyper**, United States Air Force Academy, **Danny Kaplan**, Macalester College, **Kate Kozak**, Coconino Community College, and **Rachel Levy**, Mathematical Association of America

2:00PM (1284) *Using Networked Improvement Communities to Design and Implement Program Transformation Tools for Secondary Mathematics Teacher Preparation.*
W. Gary Martin*, Auburn University, and **Wendy Smith**, University of Nebraska-Lincoln

2:00PM (1285) *Improving Representational Competence by Engaging with Physical Modeling in Foundational STEM Courses.*
Lee Singleton*, **Eric Davishahl**, Whatcom Community College, **Todd Haskell** and **Cristina Sampaio**, Western Washington University

2:00PM (1286) *Penn State University Secondary Mathematics Noyce Scholars Program.*
Rose Mary Zbiek*, **M. Kathleen Heid**, **Gina Foletta**, **James Sellers**, **Matthew Black** and **John Elia**, The Pennsylvania State University

2:00PM (1287) *Supporting and Sustaining Scholarly Mathematical Teaching.*
David Miller*, **Larissa Schroeder**, **Mako Haruta**, **Fei Xue** and **Jean McGivney-Burell**, University of Hartford

2:00PM (1288) *Diagnosis, Treatment and Prescription: The Central VA Undergraduate Mathematics Scholarship Program (CVUMSP) Action Plan for Praxis II Success.*
Cheryl Adeyemi* and **Gerald Burton**, Virginia State University

2:00PM (1289) *Investigating Early Field Experiences for Prospective Mathematics Teachers through the University Teaching Experience Model.*
Michelle Cirillo*, **Raymond LaRochelle**, University of Delaware, **Kristen Bieda**, Michigan State University, and **Fran Arbaugh**, The Pennsylvania State University

2:00PM (1290) *Simulation-Based Inquiry-Oriented Linear Algebra.*
David Plaxco*, Clayton State University, and **Michelle Zandieh**, Arizona State University

2:00PM (1291) *Assessing the Impact of the Emporium Model on Student Persistence and Dispositional Learning by Transforming Faculty Culture.*
Kathy Cousins-Cooper*, **Nicholas S. Luke**, **Katrina N. Staley**, **Seongtae Kim** and **Dominic P. Clemence**, North Carolina A&T State University

2:00PM (1292) *Modeling Across the Curriculum.*
Ben Galluzzo*, **Peter Turner**, Clarkson University, and **James Crowley**, SIAM

2:00PM (1293) *Computing with R for Mathematical Modeling.*
Ben Galluzzo*, Clarkson University, **Jie Chao**, Concord Consortium, and **Eric Simoneau**, Boston Latin School and 33sigma Learning Labs, LLC

2:00PM (1294) *Aligning Differential Equations with Partner Disciplines through Applications.*
Rebecca Segal* and **Afroditi Filippas**, Virginia Commonwealth University

2:00PM (1295) *Adjunct Mathematics Instructor Resources and Support: Improving Undergraduate Precalculus Teaching and Learning Experience.*
Eileen Murray*, **Amir Golnabi**, Montclair State University, **Zareen Rahman**, James Madison University, **Madhavi Vishnubhotla** and **Jessica Nuzzi**, Montclair State University

2:00PM (1296) *Students' Understanding of Vectors in Multivariable Calculus.*
Monica VanDieren*, Robert Morris University, **Deborah Moore-Russo**, The University of Oklahoma, and **Paul Seeburger**, Monroe Community College

2:00PM (1297) *Creating Connections in the Content: What Gets Learned and Lost in the Translations Between Disciplines (a SUMMIT-P collaboration).*
Mary Beisiegel*, **Lori Kayes**, **Devon Quick** and **Richard Nafshu**, Oregon State University

2:00PM (1298) *Collaborative Research: A National Consortium for Synergistic Undergraduate Mathematics via Multi-institutional Interdisciplinary Teaching.*
Susan Ganter*, Embry Riddle Aeronautical University, **William Haver**, **Rosalyn Hobson Hargraves**, Virginia Commonwealth University, **Stella Hofrenning**, Augsburg University, and **Jack Bookman**, Duke University

► 2:00PM (1299) *Renovating Calculus at Augsburg University: a SUMMIT-P project.*
Suzanne Doree* and **Jody Sorensen**, Augsburg University

2:00PM (1300) *Evaluating the Uptake of Research-Based Instructional Strategies in Undergraduate Chemistry, Mathematics, and Physics.* Preliminary report.
Estrella Johnson*, Virginia Tech, and **Naneh Apkarian**, Western Michigan University

2:00PM (1301) *Building Sustainable Partnerships for 21st Century STEM Teachers.*
John E. Hammett III*, **Constance Calandrino**, **Yosra Badiei**, **James J. Clayton Sr.**, **WeiDong Zhu**, **Jeanette Wilmanski**, **Jennifer Ayala** and **John Ruppert**, Saint Peter's University

2:00PM (1302) *Mathematics of Doing, Understanding, Learning and Educating for Secondary Schools - MODULE(S2).*
Jeremy Strayer*, **Alyson Lischka**, Middle Tennessee State University, **Howard Gobstein**, APLU, **Stephanie Casey** and **Andrew Ross**, Eastern Michigan University

2:00PM (1303) *Mathematics of Doing, Understanding, Learning and Educating for Secondary Schools - MODULE(S2).*
Jason Aubrey*, **Cynthia Anhalt**, University of Arizona, **Yvonne Lai**, University of Nebraska - Lincoln, **Brynja Kohler**, Utah State University, and **Emina Alibegovic**, Rowland Hall

2:00PM (1304) *STEM Teaching Scholars for High Need Chicago-Area Schools.*
Melanie Pivarski*, **Byoung Sug Kim**, **Vicky McKinley**, **Emily Dangremond**, Roosevelt University, and **Chandra James**, Chicago Public School

2:00PM (1305) *Professional Resources & Inquiry in Mathematics Education for K-8 Teacher Education.*
Shandy Hauk*, WestEd, **JenqJong Tsay**, University of Texas Rio Grande Valley, and **Billy Jackson**, , University of Louisville

► 2:00PM (1306) *NSF S-STEM Program at Shepherd University.*
Qing Wang* and **Weidong Liao**, Shepherd University

2:00PM (1307) *Holyoke Community College STEM Scholars' Program (2015-2020).*
Ileana Vasu*, Holyoke Community College, **Autumn Phaneuf**, University of Massachusetts, Amherst, **Emily Rabinski** and **Steve Winters**, Holyoke Community College

2:00PM (1308) *Transforming Linear Algebra Education with GeoGebra Applets.*
James D. Factor* and **Susan Pustejovsky**, Alverno College

2:00PM (1309) *Raising Calculus to the Surface.*
Aaron Wangberg*, Winona State University, **Jason Samuels**, City University of New York – BMCC, **Brian Fisher**, Lubbock Christian University, **Elizabeth Gire**, Oregon State University, and **Tisha Hooks**, Winona State University

2:00PM (1310) *Raising Physics to the Surface.*
Aaron Wangberg*, Winona State University, **Robyn Wangberg**, Saint Mary's University of Minnesota, and **Elizabeth Gire**, Oregon State University

2:00PM (1311) *The AugSTEM Program: Informing Institutional Collaboration and Change to Prepare Juniors and Seniors for Careers in STEM.*
Rebekah Dupont*, **Stella Hofrenning** and **Nancy Rodenborg**, Augsburg University

2:00PM (1312) *PRODUCT 1: Professional Development and Uptake through Collaborative Teams.*
Brian Katz*, Augustana College, **Angie Hodge**, Northern Arizona University, **Sandra Laursen**, University of Colorado Boulder, **Yousuf George**, Nazareth College, **Volker Ecke**, **Philip Hotchkiss**, Westfield State University, and **Partick Rault**, University of Arizona

2:00PM (1313) *PRODUCT 2: Professional Development and Uptake through Collaborative Teams.*
Christine von Renesse*, Westfield State University, **Stan Yoshinobu**, California Polytechnic State University, San Luis Obispo, **Chuck Hayward**, University of Colorado Boulder, **Ryan Gantner**, St. John Fisher College, **Xiao Xiao**, Utica College, and **Elizabeth Thoren**, Pepperdine University

AMS Invited Address

2:15 PM – 3:05 PM **Ballrooms I & II, 400 Level, BCC**

(1314) *From knots to symplectic geometry and algebra.*
Peter Ozsvath, Princeton University (1145-00-9)

MAA Workshop

2:35 PM – 3:55 PM **Room 324, BCC**

How to Talk about Math So People Want to Listen

Organizer: **Paul Zorn**, St. Olaf College
Panelists: **Rachel Levy**, Mathematical Association of America
Presenter: **Flora Lichtman**, Gimlet Media

MAA Panel

2:35 PM – 3:55 PM **Room 349, BCC**

Pathways to Leadership

Organizers: **Cynthia Curtis**, The College of New Jersey
Semra Kilic Bahi, Lafayette College
Gretchen L. Matthews, Virginia Tech
Panelists: **Jenna Carpenter**, Campbell University
Barbara Faires, Westminster College
Susan Ganter, Embry-Riddle Aeronautical University
Chawne Kimber, Lafayette College
Maura Mast, Fordham College at Rose Hill

AMS Education and Diversity Department Panel

2:45 PM – 4:15 PM **Room 316, BCC**

Bridge-to-PhD and Postbac Programs Working to Open Doors for Students from Underrepresented Groups

Organizer: **Helen G. Grundman**, American Mathematical Society

Moderator: **Helen G. Grundman**, American Mathematical Society

Panelists: **Ruth Haas**, University of Hawai'i

Ryan Hynd, University of Pennsylvania

Trachette Jackson, University of Michigan

Michael Young, Iowa State University

AMS Contributed Paper Session on Combinatorics and Graph Theory, V

3:00 PM – 3:55 PM **Room 334, BCC**

3:00PM (1315) *A new approach to the graph isomorphism problem.* Preliminary report.
Larry J. Gerstein, University of California, Santa Barbara (1145-05-683)

3:15PM ► (1316) *Coloring hypergraphs is harder than coloring graphs.*
Oscar Levin, University of Northern Colorado (1145-05-2359)

3:30PM ► (1317) *A sequence of integrals of Fibonacci polynomials.* Preliminary report.
Berit Nilsen Givens, Cal Poly Pomona (1145-05-2411)

3:45PM ► (1318) *Fourier Methods to Analyze Lattice Path Progressions.*
Charles J. Kicey* and **Shaun V. Ault**, Valdosta State University (1145-05-1926)

MAA Contributed Paper Session on Philosophy of Mathematics, I

3:10 PM – 4:00 PM **Room 302, BCC**

Organizers: **Bonnie Gold**, Monmouth University (retired)

Jeffrey Buechner, Rutgers University - Newark

3:10PM ► (1319) *Boundary Conditions: Numeric Representation and the Boundary of Pure and Applied Mathematics.*
Donald G Palmer, Ossining, NY (1145-L5-1642)

3:40PM ► (1320) *What makes a notation for the natural numbers a good notation?* Preliminary report.
Jeff Buechner, Rutgers University-Newark and The Saul Kripke Center, CUNY GC (1145-L5-1961)

AMS Invited Address

3:20 PM – 4:10 PM **Ballrooms I & II, 400 Level, BCC**

(1321) *A mathematical introduction to the molecular biology of the cell.*
Lior Pachter, California Institute of Technology (1145-00-10)

Joint Prize Session

4:25 PM – 5:25 PM **Ballrooms I & II, 400 Level, BCC**

SIGMAA on the Philosophy of Mathematics (POM SIGMAA) Reception

5:30 PM – 6:00 PM **Room 304, BCC**

Joint Prize Session Reception

5:30 PM – 6:30 PM **Ballrooms I & II Lobby, 400 Level, BCC**

National Association of Mathematicians (NAM) and the National Security Agency (NSA) Special Presentation

5:30 PM – 7:00 PM **Room 316, BCC**

Town Hall Meeting on the Status of the African Diaspora in the Mathematical Sciences

Organizers: **William Christian**, National Security Agency

Edray Goins, National Association of Mathematicians

Moderator: **Ulrica Wilson**, Morehouse College

Panelists: **Mel Currie**, National Security Agency

Raegan Higgins, Texas Tech University

Tanya Moore, Building Diversity in Science

Robin Wilson, California Polytechnic University at Pomona

MAA Two-Year College Reception

5:30 PM – 7:00 PM **Key Ballroom 11 & 12, 2nd Floor, Hilton**

SIGMAA on the Philosophy of Mathematics (POM SIGMAA) Business Meeting

6:00 PM – 6:15 PM **Room 304, BCC**

SIGMAA on Quantitative Literacy (SIGMAA QL) Joint Guest Lecture and Reception

6:00 PM – 6:45 PM **Room 301, BCC**

6:00PM (1322) *The power of quantitative literacy in the era of alternative facts.*
Dave Kung*, St. Mary's College, and **Kira Hamman**, Penn State University (1145-A0-3035)

SIGMAA on the Philosophy of Mathematics (POM SIGMAA) Guest Lecture

6:15 PM – 7:00 PM **Room 304, BCC**

Organizer: **Bonnie Gold**, Monmouth University (retired)

► 6:15PM (1323) *The Rigour of Proof.* Preliminary report.
Michele Friend, Department of Philosophy, The George Washington University (1145-A0-211)

Knitting Circle

8:15 PM – 9:45 PM **Key Ballroom 8, 2nd Floor, Hilton**

8:15—9:45—*Knitting Circle: Bring a project (knitting/crochet/tatting/beading/etc.) and chat with other mathematical crafters.*¡

Friday, January 18

Joint Meetings Registration

7:30 AM – 4:00 PM **Pratt Street Lobby, 300 Level, BCC**

Email Center

7:30 AM – 8:00 PM **Pratt Street Lobby, 300 Level, BCC**

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

8:00 AM – 10:50 AM **Room 343, BCC**

Organizers: **Darren A. Narayan**, Rochester Institute of Technology
Khang Tran, California State University, Fresno
Mark David Ward, Purdue University
John Wierman, The Johns Hopkins University

► 8:00AM (1324) *Fast, stable multivariate numerical rootfinding in a compact region.*
Suzanna Stephenson*, **Natalie Larsen**, **Erik Parkinson**, **Hayden Ringer**, **Tyler Moncur** and **Tyler Jarvis**, Brigham Young University (1145-14-2577)

► 8:30AM (1325) *Using Survey Data and Mathematical Modeling to Prioritize Water Interventions in Developing Countries.*
Jordan Marie Spencer*, **Konnor J Petersen**, **Jane Cox** and **Tyler Jarvis**, Brigham Young University (1145-00-2569)

► 9:00AM (1326) *Distinguisher-attack resistance and decoding of twisted Hermitian codes.*
Austin P. Allen*, Carnegie Mellon University, and **Keller L. Blackwell**, University of South Florida (1145-94-2120)

► 9:30AM (1327) *Eigenvalues of Cographs.* Preliminary report.
Tara Abrishami* and **Edward Scheinerman**, Johns Hopkins University (1145-05-1368)

► 10:00AM (1328) *Federalism in Epidemic Modeling: Multi-objective Management of Interconnected Populations.* Preliminary report.
Mykhaylo M. Malakhov*, Andrews University, **Ishan Phadke**, The Pennsylvania State University, **Junyan Duan**, Bryn Mawr College, **Jordan Pellett**, University of Wisconsin–La Crosse, **Katriona Shea**, The Pennsylvania State University, and **Julie C. Blackwood**, Williams College (1145-92-1646)

► 10:30AM (1329) *The Structure of Fork-Free C_4-Free Graphs.* Preliminary report.
Jenny Kaufmann* and **Maria Chudnovsky**, Princeton University (1145-05-387)

AMS Special Session on Advances in Operator Theory, Operator Algebras, and Operator Semigroups, I

8:00 AM – 10:50 AM **Room 344, BCC**

Organizers: **Joseph Ball**, Virginia Tech
Marat Markin, California State University, Fresno
Igor Nikolaev, St. John's University
Ilya Spitkovsky, New York University, Abu Dhabi

8:00AM (1330) *Reproducing kernel Hilbert spaces: the free noncommutative and Hilbert module settings.*
Joseph A Ball, Department of Mathematics, Virginia Tech, Blacksburg, VA 24061 (1145-46-1643)

► 8:30AM (1331) *Logarithmic approximation of ill-posed problems associated with generators of holomorphic semigroups.*
Matthew A Fury, Penn State Abington (1145-47-1052)

► 9:00AM (1332) *Nonvanishing minors and uncertainty principles.*
Stephan Ramon Garcia, Pomona College (1145-15-669)

9:30AM ► (1333) *Cluster Algebra or rank 2 and Jones Index Theorem.*
Andrey Glubokov*, Ave Maria University, and **Igor Nikolaev**, St.John's University (1145-47-1634)

10:00AM (1334) *Recent results in ergodic therems in von Neuman Algebras.*
Genady Grabarnik, St John's University (1145-46-2786)

10:30AM (1335) *A characterization of tracially nuclear C*-algebras.* Preliminary report.
Don Hadwin, University of New Hampshire, **Weihua Li***, Columbia College Chicago, **Wenjing Liu** and **Junhao Shen**, University of New Hampshire (1145-46-1050)

AMS Special Session on Algebraic Structures Motivated by Knot Theory, I

8:00 AM – 10:50 AM **Room 346, BCC**

Organizers: **Mikhail Khovanov**, Columbia University
Jozef H. Przytycki, George Washington University
Alexander Shumakovitch, George Washington University

8:00AM (1336) *Knot concordance in homology cobordisms.*
Jennifer Hom, Georgia Institute of Technology, **Adam Simon Levine***, Duke University, and **Tye Lidman**, North Carolina State University (1145-57-2075)

8:30AM (1337) *On factorization and chromatic graph homology.* Preliminary report.
Radmila Sazdanovic*, NC State Univerisity, and **Vladimir Baranovsky**, UC Irvine (1145-57-2203)

9:00AM (1338) *Gordian distance and spectral sequences in Khovanov homology.*
Adam M Lowrance*, Vassar College, and **Radmila Sazdanovic**, North Carolina State University (1145-57-479)

9:30AM (1339) *Categorification of Cyclotomic Integers.*
Robert Laugwitz*, Rutgers University, and **You Qi**, California Institute of Technology (1145-18-1785)

10:00AM (1340) *Even Khovanov homology and odd torsion.*
Sujoy Mukherjee, The George Washington University (1145-57-1254)

10:30AM (1341) *Virtual Khovanov Homology.* Preliminary report.
Louis H Kauffman, University of Illinois at Chicago (1145-57-1131)

AMS Special Session on Analytic Number Theory, I

8:00 AM – 10:50 AM **Room 319, BCC**

Organizers: **Thomas A. Hulse**, Boston College
Angel V. Kumchev, Towson University
Nathan McNew, Towson University
John Miller, The Johns Hopkins University

8:00AM (1342) *The Lindelöf hypothesis for primes is equivalent to the Riemann hypothesis.*
Steven M Gonek, University of Rochester (1145-11-1074)

8:30AM (1343) *The distribution of* $\log \zeta(s)$ *near its zeros.*
Fatma Cicek* and **Steve Gonek**, University of Rochester (1145-11-1079)

9:00AM (1344) *Zeros of the derivatives of the completed Riemann zeta function.*
Amita Malik*, Rutgers University, and **Arindam Roy**, UNC, Charlotte (1145-11-1196)

9:30AM ► (1345) *Cancellation in the Partial Sums of Fourier Coefficients of Modular Forms.*
Alexander Weston Walker, Rutgers, the State University of New Jersey (1145-11-956)

10:00AM (1346) *Zeroes of L-functions associated to half-integral weight modular cusp forms.* Preliminary report.
David Lowry-Duda, University of Warwick (1145-11-1102)

10:30AM (1347) *Hybrid estimates for quadratic twists of holomorphic L-series.* Preliminary report.
Jeff Hoffstein* and **Maria Nastasecu**, Brown University (1145-11-1190)

AMS Special Session on Arithmetic Statistics, I

8:00 AM – 10:50 AM **Room 318, BCC**

Organizers: **Michael Chou**, Tufts University
Robert Lemke Oliver, Tufts University
Ari Shnidman, Center for Communications Research-Princeton

8:00AM (1348) *Composite level images of Galois and Entanglement fields.*
Jackson Salvatore Morrow, Emory University (1145-11-2273)

8:30AM (1349) *A local-global principle for isogenies of composite degree.*
Isabel Vogt, MIT (1145-11-1201)

9:00AM (1350) *Arboreal Galois Representations of Dynamical Belyi Maps.* Preliminary report.
Irene Bouw, Ulm University, **Ozlem Ejder***, Colorado State University, and **Valentijn Karemaker**, University of Pensilvania (1145-11-2722)

9:30AM (1351) *Hasse Principle Violations of Quadratic Twists of Hyperelliptic Curves.*
Lori D. Watson* and **Pete L. Clark**, University of Georgia (1145-11-1640)

10:00AM (1352) *Vanishing of Hyperelliptic L-functions at the Central Point.*
Wanlin Li, University of Wisconsin-Madison (1145-11-546)

10:30AM (1353) *Irrational points on hyperelliptic curves.*
Joseph Gunther, Université Paris-Sud, Orsay (1145-11-2774)

AMS Special Session on Counting Methods in Number Theory, I

8:00 AM – 11:00 AM **Room 314, BCC**

Organizers: **Lillian Pierce**, Duke University
Arindam Roy, Rice University
Jiuya Wang, University of Wisconsin

8:00AM (1354) *On certain multiple Dirichlet series.* Preliminary report.
Eun Hye Lee* and **Ramin Takloo-Bighash**, University of Illinois at Chicago (1145-11-820)

► 8:30AM (1355) *An l^2 decoupling interpretation of efficient congruencing in 2D.*
Zane Kun Li, UCLA (1145-11-1084)

9:00AM (1356) *Studying Parsell-Vinogradov Systems via Decoupling.*
Ruixiang Zhang* and **Shaoming Guo**, University of Wisconsin-Madison (1145-42-487)

9:30AM (1357) *Growth of the analytic rank of rational elliptic curves over quintic fields.*
Michele Fornea, McGill University (1145-11-761)

10:00AM (1358) *Counting quaternion algebras.*
Benjamin Linowitz, Oberlin College, **D. B. McReynolds**, Purdue University, **Paul Pollack**, University of Georgia, and **Lola Thompson***, Oberlin College (1145-11-2728)

10:30AM (1359) *Popular values and popular subsets of Euler's φ-function.*
Paul Pollack, University of Georgia (1145-11-1651)

AMS Special Session on Differential Equations on Fractals, II

8:00 AM – 10:50 AM **Room 321, BCC**

Organizers: **Patricia Alonso-Ruiz**, University of Connecticut
Joe Chen, Colgate University
Luke Rogers, University of Connecticut
Robert Strichartz, Cornell University
Alexander Teplyaev, University of Connecticut

8:00AM (1360) *Heat kernels and functional inequalities on generalized diamond fractals.*
Patricia Alonso-Ruiz, University of Connecticut (1145-60-642)

8:30AM (1361) *Hydrodynamics on resistance spaces: from the asymmetric exclusion process to a nonlinear heat equation.*
Joe P Chen, Colgate University (1145-60-256)

► 9:00AM (1362) *Differential forms on products of fractals.* Preliminary report.
Michael Hinz*, Faculty of Mathematics, Bielefeld University, Germany, and **Daniel J. Kelleher**, Mount Holyoke College, South Hadley, MA (1145-28-1718)

► 9:30AM (1363) *Differential forms on quantum graphs and Laakso spaces.* Preliminary report.
Daniel J Kelleher, Mount Holyoke College (1145-31-1719)

► 10:00AM (1364) *Sobolev spaces and calculus of variations on fractals.*
Melissa Meinert, Bielefeld University (1145-49-1593)

10:30AM (1365) *Liouville type theorems for p-harmonic functions in metric measure spaces.*
Anders Bjorn, **Jana Bjorn**, Linkoping University, and **Nageswari Shanmugalingam***, University of Cincinnati (1145-31-1425)

AMS Special Session on Geometric and Topological Combinatorics, I

8:00 AM – 10:50 AM **Room 320, BCC**

Organizers: **Anastasia Chavez**, University of California, Davis
Jamie Haddock, University of California, Davis
Annie Raymond, University of Massachusetts, Amherst

► 8:00AM (1366) *An introduction to the combinatorics of shape: polygons, polytopes, and configurations.*
Satyan Devadoss, University of San Diego (1145-05-619)

► 9:00AM (1367) *Splitting Loops: Variants of the Square Peg Problem.*
Florian Frick, Carnegie Mellon University (1145-51-1459)

9:30AM (1368) *Geometric and topological combinatorics in chip-firing.*
Caroline J Klivans, Brown University (1145-05-2103)

► 10:00AM (1369) *Toric Ideals of Tiling Spaces.* Preliminary report.
Nicole Yamzon, The University of Illinois Urbana-Champaign (1145-05-1692)

10:30AM (1370) *Using Lattice Polytopes to Study Combinatorial Neural Codes.*
Robert Davis, Harvey Mudd College (1145-05-304)

AMS Special Session on Geometric and Topological Generalization of Groups, I

8:00 AM – 10:50 AM **Room 347, BCC**

Organizers: **Amrita Acharyya**, University of Toledo
Bikash C. Das, University of North Georgia

► 8:00AM (1371) *The number of nontrivial orbits under the composition operation for bounded juggling patterns.*
Nate Iverson, Siena Heights University (1145-20-708)

8:30AM (1372) *Generating fully irreducible outer automorphisms of the free group.*
Funda Gultepe, University of Toledo (1145-20-809)

► 9:00AM (1373) *Dixmier groups.*
Alimjon Eshmatov*, University of Toledo, **Yuri Berest**, Cornell University, and **Farkhod Eshmatov**, Sichuan University, Chengdu (1145-20-711)

9:30AM (1374) *Clique Homology and the Zero-Divisor graph problem.*
Lisa A DeMeyer, Central Michigan University (1145-20-934)

10:00AM (1375) *Configurations, groups, and algebras.*
Jonathan I Hall, Michigan State University (1145-20-1811)

10:30AM (1376) *Zariski Topology of Group Cohomology Rings.*
Nham Vo Ngo, University of North Georgia - Gainesville (1145-20-1005)

AMS Special Session on Geometry and Dynamics of Continued Fractions, I

8:00 AM – 10:50 AM **Room 337, BCC**

Organizers: **Anton Lukyanenko**, George Mason University
Joseph Vandehey, Ohio State University

► 8:00AM (1377) *Continued fractions for the golden L, and billiards in the pentagon.*
Diana Davis, Swarthmore College (1145-37-2554)

8:30AM (1378) *Hybrid subgroups of complex hyperbolic lattices.* Preliminary report.
Joseph Wells, Arizona State University (1145-22-2528)

9:00AM (1379) *Geodesic submanifolds of hyperbolic hybrids.*
David Fisher, Indiana University Bloomington, **Jean-Francois Lafont**, Ohio State University, **Nicholas Miller**, Indiana University, and **Matthew Stover***, Temple University (1145-57-1245)

9:30AM (1380) *Presentations for cusped arithmetic hyperbolic lattices.*
Alice H Mark, Rutgers University (1145-51-1862)

10:00AM (1381) *Transfinite Apollonian Metric.* Preliminary report.
Zair Ibragimov, California State University, Fullerton (1145-30-1257)

► 10:30AM (1382) *Families of Division Algorithms: Structure for Multidimensional Continued Fraction Algorithms.* Preliminary report.
Thomas Garrity, Williams College (1145-11-1966)

AMS Special Session on Harmonic Analysis, Partial Differential Equations, and Applications, I

8:00 AM – 10:50 AM **Room 328, BCC**

Organizers: **Russell Brown**, University of Kentucky
Irina Mitrea, Temple University

8:00AM (1383) *Fatou's Theorem, Poisson's Integral, and Local Maximum Principle for second order systems.*
Dorina Mitrea, University of Missouri (1145-35-1298)

8:30AM (1384) *Extrapolation of well posedness for higher order elliptic systems with rough coefficients.*
Ariel Barton, University of Arkansas (1145-35-221)

9:00AM (1385) *Boundary behavior of solutions of elliptic operators in divergence form with a BMO anti-symmetric part.*
Linhan Li and **Jill Pipher***, Brown University (1145-35-1430)

► 9:30AM (1386) *Perturbations of elliptic operators on non-smooth domains.* Preliminary report.
Murat Akman, University of Connecticut (1145-35-264)

10:00AM (1387) *Free boundary regularity for harmonic measure on multi-phase configurations.*
Matthew Badger, University of Connecticut (1145-35-571)

10:30AM (1388) *On the existence of nontangential boundary traces for solutions of elliptic PDE's.*
Marius Mitrea, University of Missouri (1145-35-1301)

AMS Special Session on If You Build It They Will Come: Presentations by Scholars in the National Alliance for Doctoral Studies in the Mathematical Sciences, I

8:00 AM – 10:50 AM **Room 327, BCC**

Organizers: **David Goldberg**, Purdue University
Phil Kutzko, University of Iowa

► 8:00AM (1389) *Good Elliptic Curves with Specified Torsion Subgroup.*
Alexander J Barrios, Carleton College (1145-11-2183)

8:30AM ► (1390) *Optimizing docetaxel scheduling to delay progression in metastatic prostate cancer patients receiving hormone therapy.*
Renee Brady*, Integrated Mathematical Oncology, H. Lee Moffitt Cancer Center & Research Institute, Tampa, FL, USA, **Tian Zhang**, Division of Medical Oncology, Department of Medicine, Duke Cancer Institute, Durham, NC 27708, USA., **Andrew Z Wang**, Department of Radiation Oncology, University of North Carolina at Chapel Hill, Chapel Hill, NC 27599, USA, **John D. Nagy**, School of Mathematical and Statistical Sciences, Arizona State University, Tempe, AZ, USA, and **Heiko Enderling**, Integrated Mathematical Oncology, H. Lee Moffitt Cancer Center & Research Institute, Tampa, FL, USA (1145-00-3002)

9:00AM ► (1391) *Implementing Mathematical Modeling Practices in Calculus at a Hispanic-Serving Institution.* Preliminary report.
Adam J Castillo, Florida International University (1145-97-716)

9:30AM (1392) *Tensor product decompositions of II_1 factors arising from extensions of amalgamated free product groups.*
Rolando de Santiago*, UCLA, **Ionut Chifan** and **Wanchalerm Sucpikarnon**, The University of Iowa (1145-46-863)

10:00AM ► (1393) *Peak polynomials and their coefficients.*
Alexander Diaz-Lopez, Villanova University (1145-05-2268)

10:30AM ► (1394) *Functional Data Classification by Discriminative Reconstruction.* Preliminary report.
Rana Haber*, Florida Institute of Technology, Melbourne, FL, **Anand Rangarajan**, University of Florida, Gainseville, FL, and **Adrian M. Peter**, Florida Institute of Technology (1145-90-789)

AMS Special Session on Low Complexity Models in Data Analysis and Machine Learning, I

8:00 AM – 10:45 AM **Room 331, BCC**

Organizers: **Emily J. King**, University of Bremen, Germany
Nate Strawn, Georgetown University
Soledad Villar, New York University

8:00AM ► (1395) *Introduction to Low Complexity Models in Data Analysis and Machine Learning.*
Emily J King*, University of Bremen, Germany, **Nate Strawn**, Georgetown University, and **Soledad Villar**, NYU Center for Data Science (1145-41-1927)

8:30AM (1396) *A convex program for bilinear inversion of sparse vectors.*
Babhru Joshi*, Computational and Applied Math, Rice University, **Paul Hand**, Department of Mathematics and College of Computer and Information Science, Northeastern University, **Ali Ahmed**, Department of Electrical Engineering, Information Technology University, Lahore, and **Alireza Aghasi**, J. Mack Robinson College of Business, Georgia State University (1145-49-2007)

9:00AM ► (1397) *Fast quantum state estimation with optimal error bounds.*
Madalin Guta, School of Mathematical Sciences, University of Nottingham, United Kingdom, **Jonas Kahn**, Institut de Mathematiques de Toulouse, Toulouse, France, **Richard Kueng*** and **Joel A Tropp**, California Institute of Technology, Pasadena, CA (1145-60-2719)

9:30AM ► (1398) *From clusters to manifolds with semidefinite and completely-positive approximations.* Preliminary report.
Mariano Tepper*, Flatiron Institute (now at Intel Labs), **Victor Minden**, Flatiron Institute (now at Google), and **Anirvan M Sengupta**, Rutgers University & Flatiron Institute (1145-00-2242)

10:00AM (1399) *Statistical Learning and Geometric techniques for Dynamical Systems.*
Mauro Maggioni, Johns Hopkins University (1145-60-1756)

AMS Special Session on Mathematical Analysis in Fluid Dynamics, I

8:00 AM – 10:50 AM **Room 336, BCC**

Organizers: **Yanqiu Guo**, Florida International University
Jinkai Li, South China Normal University
Jing Tian, Towson University
Yuncheng You, University of South Florida

8:00AM (1400) *Asymptotic expansions for solutions of non-autonomous differential equations.*
Dat Cao* and **Luan Hoang**, Texas Tech University (1145-34-1139)

8:30AM (1401) *Local uniform boundary stabilization of the 3D Navier-Stokes equations by finite dimensional localized tangential feedback controls.*
Buddhika Priyasad*, **Irena Lasiecka** and **Roberto Triggiani**, The University of Memphis (1145-76-1327)

9:00AM (1402) *On the velocity-vorticity-Voigt formulation of the 3D Navier-Stokes equations.* Preliminary report.
Adam Larios, University of Nebraska-Lincoln, **Yuan Pei***, Western Washington University, and **Leo Rebholz**, Clemson University (1145-35-176)

9:30AM (1403) *Analysis of fluids with non-smooth viscosities.*
Karoline Disser, TU Darmstadt (1145-76-224)

10:00AM (1404) *Global existence of weak solution to a two-fluid model without the equivalence condition.*
Huanyao Wen, South China University of Technology, Guangzhou, China (1145-35-1331)

10:30AM (1405) *Semigroup Wellposedness of A Linearized Compressible Flow-Plate Interaction Under Varying Boundary Interface Coupling Conditions.*
Pelin Guven Geredeli*, **George Avalos**, University of Nebraska-Lincoln, and **Justin Webster**, University of Maryland, Baltimore County (1145-35-1195)

AMS Special Session on Mathematical Investigations of Spatial Ecology and Epidemiology, I

8:00 AM – 10:50 AM **Room 325, BCC**

Organizers: **Leah Shaw**, College of William and Mary
Junping Shi, College of William and Mary
Zhisheng Shuai, University of Central Florida

8:00AM (1406) *A multi-patch SIS age-structured epidemic model with migration.* Preliminary report.
Xue-Zhi Li, Anayang Institute of Technology, China, **Junyuan Yang**, Complex Systems Research Center, Shanxi University, China, and **Maia Martcheva***, University of Florida (1145-92-841)

► 8:30AM (1407) *A Model for machine tool vibration.*
Stephen Gourley, Surrey, UK, **Feng-bin Wang**, Taiwan, and **Yanyu Xiao***, University of Cincinnati (1145-92-1786)

► 9:00AM (1408) *Indirect Transmitted Infectious Diseases: from Microscopic to Macroscopic Cycles.*
Jude Dzevela Kong*, DIMACS/Princeton University, **William Davis**, University of Alberta, and **Hao Wang**, University of alberta (1145-37-2377)

9:30AM (1409) *Asymptomatic Malaria Infections in Pregnant Women of Ngbo in Ohaukwu local Government Area of Ebonyi State of Nigeria.* Preliminary report.
Moussa Doumbia* and **Abdul-Aziz Yakubu**, Howard University (1145-92-1006)

10:00AM (1410) *Spatial Models of Vector-Host Epidemics with Directed Movement of Vectors Over Long Distances.*
William E Fitzgibbon, **Jeff J Morgan**, University of Houston, **Glenn F Webb** and **Yixiang Wu***, Vanderbilt University (1145-92-1632)

10:30AM (1411) *Impact of Asymmetric Movement on the Spatial Spread of Infectious Disease.* Preliminary report.
Arielle Gaudiello* and **Zhisheng Shuai**, University of Central Florida (1145-34-1584)

AMS Special Session on Mathematics in the Realm of Cyber Research, I

8:00 AM – 10:45 AM **Room 332, BCC**

Organizers: **Daniel Bennett**, Army Cyber Institute
Paul Goethals, United States Military Academy
Natalie Scala, Towson University

► 8:00AM (1412) *Mathematics in the Realm of Cyber Research.*
Ahmad Ridley, Department of Defense (1145-90-2586)

9:00AM (1413) *Algebraic geometry codes in the McEliece cryptosystem.*
Gretchen Matthews, Virginia Tech (1145-94-2230)

► 9:30AM (1414) *A Characterization of Finite Nilpotent Groups Using Word Maps.*
William Cocke*, University of Wisconsin-Madison, and **Meng-Che Ho**, Purdue University (1145-20-434)

► 10:00AM (1415) *A Combinatorial Approach to Software Testing.*
Cheyne Homberger, Department of Defense (1145-05-1485)

AMS Special Session on Multiscale Problems in the Calculus of Variations, I

8:00 AM – 10:50 AM **Room 329, BCC**

Organizers: **Elisa Davoli**, University of Vienna, Austria
Rita Ferreira, King Abdullah University of Science and Technology, Saudi Arabia

8:00AM (1416) *A Homogenization Result in the Gradient Theory of Phase Transitions.*
Irene Fonseca*, Carnegie Mellon University, Pittsburgh, PA, **Riccardo Cristoferi**, Heriot-Watt University, Edinburgh, UK, **Adrian Hagerty**, Carnegie Mellon University, Pittsburgh, PA, and **Cristina Popovici**, Loyola University Chicago (1145-49-643)

► 9:00AM (1417) *Multiscale function reconstruction based on reproducing kernels.*
Barbara Zwicknagl, TU Berlin (1145-41-2538)

► 9:30AM (1418) *On the passage from nonlinear to linearized viscoelasticity.*
Manuel Friedrich, Applied Mathematics, University of Muenster, and **Martin Kruzik***, Czech Academy of Sciences, Institute of Information Theory and Automation (1145-35-649)

10:30AM (1419) *Derivation of von Karman plate theory in the framework of three-dimensional viscoelasticity.* Preliminary report. **Manuel Friedrich***, WWU Muenster, and **Martin Kruzik**, Czech Academy of Sciences (1145-35-654)

AMS Special Session on Recent Advances in Biological Modeling and Related Dynamical Analysis, I

8:00 AM – 10:50 AM **Room 326, BCC**

Organizers: **Joshi Raj Hem**, Xavier University

Yanyu Xiao, University of Cincinnati

8:00AM ► (1420) *Modeling the Immune Response of Celiac Disease.* Preliminary report. **Cara J. Sulyok**, University of Tennessee, Knoxville (1145-93-1516)

8:30AM ► (1421) *Modeling animal movement with memory with partial differential equations with time-delay.* **Junping Shi***, College of William and Mary, **Chuncheng Wang**, Harbin Institute of Technology, **Hao Wang**, University of Alberta, and **Qingyan Shi**, Tongji University (1145-92-1679)

9:00AM (1422) *Traveling waves for a class of diffusive disease-transmission models with network structures.* **K.-Y. Lam**, Ohio State University, **X. Wang***, Washington State University, and **T. Zhang**, Southwest University, China (1145-35-1380)

9:30AM ► (1423) *Optimal control of vaccination in a vector-borne reaction-diffusion model applied to Zika virus.* Preliminary report. **Suzanne Lenhart**, University of Tennessee and NIMBioS (1145-92-348)

10:00AM ► (1424) *Spreading Mechanics and Differentiation of Astrocytes During Retinal Development.* **Tracy L. Stepien***, Department of Mathematics, University of Arizona, and **Timothy W. Secomb**, Department of Physiology, University of Arizona (1145-92-1322)

10:30AM (1425) *Global analysis of a simplified model of anaerobic digestion and a new result for the chemostat.* **Tyler Meadows***, McMaster University, **Marion Weedermann**, Dominican University, and **Gail S.K. Wolkowicz**, McMaster University (1145-34-1956)

AMS Special Session on Recent Advances in Inverse Problems and Imaging, I

8:00 AM – 10:50 AM **Room 330, BCC**

Organizers: **Kui Ren**, University of Texas at Austin

Yang Yang, Michigan State University

8:00AM (1426) *Single Floquet-Bloch Mode Imaging of Local Perturbations in Periodic Media.* **Fioralba Cakoni***, Rutgers, The State University of New Jersey, **Houssem Haddar**, INRIA Sacley, CMAP Ecole Polytechnique, and **Thi Phong Nguyen**, Rutgers, The State University of New Jersey (1145-35-758)

8:30AM (1427) *Investigation of the super-resolution phenomenon in nonlinear inverse problems.* **Vadim A Markel**, Department of Radiology, University of Pennsylvania (1145-78-2363)

9:00AM (1428) *Hadamard-Babich ansatz for Maxwell's equations in inhomogeneous media.* **Jianliang Qian***, Department of Mathematics, Michigan State University, **Wangtao Lu**, Zhejiang University, Zhejiang, China, and **Robert Burridge**, University of New Mexico, New Mexico (1145-35-854)

9:30AM (1429) *Nonlinear processing of multi-scattering data via sparse data-driven reduced order models.* **Vladimir Druskin***, Worcester Polytechnic Institute, **Liliana Borcea**, University of Michigan, **Alexander Mamonov**, University of Houston, and **Mikhail Zaslavsky**, Schlumberger (1145-65-1557)

10:00AM (1430) *Inverse problems for the perturbed wave equation.* **R Rakesh**, University of Delaware (1145-35-1457)

10:30AM (1431) *Beam Wave Scattering and Imaging in Clutter.* **K Solna***, UC Irvine, and **J Garnier**, Ecole Polytechnique (1145-60-884)

AMS Special Session on Stochastic Analysis and Applications in Finance, Actuarial Science and Related Fields, I

8:00 AM – 10:50 AM **Room 345, BCC**

Organizers: **Julius N. Esunge**, University of Mary Washington

See Keong Lee, University of the Sciences, Malaysia

Aurel I. Stan, The Ohio State University at Marion

8:00AM (1432) *The Enskog process for hard and soft potentials.* Preliminary report. **P. Sundar**, Louisiana State University (1145-60-2424)

8:30AM (1433) *Large Deviations for a Class of Stochastic Semilinear Partial Differential Equations.* **Leila Setayeshgar***, Providence College, and **Mohammud Foondun**, University of Strathclyde (1145-60-50)

9:00AM (1434) *A stochastic maximum principle for controlled stochastic factor model.* **Olivier Menoukeu Pamen**, African Institute for Mathematical Sciences, Ghana/ University of Liverpool, UK (1145-60-1795)

9:30AM (1435) *Parameter Estimation for Jump Diffusion Model Driven by α-stable Lévy Motion.* Preliminary report. **Sher B. Chhetri*** and **Hongwei Long**, Department of Mathematical Sciences, Florida Atlantic University (1145-60-2399)

10:00AM (1436) *The Actuarial HLE Model: Mathematical Aspects and Applications.* Preliminary report. **Ambar N Sengupta***, **Jeyaraj Vadiveloo** and **Jiatian Xu**, University of Connecticut (1145-60-1579)

10:30AM ► (1437) *Modeling and Pricing Weather Derivatives.* Preliminary report. **Nguyet N Nguyen***, Youngstown State University, and **Isaac Adjetey**, Florida State University (1145-03-2420)

AMS Special Session on Topology, Structure and Symmetry in Graph Theory, I

8:00 AM – 10:50 AM **Room 338, BCC**

Organizers: **Lowell Abrams**, George Washington University

Mark Ellingham, Vanderbilt University

8:00AM (1438) *Fine structure of 3-connected $K_{2,t}$-minor-free graphs.* **Ryan W Solava*** and **Mark Ellingham**, Vanderbilt University (1145-05-1056)

8:30AM (1439) *Finding disjoint theta graphs.* Preliminary report. **Emily Marshall***, Arcadia University, and **Michael Santana**, Grand Valley State University (1145-05-950)

9:00AM (1440) *Circuit Covers of Highly Connected Signed Graphs.* Preliminary report. **Yezhou Wu**, Zhejiang University, and **Dong Ye***, Middle Tennessee State University (1145-05-942)

9:30AM (1441) *Homomorphic Preimages of Graphs.* **Sally Cockburn**, Hamilton College (1145-05-325)

10:00AM (1442) *Color-induced subgraphs of Grünbaum colorings of triangulations.* **sarah-marie belcastro***, MathILy / Smith College, and **Ruth Haas**, University of Hawaii (1145-05-971)

10:30AM (1443) *Spanning trees with few leaves in graphs on surfaces.* **Kenta Ozeki**, Yokohama National University (1145-05-996)

MAA Invited Paper Session on The Past 50 Years of African Americans in the Mathematical Sciences

8:00 AM – 10:20 AM **Room 317, BCC**

Organizer: **Edray Goins**, Pomona College

8:00AM ► (1444) *A random walk with a black graph theorist.* **Michael Young**, Iowa State University (1145-AF-2299)

8:30AM ► (1445) *Hidden Figures: The Mathematics of Katherine Johnson and Rudy Horne.* **Talitha M Washington**, Howard University (1145-AF-534)

9:00AM ► (1446) *A Uniform Acceleration Trilogy for Dynamic Rate, Single Server Queueing Transience.* **William A Massey**, Princeton University (1145-AF-2347)

9:30AM ► (1447) *Finding Nodes for Fast Communication in Small and Large Networks.* **Fern Y Hunt**, National Inst. of Standards and Technology (1145-AF-1404)

10:00AM ► (1448) *On Mathematicians of the African Diaspora.* Preliminary report. **Scott W. Williams**, University at Buffalo, SUNY (1145-AF-2501)

AMS Contributed Paper Session on Combinatorics and Graph Theory, I

8:00 AM – 10:55 AM **Room 313, BCC**

8:00AM ► (1449) *Regular Permutation Graphs.* **Amanda Lohss**, Messiah College (1145-05-1350)

8:15AM ► (1450) *Domination Parameters of the Unitary Cayley Graph of $\mathbb{Z}/n\mathbb{Z}$.* **Amanda Burcroff**, University of Michigan (1145-05-2904)

8:30AM (1451) *When Graphs are Wreath Products.* Preliminary report. **Rachel V Barber***, Mississippi State University, and **Edward Dobson**, University of Primorska (1145-00-1949)

8:45AM ► (1452) *Growing Graceful Trees.* **Edinah K. Gnang**, Assistant Professor/ Department of Applied Mathematics and Statistics, Johns Hopkins University (1145-05-2066)

9:00AM ► (1453) *Planar Graphs with Girth 20 are Additively 3-choosable.* **Axel Brandt**, Northern Kentucky University, **Nathan Tenpas**, Vanderbilt University, and **Carl Yerger***, Davidson College (1145-05-802)

9:15AM ► (1454) *Destroying the Ramsey Property by the Removal of Edges.* **Mark Budden** and **Elijah DeJonge***, Western Carolina University (1145-05-2459)

9:30AM (1455) *Throttling for Zero Forcing and its Minor Monotone Floor.*
Joshua Carlson, Iowa State University (1145-05-794)

9:45AM ► (1456) *The anti-van der Waerden number of graphs.*
Hunter Rehm, The University of Vermont, **Alex Schulte***, Iowa State University, **Nathan Warnberg**, University of Wisconsin La Crosse, and **Michael Young**, Iowa State University (1145-05-941)

10:00AM ► (1457) *Bounds on Quantum Chromatic Number and New Nontrivial Colorings.*
Chen Xie, University of Waterloo (1145-05-2915)

10:15AM ► (1458) *Edge-Distinguishing Chromatic Number for Three-Legged Spiders.*
Grant Fickes* and **Wing Hong Tony Wong**, Kutztown University of Pennsylvania (1145-05-805)

10:30AM ► (1459) *Vertex-Minimal Planar Graphs with Prescribed Automorphism Groups.* Preliminary report.
Sarah Elizabeth Lubow*, Loyola University New Orleans, and **Carlie J. Triplitt**, University of Science and Arts of Oklahoma (1145-00-2091)

10:45AM ► (1460) *The Asymmetric Index of a Graph.*
Darren Narayan*, Rochester Institute of Technology, **Alejandra Brewer**, Florida Southern College, **Adam Gregory**, Western Carolina University, and **Quindel Jones**, Jackson State University (1145-05-258)

AMS Contributed Paper Session on Mathematics in the Life Sciences, Ecology, and Related Fields, I

8:00 AM – 10:40 AM **Room 312, BCC**

8:00AM (1461) *Emergent Three-Dimensional Sperm Motility Coupled to Calcium Dynamics.*
Lucia Carichino* and **Sarah D Olson**, Worcester Polytechnic Institute (1145-92-1781)

8:15AM ► (1462) *Dynamics of Liver Glycogen in a Glucose-Regulatory Model.* Preliminary report.
Caleb L Adams, Radford University (1145-92-2255)

8:30AM ► (1463) *A Model of the Neuromuscular Junction and its Application to Myasthenia Gravis.*
Taylor Meredith*, **Calina Copos** and **Jennifer Crodelle**, Courant Institute, NYU (1145-92-1836)

8:45AM ► (1464) *Got Milk? Modeling a Dairy Allergy: Oral Immunotherapy and the Immune Response.*
Kelley France*, **Brittany Bannish** and **Sean Laverty**, University of Central Oklahoma (1145-92-1752)

9:00AM ► (1465) *A Mathematical Approach for assessing tDCS efficacy for Post-Traumatic Stress Disorder.* Preliminary report.
Abigail T. Small* and **Edward T. Dougherty**, Roger Williams University (1145-92-2002)

9:15AM ► (1466) *Global sensitivity analysis and model selection of a neurological control model.*
Nicholas Randolph*, **E Benjamin Randall** and **Mette Olufsen**, North Carolina State University (1145-92-414)

9:30AM ► (1467) *Differences in Transcriptional Dynamics Between T-cells and Macrophages as Determined by a Three-State Mathematical Model.*
Tin Phan*, **Yang Kuang**, School of Mathematical and Statistical Sciences, Arizona State University, **Maria Emelianenko**, **Daniel M Anderson**, Department of Mathematical Sciences, George Mason University, **Fatah Kashanchi**, **Catherine Demarino**, **Michelle L Pleet**, **Daniel O Pinto** and **Maria Cowen**, Laboratory of Molecular Virology, School of Systems Biology, George Mason University (1145-92-2817)

9:45AM ► (1468) *Mathematical models of adoptive cell transfer approach for cancer immunotherapy.* Preliminary report.
Feng Fu, Dartmouth College (1145-92-1747)

10:00AM ► (1469) *Investigating the effects of cancerous stem cells on tumor growth.* Preliminary report.
Emek Kose, St. Mary's College of Maryland, **Allison L Lewis***, Lafayette College, and **Elizabeth Zollinger**, St. Joseph's College New York (1145-92-1519)

10:15AM ► (1470) *Cellular-Scale Modeling of Oncogenic Proteins.*
Bernardo A Hernandez Adame*, Massachusetts Institute of Technology, **Erin Stafford**, Tulane University, **Amanda McAdams**, Washington University in St. Louis, and **Jonathan Galvan Bermudez**, Universidad de Guanajuato (1145-92-1387)

10:30AM ► (1471) *A mathematical model of breast cancer cell motion through a microfluidic device.* Preliminary report.
Jared O Barber* and **Luoding Zhu**, Indiana University-Purdue University Indianapolis (1145-92-3023)

AMS Contributed Paper Session on Numerical Analysis, II

8:00 AM – 10:25 AM **Room 311, BCC**

8:00AM (1472) *The Hodge Laplacian on Axisymmetric Domains.*
Minah Oh, James Madison University (1145-65-1068)

8:15AM (1473) *Weak Galerkin finite element method for Poisson's Equations.* Preliminary report. **Yinlin Dong**, University of Central Arkansas (1145-65-1101)

8:30AM (1474) *A class of upper and lower triangular splitting iteration methods for image restoration.* **Xinyun Zhu***, Department of Mathematics, UT Permian Basin, **Hong-tao Fan**, Lanzhou University, **Mehdi Bastani**, University of Mohaghegh, and **Bing Zheng**, Lanzhou University (1145-65-319)

8:45AM (1475) *Estimating Structured, Time-Varying Parameters via Nonlinear Filtering.* **Andrea Arnold**, Worcester Polytechnic Institute (1145-65-3028)

9:00AM (1476) *Majorizing Sequences for Iterative Methods with Applications.* **Samundra Regmi***, Cameron University, and **Ioannis K. Argyros**, Cameron Univesity (1145-65-1885)

9:15AM (1477) *Peregrine solitons and gradient catastrophes in continuum and discrete models: Theory and Computation.* **Efstathios Georgios Charalampidis**, University of Massachusetts (1145-65-978)

9:30AM (1478) *Unified Bayesian Networks for Uncertain Inputs and Partial Model Ensembles.* **Sean Ryan Breckling***, **Daniele Schiavazzi** and **Thomas Juliano**, University of Notre Dame (1145-65-2037)

9:45AM (1479) *Energy Stable DG-FE Schemes For Diffuse Interface Models.* **Andreas C. Aristotelous**, West Chester University of Pennsylvania (1145-65-2801)

10:00AM (1480) *A Finite Volume - Alternating Direction Implicit Method for the Valuation of American Options under the Heston Model.* **Jiacheng Cai***, Salisbury University, and **Hongtao Yang**, University of Nevada, Las Vegas (1145-65-360)

10:15AM (1481) *A dynamically balanced numerical method for solving stochastic Heston volatility option pricing model equations.* **Chong Sun*** and **Qin Sheng**, Baylor University (1145-65-558)

MAA Contributed Paper Session on Ethnomathematics: Ideas and Innovations in the Classroom

8:00 AM – 10:35 AM **Room 301, BCC**

Organizers: **Janet Beery**, University of Redlands
Antonia Cardwell, Millersville University of Pennsylvania
Ximena Catepillan, Millersville University of Pennsylvania
Amy Shell-Gellasch, Eastern Michigan University

8:00AM (1482) *Teaching ethnomathematics courses to a variety of student audiences.* **Thomas Gilsdorf**, Central Michigan University (1145-B1-31)

8:20AM (1483) *Multicultural Mathematics for Teachers: Making Mathematics Relevant for a Diverse Student Population.* **Elizabeth (Betty) C. Rogers**, Piedmont College (1145-K1-2971)

8:40AM (1484) *Math Chavrusa: A Partnership Learning Model.* Preliminary report. **Rochy Flint**, Teachers College, Columbia University (1145-K1-1372)

9:00AM (1485) *What Graphs Support Good Blockade Games?* Preliminary report. **Darrah Chavey**, Beloit College (1145-K1-2972)

9:20AM (1486) *Maya Mathematics in a Geometry Classroom.* **Cynthia J. Huffman**, Pittsburg State University (1145-K1-269)

9:40AM (1487) *Ethnomathematics of India.* **Satish C Bhatnagar**, University of Nevada Las Vegas (1145-K1-255)

10:00AM (1488) *Ancient Indian Verse and the Powers of 2.* **Amy Shell-Gellasch**, Eastern Michigan University (1145-K1-634)

10:20AM (1489) *Designing Sustainable Information And Communications Technology (ICT) Educational Tools For The Teaching And Learning Of Ethnomathematics In The 21st Century.* **Henry Musisi**, St. Mary's College Kisubi (1145-K1-143)

MAA Contributed Paper Session on Inquiry-Based Learning and Teaching, II

8:00 AM – 10:55 AM **Room 339, BCC**

Organizers: **Susan Crook**, Loras College
Eric Kahn, Bloomsburg University
Brian Katz, Augustana College
Amy Ksir, United States Naval Academy
Victor Piercey, Ferris State University
Candice Price, University of San Diego
Xiao Xiao, Utica College

8:00AM (1490) *A Transition-to-Graduate-School Boot Camp Using Active Learning and Primary Historical Sources: Revelations and Transformations.* **Sarah S Hagen**, Oregon State University (1145-O5-2196)

8:20AM (1491) *Reinventing the graduate boot camp.* **Alex D Austin**, UCLA (1145-O5-2980)

8:40AM Break.

9:20AM ► (1492) *Statistics Reimagined: The Courage to Make Substantial Changes.*
Brandon Samples, Georgia College (1145-O5-2849)

9:40AM (1493) *Using Computer Simulations to Promote Conjecture in an IBL Dynamical Systems Course.*
Thomas LoFaro, Gustavus Adolphus College (1145-O5-237)

10:00AM ► (1494) *Inquiry-Oriented Laplace Transforms.* Preliminary report.
Mami T. Wentworth* and **Melvin S. Henriksen**, Wentworth Institute of Technology (1145-O5-2058)

10:20AM ► (1495) *Connecting Calculus to the Real World through a FAST, Fun, and Furious Problem.*
Candice M. Quinn, Middle Tennessee State University (1145-O5-1558)

10:40AM (1496) *Can turtles do math? Exploring different number-bases through a novel task.*
Samuel D Reed, Middle Tennessee State University (1145-O5-2349)

MAA Contributed Paper Session on Mathematical Experiences and Projects in Business, Industry, and Government (BIG)

8:00 AM – 10:55 AM **Room 304, BCC**

Organizers: **Robert Burks**, Naval Postgraduate School
Allen Butler, Wagner Associates

8:00AM ► (1497) *Mathematics and Nuclear Nonproliferation: Big Data, Hard Problems, and Real Impacts.*
Aaron Luttman, Nevada National Security Site (1145-K5-57)

8:20AM ► (1498) *A Cost-Benefit Analysis of Cyber Defense Improvements.*
Tung T. Thai, Wentworth Institute of Technology (1145-K5-1237)

8:40AM ► (1499) *Machine Learning and Monte Carlo at NASA.*
Tom Cuchta* and **Robert J. Niichel**, Fairmont State University (1145-K5-2571)

9:00AM ► (1500) *Trash Talking: Making Connections with the Waste / Recycling Industry.*
Darren Narayan, Rochester Institute of Technology (1145-K5-92)

9:20AM ► (1501) *The automated scoring of mathematics responses containing text and equations.*
James H Fife, Educational Testing Service (1145-K5-561)

9:40AM (1502) *An Economic Production Quantity Model for a Multi-Stage Production Process with Raw Material and Quality.*
Abdul-Nasser El-Kassar, Lebanese American University (1145-K5-2905)

10:20AM (1503) *Optimal Vehicle Fleet Size and Fleet Management Control.*
Jeffrey Yeh*, California State Polytechnic University, Pomona, **Skyler Seto**, Cornell University, **Takahiro Noguchi**, University of Tsukuba, **Sakura Hoshi**, Tohoku University, and **Yuya Ota**, Soka University (1145-K5-2215)

10:40AM (1504) *Mentoring Undergraduate Research Projects in Industrial Mathematics.*
Mihhail Berezovski, Embry-Riddle Aeronautical University (1145-K5-2839)

MAA Contributed Paper Session on Mathematics and the Arts, IV

8:00 AM – 10:55 AM **Room 306, BCC**

Organizers: **Karl Kattchee**, University of Wisconsin-LaCrosse
Douglas Norton, Villanova University
Anil Venkatesh, Ferris State University

8:00AM ► (1505) *Learning to Love Math through the Exploration of Art in Culturally Responsive Context.* Preliminary report.
Mara Alagic, Wichita State University (1145-D1-2962)

8:20AM ► (1506) *Creating an Art+Math Upper-Level General-Education Mathematics and Studio Art Course.* Preliminary report.
Kerri Cushman and **M. Leigh Lunsford***, Longwood University (1145-D1-2493)

8:40AM ► (1507) *Mathematics and Art in Spain: Planning a Faculty-Led Travel Course.* Preliminary report.
Mark A Branson, Stevenson University (1145-D1-1930)

9:00AM ► (1508) *Geometry mined from architectural design.*
Maureen T. Carroll, University of Scranton, and **Elyn Rykken***, Muhlenberg College (1145-D1-1648)

9:20AM ► (1509) *Simultaneously Visualizing Symmetry Subgroups.*
David A Reimann, Albion College (1145-D1-2989)

9:40AM ► (1510) *De Brujin Sequences for Change Ringing.* Preliminary report.
Kurt E Ludwick, Salisbury University (1145-D1-2686)

10:00AM ► (1511) *Enumeration of Internal Symmetries in Musical 12-Tone Rows.*
Anil Venkatesh, Ferris State University (1145-D1-1043)

10:20AM ► (1512) *Cubes Underscore Art: Exploring How Algebraic Structures Support Aesthetic Patterns on nxnxn Rubik's Cube-type Puzzles.*
David Plaxco, Clayton State University (1145-D1-858)

MAA Contributed Paper Session on Open Educational Resources: Combining Technological Tools and Innovative Practices to Improve Student Learning

8:00 AM – 10:55 AM **Room 303, BCC**

Organizers: **Benjamin Atchison**, Framingham State University
Marianna Bonanome, New York City College of Technology
Margaret Dean, Borough of Manhattan Community College
Annie Han, Borough of Manhattan Community College
Michael Gage, University of Rochester

► 8:00AM (1513) *Discussion of Various Technical Strategies Used in College Math Teaching.* Preliminary report.
Lina Wu, Borough of Manhattan Community College-The City University of New York (1145-L1-870)

8:20AM (1514) *Effectiveness of Adopting Open Educational Resources Platforms in Blended Learning: Undergraduate Mathematics Student Learning, Achievement, and Perspectives on an Innovative Pedagogical Approach.*
Minsu Kim, University of North Georgia (1145-L1-1111)

► 8:40AM (1515) *SageMathCell and Automated Interactivity.*
D Scott Dillery, Lindsey Wilson College (1145-L1-1311)

9:00AM (1516) *Administering and using WeBWorK across the curriculum.*
Sieben Nandor, Northern Arizona University (1145-L1-2138)

9:20AM (1517) *MathJax v3: Modern Mathematical Typesetting for the Web.*
Davide P. Cervone*, Union College, and **Volker Sorge** (1145-L1-2335)

9:40AM (1518) *Edfinity: Enhancing traditional high-school education materials.*
Bob Carmichael*, Edfinity, and **Davide P Cervone**, Union College (1145-L1-2454)

► 10:00AM (1519) *From Animated GIFs to GeoGebra: Using GeoGebra to Create Some "Proofs Without Words".*
John Diamantopoulos, Northeastern State University (1145-L1-73)

► 10:20AM (1520) *From WebWork to Edfinity, Making the Transition.* Preliminary report.
Corey Irving, Santa Clara University (1145-L1-2222)

10:40AM (1521) *An Open Access Conversion Experience in Geometry.*
Michael P Hitchman, Linfield College (1145-L1-2382)

MAA Contributed Paper Session on Philosophy of Mathematics, II

8:00 AM – 10:50 AM **Room 302, BCC**

Organizers: **Bonnie Gold**, Monmouth University (retired)
Jeffrey Buechner, Rutgers University - Newark

► 8:00AM (1522) *Feynman's Funny Pictures.* Preliminary report.
Thomas D Morley, Georgia Institute of Technology (1145-L5-228)

► 8:30AM (1523) *What is a measure?* Preliminary report.
Daniel C. Sloughter, Furman University (1145-L5-1466)

► 9:00AM (1524) *Multiplicity of Logical Symbols: Why Is That a Thing?*
James R. Henderson, Penn State Behrend (1145-L5-1790)

► 9:30AM (1525) *What does mathematical terminology say about linguistic determinism?*
Kevin Iga, Pepperdine University (1145-L5-1687)

► 10:00AM (1526) *Mathematical Intuition and the Secret of Platonism.* Preliminary report.
Sergiy Koshkin, University of Houston-Downtown (1145-L5-740)

10:30AM (1527) *Wittgenstein and Social Constructivism.*
Ilhan M. Izmirli, George Mason University (1145-L5-1343)

MAA Contributed Paper Session on Research in Undergraduate Mathematics Education(RUME), III - the Teaching and Learning of Proof and Upper-division Math

8:00 AM – 10:35 AM **Room 340, BCC**

Organizers: **Stacy Brown**, California State Polytechnic University
Megan Wawro, Virginia Tech
Aaron Weinberg, Ithaca College

► 8:00AM (1528) *Mathematics Students' Views of Proof and How They Change During an Introductory Proof Course.* Preliminary report.
David Miller and **Joshua Case***, West Virginia University (1145-J5-1866)

► 8:20AM (1529) *An In-Depth Investigation of How an Undergraduate Mathematics Student Learns the Concept of Proof.*
Shanah K. Grant* and **Draga D. Vidakovic**, Georgia State University (1145-J5-2675)

► 8:40AM (1530) *Making Proof Accessible to Undergraduate Students through Communal Engagement.* Preliminary report.
Yi-Yin Ko*, **Dalton Edgecomb** and **Nathan Kooi**, Indiana State University (1145-J5-1070)

9:00AM (1531) *How Can Instructors Fostering Mathematical Creativity Build Student Self-efficacy for Proving?*
Paul Regier* and **Milos Savic**, The University of Oklahoma (1145-J5-2473)

9:20AM (1532) *Real Analysis Mathematical Knowledge for Teaching: An Investigation.* Preliminary report.
Blain Patterson, North Carolina State University (1145-J5-239)

9:40AM ► (1533) *What is a rotation? Mapping student's evolving descriptions of 3-dimensional symmetries.* Preliminary report.
Anna Marie Bergman, Portland State University (1145-J5-2155)

10:00AM ► (1534) *Abstract Algebra Students' Use of Metaphors While Problem Solving.*
Rachel Rupnow, Virginia Tech (1145-J5-739)

10:20AM ► (1535) *Mapping Mappings: Students' Reasoning on Morphisms in Both Linear and Abstract Algebra.*
Jeffrey Slye, University of Kentucky (1145-J5-2462)

MAA General Contributed Paper Session on Applied Mathematics, I

8:00 AM – 10:55 AM **Room 341, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

8:00AM (1536) *Estimating Error Of Matrix Function Approximation.*
Nasim Eshghi* and **Lothar Reichel**, Kent State University (1145-VN-1018)

8:15AM ► (1537) *A Minimal Time Solution to the Firing Squad Synchronization Problem with Von Neumann Neighborhood with Radius of Extent 2.*
Kathryn A. Boddie, University of Wisconsin-Milwaukee (1145-VN-1256)

8:30AM ► (1538) *Mathematical Modeling and Analysis of a Phytoplankton Competition Model Incorporating Preferential Nutrient Uptake.*
Thomas G Stojsavljevic, University of Wisconsin-Milwaukee (1145-VN-1263)

8:45AM (1539) *Time-delayed differential inclusions and contractibility of their solution sets.*
Vinicio R. Ríos, Professor/Universidad del Zulia (1145-VN-1325)

9:00AM (1540) *A super-Gaussian Poisson-Boltzmann model for electrostatic solvation energy calculation: EDC Analysis and Application on Protein Cavities.* Preliminary report.
Tania Hazra*, Misericordia University, Dallas, Pennsylvania, and **Shan Zhao**, University of Alabama, Tuscaloosa, Alabama (1145-VN-1551)

9:15AM (1541) *Modeling oncolytic viral therapy and the complex dynamics of innate and adaptive immunity.*
Kathleen Storey* and **Trachette Jackson**, University of Michigan (1145-VN-1553)

9:30AM ► (1542) *An axiomatic approach to aggregating individual preferences into a collective preference.*
Trevor A. Leach, University of Louisville (1145-VN-1560)

9:45AM (1543) *Averaging images through averaging Diffeomorphisms.*
Zicong Zhou* and **Guojun Liao**, University of Texas at Arlington (1145-VN-1618)

10:00AM ► (1544) *Approximating the Generalized Singular Value Expansion.*
Matthew Jacob Roberts, Michigan Technological University (1145-VN-1626)

10:15AM (1545) *Exact solutions of nonlinear partial differential equations.*
Alrazi Abdeljabbar, Khalifa University for Science and Technology (1145-VN-1717)

10:30AM (1546) *A Predictive Analytical Model for Stomach Cancer Data.*
Nawa Raj Pokhrel*, Xavier University of Louisiana, **Netra khanal**, University of Tampa, and **Chris P. Tsokos**, University of South Florida (1145-VN-2029)

10:45AM ► (1547) *Fair Contributions in a Nonlinear Stochastic Public Goods Game.*
Matthew Young* and **Andrew Belmonte**, Penn State (1145-VN-2153)

MAA General Contributed Paper Session on Modeling and Applications, III

8:00 AM – 10:40 AM **Room 348, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

8:00AM (1548) *Modeling Menstrual Cycle Follicle Dynamics with Applications.* Preliminary report.
Nicole M Panza, Francis Marion University (1145-VF-2793)

8:15AM (1549) *A Scalable Pluggable Cryptographic Algorithm for Enterprise Blockchain Sub-Channels.*
Robert S. Owor*, **Zephyrinus C. Okonkwo** and **Anilkumar Devarapu**, Albany State University (1145-VF-2870)

8:30AM ► (1550) *A Trust Model In Bootstrap Percolation.* Preliminary report.
Rinni Bhansali*, MIT PRIMES USA, and **Laura Schaposnik**, University of Chicago at Illinois (1145-VF-2955)

8:45AM ► (1551) *A First Semester Modeling Course for Applied Math First Year Students.* Preliminary report.
Amanda L Hattaway, Wentworth Institute of Technology (1145-VF-3000)

9:00AM ► (1552) *Defeating Ambiguity: Modeling Problems with Calculus.*
Andrew Plucker* and **William Corson**, United States Military Academy (1145-VF-301)

9:15AM ► (1553) *Modelling the effects of variations in corporate tax effort on revenue output in Zimbabwe.*
Leonard Mushunje, Midlands State University, Zimbabwe. (1145-VF-3032)

9:30AM ► (1554) *Predator-prey dynamics of bald eagles and glaucous-winged gulls at Protection Island, Washington.*
Shandelle M. Henson, Andrews University, **Robert A. Desharnais**, California State University, Los Angeles, **Eric T. Funasaki***, Sul Ross State University, **Joseph G. Galusha**, Walla Walla University, **James W. Watson**, Washington Department of Fish and Wildlife, and **James L. Hayward**, Andrews University (1145-VF-413)

9:45AM ► (1555) *Modeling the Effects of the Macrophages on Bone Fracture Healing.*
Imelda Trejo*, **Hristo Kojouharov** and **Benito Chen-Charpentier**, The University of Texas at Arlington (1145-VF-842)

10:00AM ► (1556) *A Bayesian method for locating breakpoints in time series.* Preliminary report.
Sarah Neitzel*, Unity College, **Kathryn Haglich**, Lafayette College, **Amy Pitts**, Marist College, and **Jeffrey Liebner**, Lafayette College (1145-VF-85)

10:15AM ► (1557) *Efficacy of Control in a Spatially Dynamic Model of White-Nose Syndrome.*
Junyan Duan, Bryn Mawr College, **Mykhaylo Malakhov**, Andrews University, **Jordan Pellett***, University of Wisconsin- La Crosse, **Ishan Phadke**, The Pennsylvania State University, and **Julie Blackwood**, Williams College (1145-VF-979)

10:30AM ► (1558) *Adaptive Thresholding and Binarization.*
Mohamed Allali, Chapman University (1145-VF-2171)

MAA General Contributed Paper Session on Teaching and Learning Calculus, I

8:00 AM – 10:10 AM **Room 322, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

8:00AM ► (1559) *Practice makes perfect & explaining makes experts!* Preliminary report.
Karen B. McCready, King's College (1145-VJ-112)

8:15AM ► (1560) *Use of "Mathematica" as a classroom demonstration for Calculus and Differential Equation.*
Tanvir Prince, Hostos Community College, City University of New York (1145-VJ-1136)

8:30AM (1561) *Teaching Calculus Using Mathematica.*
Yun Lu, Kutztown University (1145-VJ-2277)

8:45AM ► (1562) *When has a Student Mastered Calculus? Mastery-Based Grading with a Final Exam in Calculus I.*
Alexander Halperin, Salisbury University (1145-VJ-1407)

9:00AM ► (1563) *RIP: The Best Approach to Integration by Parts.*
John A. Rock, Cal Poly Pomona (1145-VJ-1437)

9:15AM ► (1564) *Making Sequences and Series Accessible.*
Vincent J. Matsko, Independent educational consultant (1145-VJ-1988)

9:30AM ► (1565) *Consistent Intervention Model in Calculus Classes.*
Daniel L Kern* and **Menaka B Navaratna**, Florida Gulf Coast University (1145-VJ-1982)

9:45AM ► (1566) *Learning From Students' Errors-College Algebra and Calculus Examples.* Preliminary report.
Douglas Magomo, Florida SouthWestern State College (1145-VJ-183)

10:00AM ► (1567) *Using computing software in Calculus I: Replacing coding with dynamic visualizations.*
Christopher R. Cornwell, **Kristin M. Frank** and **Nathan G. McNew***, Towson University (1145-VJ-1846)

Project NExT Workshop

8:00 AM – 6:00 PM **Room 308, BCC**

MAA Panel

8:00 AM – 9:20 AM **Room 349, BCC**

Advanced Placement Calculus and Student Understanding

Organizer: **Gail Burrill**, Michigan State University

Panelists: **Gail Burrill**, Michigan State University
Stephen Davis, Davidson University
Brendan Murphy, John Bapst High School
Stephanie Ogden, College Board

Employment Center

8:00 AM – 5:30 PM **Exhibit Hall E, 100 Level, BCC**

AMS-MAA Grad School Fair

8:30 AM – 10:30 AM **Exhibit Hall G, 100 Level, BCC**

Undergrads! Take this opportunity to meet representatives from mathematical science graduate programs.

MAA Invited Address

9:00 AM – 9:50 AM **Ballrooms I & II, 400 Level, BCC**

(1568) *A mathematical journey of culture, community, and collaboration.*
Pamela Harris, Williams College (1145-A0-18)

ASL Invited Address

9:00 AM – 9:50 AM **Room 315, BCC**

(1569) *Ramsey theory of the Henson graphs.*
Natasha Dobrinen, University of Denver (1145-03-1818)

MAA Minicourse #1: Part B

9:00 AM – 11:00 AM **Holiday Ballroom 1, 2nd Floor, Hilton**

Mathematical Inquiry and Writing through Sports

Presenters: **Eric Kahn**, Bloomsburg University
Tricia Muldoon Brown, Georgia Southern University

MAA Minicourse #7: Part B

9:00 AM – 11:00 AM **Holiday Ballroom 3, 2nd Floor, Hilton**

Using Data Applications to Inspire Linear Algebra Topics in the Classroom

Presenters: **Tom Asaki**, Washington State University
Amanda Harsy, Lewis University
Heather A. Moon, Lewis-Clark State College
Marie A. Snipes, Kenyon College

MAA Minicourse #6: Part A

9:00 AM – 11:00 AM **Holiday Ballroom 2, 2nd Floor, Hilton**

Visualizing Multivariable Calculus & Differential Equations using CalcPlot3D

Presenters: **Paul E. Seeburger**, Monroe Community College
Monica VanDieren, Robert Morris University

AMS Contributed Paper Session on Sequences, Approximations, and Fourier Analysis

9:00 AM – 10:55 AM **Room 334, BCC**

► 9:00AM (1570) *Orlicz function and some paranormed difference $\mathbb{C}_2$-sequence spaces.* Preliminary report.
Sukhdev Singh*, Lovely Professional University, Punjab, India, and **Sanjeev Kumar**, Dr. B. R. Ambedkar University, Agra, India (1145-40-994)

9:15AM (1571) *Design of Golay sequences in Zak space.* Preliminary report.
Andrzej K. Brodzik, Boston University and Technical University of Gdansk (joint) (1145-40-1697)

9:30AM (1572) *A Dual Kaczmarz Algorithm.* Preliminary report.
Anna Aboud, Iowa State University (1145-41-2795)

9:45AM (1573) *Semidiscrete approximation of linear neutral delay differential equations.*
Catherine Payne*, Winston-Salem State University, and **R. Fabiano**, University of North Carolina-Greensboro (1145-41-2622)

► 10:00AM (1574) *Theoretical Nanoparticle Light Scattering.*
Jacob D Austin*, **Katlyn V York** and **Kaylee R Grabarkewitz**, Simpson College (1145-41-1979)

10:15AM (1575) *Coifman–Meyer multipliers: Leibniz-type rules and applications to scattering of solutions to PDEs.*
Virginia Naibo and **Alex Thomson***, Kansas State University (1145-42-1689)

10:30AM (1576) *Fourier Bases on the Skewed Sierpinski Gasket.*
Calvin F Hotchkiss, University of Delaware (1145-42-1891)

► 10:45AM (1577) *Zeros of Optimal Functions in the Cohn-Elkies Sphere Packing Theorem.*
Nina Zubrilina, Stanford University (1145-42-2706)

MAA Contributed Paper Session on Inclusive Excellence - Attracting, Involving, and Retaining Women and Underrepresented Groups in Mathematics, I

9:00 AM – 10:55 AM **Room 305, BCC**

Organizers: **Francesca Bernardi**, University of North Carolina at Chapel Hill
Meghan DeWitt, St Thomas Aquinas College
Semra Kilic-Bahi, Colby-Sawyer College
Minah Oh, James Madison University

9:20AM ► (1578) *Dimensions of an Equity-Based Mathematics Program.* **Helen Burn***, Highline College, **Vilma Mesa**, University of Michigan, **J. Luke Wood**, San Diego State University, and **Eboni Zamani-Gallaher**, University of Illinois at Urbana-Champaign (1145-Q1-313)

9:40AM ► (1579) *Lamar University STEM Students of Color Alliance.* Preliminary report. **Jacqueline Jensen-Vallin**, Lamar University (1145-Q1-381)

10:00AM ► (1580) *The Jackson State University Girls Engaging in the Mathematical Sciences Program: A Summer Enrichment Experience for Middle School Girls.* Preliminary report. **Jana Talley*** and **Carmen Wright**, Jackson State University (1145-Q1-623)

10:20AM ► (1581) *PREParing underrepresented students through Intensive Summer STEM Program.* Preliminary report. **Liz Andrus**, **Daniel Horns**, **Violeta Vasilevska*** and **Krista Ruggles**, Utah Valley University (1145-Q1-636)

10:40AM ► (1582) *A math enrichment program for underserved 4th and 5th grade students.* Preliminary report. **Ryan Roger Moruzzi, Jr**, University of California, Riverside (1145-Q1-800)

MAA Poster Session: Recreational Mathematics: Puzzles, Card Tricks, Games, and Gambling

9:00 AM – 11:00 AM **MAA Pavilion, Exhibit Hall F, 100 Level, BCC**

Organizers: **Paul Coe**, Dominican University
Darren Glass, Gettysburg College
Robert Vallin, Lamar University

Exhibits and Book Sales

9:30 AM – 5:30 PM **Exhibit Hall F, 100 Level, BCC**

MAA Panel

9:35 AM – 10:55 AM **Room 349, BCC**

Increasing Diversity and Retention in STEM Through Math-Focused First-Year Seminars

Organizer: **Laramie Paxton**, Washington State University

Panelists: **Carlos Castillo-Garsow**, Eastern Washington University
Maria Fung, Worcester State University
Guadalupe Lozano, University of Arizona
Shahriar Shahriari, Pomona College
Francis Su, Harvey Mudd College

MAA Workshop

9:45 AM – 10:55 AM **Room 324, BCC**

Discussing Project Ideas with NSF/EHR Program Officers, Part II

Organizer: **Karen Allen Keene**, National Science Foundation, Division of Undergraduate Education

Presenters: **Karen Allen Keene**, National Science Foundation, Division of Undergraduate Education
Karen King, National Science Foundation, Division of Research on Learning
Sandra Richardson, National Science Foundation, Division of Undergraduate Education
Tara Smith, National Science Foundation, Division of Graduate Education
Talitha Washington, National Science Foundation, Division of Undergraduate Education
Lee Zia, National Science Foundation, Division of Undergraduate Education

ASL Invited Address

10:00 AM – 10:50 AM **Room 315, BCC**

(1583) *35 years later: A fresh perspective on classifiable theories.* Preliminary report. **Michael Chris Laskowski**, University of Maryland (1145-03-664)

AMS Invited Address

10:05 AM – 10:55 AM **Ballrooms I & II, 400 Level, BCC**

► (1584) *The roaring twenties in American mathematics.* Preliminary report. **Karen Hunger Parshall**, University of Virginia (1145-01-36)

Radical Dash Prize Session

10:30 AM – 11:00 AM **Room 350, BCC**

Organizers: **Stacey Muir**, University of Scranton
Janine Janoski, Kings College

AMS-MAA Invited Address

11:10 AM – NOON **Ballrooms I & II, 400 Level, BCC**

► (1585) *Miracles of Algebraic Graph Theory.*
Daniel A Spielman, Yale University (1145-00-2547)

MAA Student Poster Session Judge's Orientation

NOON – 1:00 PM **Room 316, BCC**

AMS Colloquium Lectures: Lecture III

1:00 PM – 1:50 PM **Ballrooms I & II, 400 Level, BCC**

► (1586) *Complex multiplication: past, present, future.*
Benedict H. Gross, University of California San Diego (1145-11-35)

ASL Invited Address

1:00 PM – 1:50 PM **Room 315, BCC**

(1587) *Valuations and o-minimality.*
Jana Marikova, Western Illinois University (1145-03-1528)

MAA Lecture for Students

1:00 PM – 1:50 PM **Room 309/310, BCC**

► (1588) *Drawing conclusions from drawing a square.*
Annalisa Crannell, Franklin & Marshall College (1145-A0-135)

Current Events Bulletin

1:00 PM – 4:45 PM **Room 307, BCC**

Organizer: **David Eisenbud**, MSRI and UC Berkeley

1:00PM (1589) *Perfectoid geometry and its applications.*
Bhargav Bhatt, University of Michigan (1145-14-855)

2:00PM (1590) *Verifying quantum computations at scale: a cryptographic leash on quantum devices.*
Thomas Vidick, California Institute of Technology (1145-68-144)

3:00PM ► (1591) *The shuffle conjecture.*
Stephanie van Willigenburg, University of British Columbia (1145-05-168)

4:00PM (1592) *Tangent Developable Surfaces and the Equations Defining Algebraic Curves.*
Robert Lazarsfeld, Stony Brook University (1145-14-236)

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

1:00 PM – 5:50 PM **Room 343, BCC**

Organizers: **Darren A. Narayan**, Rochester Institute of Technology
Khang Tran, California State University, Fresno
Mark David Ward, Purdue University
John Wierman, The Johns Hopkins University

1:00PM ► (1593) *Transition Matrices for Young's Representations of S_n.* Preliminary report.
Sam Armon* and **Tom Halverson**, Macalester College (1145-05-1234)

1:30PM ► (1594) *Controlling Alternans in a Discrete Cardiac Cell Model.*
Jonathan Machado*, University of North Carolina at Greensboro, and **Pedro Vásquez**, University of Puerto Rico Mayagüez Campus (1145-39-107)

2:00PM ► (1595) *The Asymmetric Index of a Graph and Families of Asymmetric Graphs.*
Alejandra Brewer*, Florida Southern College, **Adam Gregory**, Western Carolina University, and **Quindel Jones**, Jackson State University (1145-05-109)

2:30PM ► (1596) *On the Classification of Graphs Based on Their Rank Numbers.*
Hayley Boynton, Texas State University, **Ethan Burroughs***, Rochester Institute of Technology, and **Stephanie Gaston**, California State University Dominguez Hills (1145-05-91)

3:00PM ► (1597) *Ramsey Problems for Cycles versus K_5.*
Melanie Ferreri*, Wake Forest University, and **Jacob Liddy**, University of Akron (1145-05-94)

3:30PM ► (1598) *Maximum proper diameter of 2-connected graphs.* Preliminary report.
Grant I. Fickes, Kutztown University of Pennsylvania, **Dylan P. Green***, Trevecca Nazarene University, **Karen B. McCready**, King's College, **Kathleen M. Ryan**, DeSales University, **Nathaniel J. Sauerberg**, Carleton College, and **Jill K. Stifano**, Fairfield University (1145-05-78)

4:00PM ► (1599) *Investigating shortest paths in generalizations of the Cantor Set.* Preliminary report.
Elene Karangozishvili, Lafayette College (1145-51-305)

4:30PM ► (1600) *Intersections of Shortest Taxicab Paths in the Sierpiński Carpet.* Preliminary report.
Rebekah Chase*, Evangel University, **Carl Hammarsten**, Lafayette University, **Ryan A Mike**, University of Colorado Boulder, and **Laura J Seaberg**, Haverford College (1145-51-159)

5:00PM ► (1601) *Leafiness of Trees.* Preliminary report. **Gary Gordon** and **Keith Vreeland***, Lafayette College (1145-05-271)

5:30PM ► (1602) *Classification of Solvable Leibniz Algebras with Abelian Nilradical and $k-1$ Dimensional Extension.* **Rustam Gaybullaev**, National University of Uzbekistan, **Abror Khudoyberdiyev**, National University of Uzbekistan, Institute of Mathematics Academy of Sciences of Uzbekistan, and **Kyla Pohl***, St. Olaf College (1145-17-1249)

AMS Special Session on Advances in Operator Theory, Operator Algebras, and Operator Semigroups, II

1:00 PM – 5:50 PM **Room 344, BCC**

Organizers: **Joseph Ball**, Virginia Tech
Marat Markin, California State University, Fresno
Igor Nikolaev, St. John's University
Ilya Spitkovsky, New York University, Abu Dhabi

1:00PM ► (1603) *Diagonals of positive operators - an alternative approach.* **Victor Kaftal**, University of Cincinnati (1145-47-1276)

1:30PM (1604) *Local Structure in Jordan-Lie Banach algebras.* **Alexander A. Katz**, St. John's University, NY (1145-46-1165)

2:00PM (1605) *The Maslov index and spectra of differential operators.* **Yuri Latushkin**, Univesrsity of Missouri (1145-47-162)

2:30PM (1606) *Inverse continuity of the numerical range map for Hilbert space operators.* **Brian C Lins***, Hampden-Sydney College, and **Ilya M. Spitkovsky**, New York University, Abu Dhabi (1145-47-1673)

3:00PM (1607) *On the Smoothness of Weak Solutions of an Abstract Evolution Equation with a Scalar Type Spectral Operator on the Real Axis.* Preliminary report. **Marat V. Markin**, California State University, Fresno (1145-47-1243)

3:30PM ► (1608) *Positive functionals on operator algebras on Pontryagin space Pi_1.* Preliminary report. **Sofya S Masharipova***, University of Pittsburgh Johnstown, and **Shukhrat M Usmanov**, Waldorf University (1145-46-1479)

4:00PM (1609) *Quantum dynamics of elliptic curves.* **Igor V. Nikolaev**, St. John's University (1145-46-443)

4:30PM (1610) *Non-Euclidean Metrics on the Resolvent Set.* **Mai Tran*** and **Rongwei Yang**, University at Albany, SUNY (1145-47-2290)

5:00PM (1611) *On the field recursion method for two-component composites.* **Aaron Thomas Welters**, Florida Institute of Technology (1145-47-2798)

5:30PM (1612) *A quantitative BT-theorem and applications.* **Laszlo Zsido**, University of Rome "Tor Vergata" (1145-46-2717)

AMS Special Session on Algebraic Structures Motivated by Knot Theory, II

1:00 PM – 5:50 PM **Room 346, BCC**

Organizers: **Mikhail Khovanov**, Columbia University
Jozef H. Przytycki, George Washington University
Alexander Shumakovitch, George Washington University

1:00PM (1613) *Crystal colorings of framed graph diagrams and categorifications.* Preliminary report. **Oleg Viro**, Stony Brook University (1145-57-982)

1:30PM (1614) *Stabilized Dehn-Thurston coordinates for curves on a closed surface and their applications.* **Charles D Frohman**, The University of iowa, **Joanna Kania-Bartoszynska***, National Science Foundation, and **Thang Le**, Georgia Tech (1145-57-2468)

2:00PM (1615) *The dimension of the Kauffman bracket skein algebra at roots of unity.* **Charles Frohman***, The University of Iowa, **Joanna Kania-Bartoszynska**, National Science Foundation, and **Thang Le**, Georgia Tech (1145-57-1110)

2:30PM (1616) *Skein Algebras and Teichmuller Theory.* Preliminary report. **Adam S Sikora**, University at Buffalo, SUNY (1145-57-2427)

3:00PM (1617) *Multi-sum representations of the colored Jones polynomial.* Preliminary report. **Uwe Kaiser***, Boise State University, and **Rama Mishra**, IISER Pune, Dr. Homi Bhabha Road, Pashan, Pune 411008, INDIA (1145-57-1817)

3:30PM ► (1618) *The action of the Kauffman bracket skein algebra of the torus on the skein module of a knot complement.* **Razvan Gelca**, Texas Tech University (1145-57-1665)

4:00PM (1619) *On the equivalence of Legendrian knots.* **Ivan Dynnikov**, Steklov Mathematical Institute of Russian Academy of Sciences (1145-57-1716)

4:30PM (1620) *Finite-type invariants of virtual knots and tangles.* **Nicolas Petit**, Oxford College of Emory University (1145-57-1009)

5:00PM (1621) *Crossing Matrices for Braids.*
Mauricio Gutierrez, Boston, Massachusetts, and **Zbigniew Nitecki***, Tufts University, Medford, MA 02155 (1145-57-901)

5:30PM (1622) *Polynomial braid combing.*
Marithania Silvero, Universidad del País Vasco (1145-55-591)

AMS Special Session on Analytic Number Theory, II

1:00 PM – 5:50 PM **Room 319, BCC**

Organizers: **Thomas A. Hulse**, Boston College
Angel V. Kumchev, Towson University
Nathan McNew, Towson University
John Miller, The Johns Hopkins University

1:00PM (1623) *Some algebraic contributions to Waring's problem.*
Paul Pollack, University of Georgia (1145-11-1217)

1:30PM (1624) *Irreducible quadratic polynomials and Euler's function.*
Noah Lebowitz-Lockard, University of Georgia (1145-11-58)

► 2:00PM (1625) *Weak subconvexity without a Ramanujan hypothesis.*
Kannan Soundararajan and **Jesse Thorner***, Stanford University (1145-11-49)

2:30PM (1626) *Value-distribution of cubic Hecke L-functions.*
Amir Akbary, University of Lethbridge, and **Alia Hamieh***, University of Northern British Columbia (1145-11-454)

3:00PM (1627) *Coordinate distribution of Gaussian primes.* Preliminary report.
John Friedlander*, Department of Mathematics, University of Toronto, and **Henryk Iwaniec**, Rutgers University (1145-11-522)

3:30PM (1628) *Additive Twists of Fourier Coefficients.*
Alia Hamieh, University of Northern British Columbia, and **Naomi Tanabe***, Bowdoin College (1145-11-1172)

4:00PM (1629) *Moments of other random multiplicative functions.*
Asif Ali Zaman, Stanford University (1145-11-1039)

4:30PM (1630) *Extremal primes for elliptic curves without complex multiplication.*
Chantal David, Concordia University, **Ayla Gafni***, University of Rochester, **Amita Malik**, Rutgers University, **Neha Prabhu**, Queens University, and **Caroline Turnage-Butterbaugh**, Carleton College (1145-11-910)

► 5:00PM (1631) *Equidistribution of sequences on the p-adic unit ball.*
Naveen Somasunderam* and **Clayton Petsche**, Oregon State University, Corvallis (1145-11-986)

5:30PM (1632) *The Erdős conjecture for primitive sets.*
Jared Duker Lichtman, University of Cambridge, and **Carl Pomerance***, Dartmouth College (1145-11-627)

AMS Special Session on Arithmetic Statistics, II

1:00 PM – 5:50 PM **Room 318, BCC**

Organizers: **Michael Chou**, Tufts University
Robert Lemke Oliver, Tufts University
Ari Shnidman, Center for Communications Research-Princeton

► 1:00PM (1633) *2^k?-Selmer groups and Goldfeld's conjecture.*
Alexander Smith, Harvard University (1145-11-1939)

1:30PM (1634) *Ranks, 2-Selmer groups, and Tamagawa numbers of elliptic curves with $\mathbb{Z}/2\mathbb{Z} \times \mathbb{Z}/8\mathbb{Z}$-torsion.*
Stephanie Chan, University College London (1145-11-2100)

► 2:00PM (1635) *The second moment of the number of integral points on elliptic curves is bounded.*
Levent Hasan Ali Alpöge*, Princeton University, and **Wei Ho**, University of Michigan (1145-11-2080)

2:30PM (1636) *Binary quartic forms with vanishing J-invariant.*
Stanley Yao Xiao, University of Toronto (1145-11-493)

3:00PM (1637) *Joint Shapes of Quartic Fields and Their Cubic Resolvents.*
Piper H*, University of Hawaii at Manoa, and **Christelle Vincent**, The University of Vermont (1145-11-2224)

3:30PM (1638) *Shapes of sextic $C_3 \wr C_2$-fields: equidistribution, Malle's conjecture, and detection of log terms in Klüners; counterexample.*
Robert Harron, University of Hawai'i at Manoa, and **Erik Holmes***, University of Hawaii at Manoa (1145-11-2922)

4:00PM (1639) *Inductive Methods for Counting Number Fields.*
Robert J Lemke Oliver, Tufts University, **Jiuya Wang***, Duke University, and **Melanie Matchett Wood**, University of Wisconsin, Madison (1145-11-1664)

4:30PM (1640) *A non-abelian version of Cohen-Lenstra heuristics.*
Yuan Liu* and **Melanie Matchett Wood**, University of Wisconsin-Madison (1145-11-1907)

5:00PM (1641) *Malle's conjecture on Frobenius groups.* **Harsh A Mehta**, University of South Carloina (1145-11-76)

5:30PM (1642) *Counting points, counting fields, and heights on stacks.* **David Zureick-Brown***, Emory University, **Jordan Ellenberg**, University of Wisconsin-Madison, and **Matthew Satriano**, Waterloo (1145-11-491)

AMS Special Session on Geometric and Topological Combinatorics, II

1:00 PM – 5:50 PM **Room 320, BCC**

Organizers: **Anastasia Chavez**, University of California, Davis

Jamie Haddock, University of California, Davis

Annie Raymond, University of Massachusetts, Amherst

1:00PM (1643) *Constructing Counterexamples to a Conjecture of Perles.* **Joseph Doolittle**, University of Kansas (1145-05-913)

► 1:30PM (1644) *Deformation dimension of zonotopes.* Preliminary report. **Raman Sanyal**, Goethe University Frankfurt, and **Josephine Yu***, Georgia Tech (1145-52-1792)

2:00PM (1645) *Completely log-concave polynomials and applications to matroids.* **Nima Anari**, Stanford, **KuiKui Liu**, **Shayan Oveis Gharan**, University of Washington, and **Cynthia Vinzant***, North Carolina State University (1145-05-1753)

2:30PM (1646) *Finiteness theorems for matroid complexes with prescribed homotopy type.* **Federico Castillo**, University of Kansas, and **Jose Alejandro Samper***, University of Miami (1145-05-602)

► 3:00PM (1647) *Random Monomial Ideals.* **Lily Silverstein**, University of California, Davis (1145-05-2170)

3:30PM (1648) *Using random polynomials in extremal graph theory.* **Michael Tait**, Carnegie Mellon University (1145-05-949)

► 4:00PM (1649) *Envy-free division of a cake without the "hungry players" assumption.* **Frederic Meunier**, Universite Paris Est, CERMICS, and **Shira Zerbib***, University of Michigan (1145-05-2051)

► 4:30PM (1650) *Multilabeled versions of Sperner's and Fan's lemmas and applications.* **Francis Edward Su***, Harvey Mudd College, and **Frédéric Meunier**, Universit´e Paris-Est (1145-52-2025)

5:00PM (1651) *Weak order and descents for monotone triangles.* **Zachary Hamaker***, University of Michigan, and **Victor Reiner**, University of Minnesota (1145-05-1677)

5:30PM (1652) *Ehrhart Tensor Polynomials.* **Sören Berg**, TU Berlin, **Katharina Jochemko**, KTH Stockholm, and **Laura Silverstein***, TU Wien (1145-05-1909)

AMS Special Session on Geometric and Topological Generalization of Groups, II

1:00 PM – 3:20 PM **Room 347, BCC**

Organizers: **Amrita Acharyya**, University of Toledo

Bikash C. Das, University of North Georgia

1:00PM (1653) *On the quasi-isometric rigidity of a class of right-angled Coxeter groups.* **Jordan Bounds*** and **Xiangdong Xie**, Bowling Green State University (1145-20-798)

► 1:30PM (1654) *Latin Squares from Zoomorphic Images and Orthomorphisms of Groups.* Preliminary report. **Stephen M. Gagola, Jr.**, Kent State University (1145-20-1856)

2:00PM (1655) *Thickness of* Out$(A_1 * ... * A_n)$. **Saikat Das**, Rutgers-Newark (1145-20-2638)

2:30PM (1656) *Cofinite groupoids and their profinite completions.* **Amrita Acharyya***, University of Toledo, **Jon M Corson**, University of Alabama, and **Bikash C Das**, University of North Georgia (1145-20-1501)

3:00PM (1657) *Varieties of profinite graphs.* **Amrita Acharyya**, University of Toledo, **Jon M Corson**, University of Alabama, and **Bikash C Das***, University of North Georgia (1145-00-2946)

AMS Special Session on Geometry and Dynamics of Continued Fractions, II

1:00 PM – 5:50 PM **Room 337, BCC**

Organizers: **Anton Lukyanenko**, George Mason University

Joseph Vandehey, Ohio State University

1:00PM (1658) *α-continued fractions for infinitely many triangle groups.* Preliminary report. **Kariane Calta**, Vassar College, **Cor Kraaikamp**, Technische Universiteit Delft and Thomas Stieltjes Institute of Mathematics; Delft, the Netherlands, and **Thomas A. Schmidt***, Oregon State University (1145-37-1848)

1:30PM (1659) *Iwasawa continued fractions and higher-dimensional hyperbolic spaces.* **Joseph A. Vandehey***, The Ohio State University, and **Anton Lukyanenko**, George Mason University (1145-11-1684)

2:00PM (1660) *Coding geodesic flows and various continued fractions.*
Claire Merriman* and **Florin P. Boca**, University of Illinois at Urbana-Champaign (1145-37-1181)

2:30PM (1661) *α-expansions with odd partial quotients.*
Florin P Boca* and **Claire Merriman**, University of Illinois at Urbana-Champaign (1145-37-1184)

3:00PM ► (1662) *Generalized Farey Sequences.* Preliminary report.
Jeffrey C Lagarias, University of Michigan (1145-11-1443)

3:30PM Break

4:00PM ► (1663) *The Lagrange and Markov Spectra of Pythagorean triples.*
Byungchul Cha*, Muhlenberg College, and **Dong Han Kim**, Dongguk University (1145-11-744)

4:30PM (1664) *Dimension Spectrum for Complex and Real Continued Fractions with Restricted Entries.*
Mariusz Urbanski*, University of North Texas, **Vasilis Chousionis** and **Dmitry Leykehman**, University of Connecticut (1145-37-146)

5:00PM ► (1665) *Badly approximable numbers over imaginary quadratic fields.* Preliminary report.
Robet Hines, University of Colorado, Boulder (1145-11-777)

5:30PM (1666) *Is one-dimensional Diophantine approximation all about continued fractions?*
Dmitry Kleinbock, Brandeis University (1145-11-1852)

AMS Special Session on Harmonic Analysis, Partial Differential Equations, and Applications, II

1:00 PM – 5:50 PM **Room 328, BCC**

Organizers: **Russell Brown**, University of Kentucky
Irina Mitrea, Temple University

1:00PM ► (1667) *Two fun snapshots from classical harmonic analysis.*
Robert S. Strichartz, Math Dept. Cornell University, Ithaca NY 14853 (1145-42-222)

1:30PM (1668) *Approximations in the Direct Problem for Impedance Tomography.* Preliminary report.
George H Lytle, University of Kentucky (1145-35-906)

2:00PM (1669) *Extension of functions of vanishing mean oscillation in a domain.*
Almaz Butaev and **Galia Dafni***, Concordia University (1145-42-1290)

2:30PM (1670) *Estimates for the L^p Mixed Boundary Value Problem in $C^{1,1}$ Domains.* Preliminary report.
Laura Dawn Croyle*, Baldwin Wallace University, and **Russell Brown**, University of Kentucky (1145-35-1144)

3:00PM (1671) *The mixed problem for the linear Stokes system.* Preliminary report.
Katharine Ott, Bates College (1145-35-1035)

3:30PM (1672) *Quantitative homogenization with relatively soft inclusions.*
B Chase Russell, Penn State, Erie–The Behrend College (1145-35-850)

4:00PM (1673) *Oscillatory integrals and homogenization of elliptic systems with Robin boundary condition.*
Jun Geng, Lanzhou University, and **Jinping Zhuge***, University of Kentucky (1145-35-1203)

4:30PM ► (1674) *On the symmetrization of Cauchy-like kernels.* Preliminary report.
Loredana Lanzani*, Syracuse University, and **Malabika Pramanik**, U. British Columbia (1145-31-1633)

5:00PM (1675) *On the Dirichlet problem in cylindrical domains for evolution Oleinik–Radkevic PDE's : a Thychonov-type theorem.*
Alessia E. Kogoj*, University of Urbino, and **Ermanno Lanconelli**, University of Bologna (1145-35-764)

5:30PM (1676) *The obstacle problem for the fractional heat equation: properties of the free boundary.*
Agnid Banerjee, TIFR CAM, **Donatella Danielli***, Purdue University, **Nicola Garofalo**, University of Padova, and **Arshak Petrosyan**, Purdue University (1145-35-1510)

AMS Special Session on If You Build It They Will Come: Presentations by Scholars in the National Alliance for Doctoral Studies in the Mathematical Sciences, II

1:00 PM – 5:50 PM **Room 327, BCC**

Organizers: **David Goldberg**, Purdue University
Phil Kutzko, University of Iowa

1:00PM ► (1677) *On the maximum rectilinear crossing number of spiders.*
Joshua Fallon, Carnegie Mellon, **Kirsten Hogenson***, Colorado College, **Lauren Keough**, Grand Valley State University, **Mario Lomelí**, Universidad Autonoma de San Luis Potosi, **Marcus Schaefer**, DePaul University, and **Pablo Soberón**, Baruch College (1145-05-359)

1:30PM ► (1678) *Smoothing effect for solutions to the Dysthe equation.* Preliminary report.
Kristin M. Kurianski* and **Gigliola Staffilani**, Massachusetts Institute of Technology (1145-35-608)

2:00PM (1679) *Equilibrium States for (α, β)-transformations.*
Leonard Carapezza, Utah International Charter School, **Marco Antonio López***, Wake Forest University, and **Donald Robertson**, University of Utah (1145-37-883)

2:30PM ► (1680) *The almost-principal minors and ap-rank of symmetric matrices.*
Shaun M. Fallat, University of Regina, and **Xavier Martinez-Rivera***, Auburn University (1145-15-674)

3:00PM ► (1681) *Mathematical Model of Bone Regeneration in Bone Marrow-derived Mesenchymal Stem Cell Populations.* Preliminary report.
Ruqiah A Muhammad, University of Iowa (1145-92-781)

3:30PM (1682) *Modeling the Diet Dynamics of Children: the Roles of Socialization and the School Environment.*
Anarina L Murillo*, University of Alabama at Birmingham, **Muntaser Safan**, **Devina Wadhera** and **Carlos Castillo-Chavez**, Arizona State University (1145-34-386)

4:00PM ► (1683) *The use of Bayesian Logistic Models in Defense Analysis: a Case Study.* Preliminary report.
Keyla Pagan-Rivera, Institute for Defense Analyses (1145-62-570)

4:30PM ► (1684) *The Role of Recovery in Daphnia Epidemics.* Preliminary report.
Vanessa Rivera-Quinones*, Department of Mathematics, University of Illinois at Urbana-Champaign, **Tara Stewart**, Program of Ecology, Evolution, and Conservation Biology, University of Illinois at Urbana-Champaign, **Zoi Rapti**, Department of Mathematics, University of Illinois at Urbana-Champaign, and **Carla Caceres**, Department of Animal Biology, University of Illinois at Urbana-Champaign (1145-92-525)

5:00PM ► (1685) *The role of Varroa on the honeybee population dynamics: a modeling approach and the effect of brood-mite interaction.*
Komi S Messan, Cold Regions Research Engeneering Laboratory, **Marisabel Rodriguez Messan***, Dartmouth College, **Gloria Degrandi-Hoffman**, Carl Hayden Bee Research Center, USDA-ARS, and **Yun Kang**, Arizona State University (1145-37-2753)

5:30PM (1686) *Factorizations of Positive Definite Kernels.*
Aqeeb A Sabree, University of Iowa (1145-46-719)

AMS Special Session on Low Complexity Models in Data Analysis and Machine Learning, II

1:00 PM – 5:45 PM **Room 331, BCC**

Organizers: **Emily J. King**, University of Bremen, Germany
Nate Strawn, Georgetown University
Soledad Villar, New York University

1:00PM (1687) *Expressivity and structure of neural network spaces.*
Philipp Christian Petersen, University of Oxford (1145-41-1715)

2:00PM (1688) *Graph Neural Networks and Graph Scattering Transforms.*
Fernando Gama, **Alejandro Ribeiro***, University of Pennsylvania, and **Joan Bruna**, Courant Institute of Mathematical Sciences - NYU (1145-42-2281)

2:30PM ► (1689) *SUNLayer: stable denoising with generative models.* Preliminary report.
Soledad Villar, New York University (1145-32-2152)

3:00PM (1690) *Singular Values for ReLU layers.* Preliminary report.
Soeren Dittmer, University of Bremen (1145-41-1748)

3:30PM (1691) *SqueezeFit: Label-aware dimensionality reduction.*
Dustin G. Mixon, The Ohio State University (1145-52-2313)

4:00PM ► (1692) *Efficient Manifold Approximation with Spherelets.*
Didong Li*, **Minerva Mukhopadhyay** and **David B Dunson**, Duke University (1145-62-1044)

4:30PM (1693) *LDMNet: Low Dimensional Manifold Regularized Neural Networks.*
Wei Zhu*, **Qiang Qiu**, Duke University, **Jiaji Huang**, Baidu Silicon Valley AI Lab, **Robert Calderbank**, **Guillermo Sapiro** and **Ingrid Daubechies**, Duke University (1145-65-1029)

5:00PM (1694) *Dropout as a Low-Rank Regularizer for Matrix Factorization.*
Rene Vidal, Mathematical Institute for Data Science / Johns Hopkins University (1145-41-514)

AMS Special Session on Mathematical Analysis in Fluid Dynamics, II

1:00 PM – 5:50 PM **Room 336, BCC**

Organizers: **Yanqiu Guo**, Florida International University
Jinkai Li, South China Normal University
Jing Tian, Towson University
Yuncheng You, University of South Florida

1:00PM (1695) *Subsonic and Transonic shock flows in bounded nozzles.*
S. Weng, School of Mathematics and Stochastics, Wuhan University (1145-35-467)

1:30PM (1696) *Global regularity for parabolic incompressible fluid interfaces.*
Eduardo Garcia-Juarez, University of Pennsylvnia (1145-35-2063)

► 2:00PM (1697) *The emergence of higher-order structures in hydrodynamic flocking.*
Eitan Tadmor, University of Maryland (1145-76-832)

2:30PM (1698) *Properties of infinite energy solutions to the Navier-Stokes equations.*
Zachary Bradshaw*, University of Arkansas, and **Tai-Peng Tsai**, University of British Columbia (1145-35-214)

3:00PM (1699) *On the two-dimensional Kuramoto-Sivashinsky equation.*
Anna L Mazzucato, Penn State University (1145-35-625)

3:30PM (1700) *On the existence and uniqueness of the 3D compressible primitive equations of atmospheric dynamics*
Xin Liu* and **Edriss S. Titi**, Department of mathematics, Texas A&M university (1145-35-315)

4:00PM (1701) *Bounds on the attractor for the 2D Rayleigh-Bénard problem.* Preliminary report.
Michael S Jolly and **Yu Cao***, Indiana University (1145-76-2236)

4:30PM (1702) *Determining map for statistical data assimilation and applications.* Preliminary report.
Animikh Biswas, University of Maryland Baltimore County (1145-76-2683)

5:00PM (1703) *Global well-posedness for the 2D Boussinesq system with anisotropic viscosity and without heat diffusion.*
Adam Larios, University of Nebraska, Lincoln, **Evelyn Lunasin***, United States Naval Academy, and **Edriss S. Titi**, Texas A&M University, and Weizmann Institute of Science (1145-35-1631)

► 5:30PM (1704) *Well-posedness and ergodicity of three-dimensional Hall-magnetohydrodynamics system.*
Kazuo Yamazaki, University of Rochester (1145-76-1344)

AMS Special Session on Mathematical Investigations of Spatial Ecology and Epidemiology, II

1:00 PM – 5:50 PM **Room 325, BCC**

Organizers: **Leah Shaw**, College of William and Mary
Junping Shi, College of William and Mary
Zhisheng Shuai, University of Central Florida

► 1:00PM (1705) *How switching between movement modes improves foraging success in fragmented landscapes: exploring the benefits of context-dependent diffusion and advection.*
William F. Fagan*, **Tyler Hoffman**, **Daisy Dahiya**, University of Maryland, **Robert Stephen Cantrell** and **Chris Cosner**, University of Miami (1145-92-1273)

► 1:30PM (1706) *Uniqueness in constrained Hamilton-Jacobi equation and the dynamics of adaptation.* Preliminary report.
Vincent Calvez, Institut Camille Jordan, UMR 5208 CNRS & Universite Claude Bernard, and **King-Yeung Lam***, Department of Mathematics, The Ohio State University (1145-35-1870)

► 2:00PM (1707) *Evolutionary games in spatially and temporally variable environments.*
Sebastian Schreiber, University of California, Davis (1145-92-1586)

► 2:30PM (1708) *A periodic spatial model for population dynamics under seasonal changes.*
Ying Zhou, Department of Mathematics, Lafayette College (1145-45-1999)

► 3:00PM (1709) *One spot, two spot, red spot grew spots: How differential dispersal, phenology and the Allee effect predict pattern formation in mountain pine beetle impact.*
James A Powell, Department of Mathematics and Statistics, Utah State University (1145-92-2239)

3:30PM (1710) *Persistence and Extinction of Population in Reaction-Diffusion-Advection Model with Strong Allee Effect Growth.*
Yan Wang* and **Junping Shi**, The College of William and Mary (1145-92-1154)

4:00PM (1711) *Water Transport Shapes Banded Vegetation Patterns in Dryland Ecosystems.*
Sarah Iams*, Harvard University, **Punit Gandhi**, Mathematical Biosciences Institute, The Ohio State University, and **Mary Silber**, University of Chicago (1145-37-2406)

► 4:30PM (1712) *Water transport in models of dryland vegetation patterns.* Preliminary report.
Punit Gandhi*, Ohio State University, **Sara Bonetti**, ETH Zurich, **Sarah Iams**, Harvard University, **Amilcare Porporato**, Princeton University, and **Mary Silber**, University of Chicago (1145-92-2342)

► 5:00PM (1713) *Model of pattern formation in marsh ecosystems with nonlocal interactions.*
Sofya Zaytseva*, **Leah B. Shaw**, **Junping Shi**, William & Mary, **Romuald N. Lipcius** and **Matthew L. Kirwan**, Virginia Institute of Marine Science (1145-92-1970)

5:30PM ► (1714) *Biological Control with Nonlocal Interactions.*
Eric A. Autry*, Duke University, Department of Mathematics, **Alvin Bayliss** and **Vladimir A. Volpert**, Northwestern University, Department of Engineering Sciences and Applied Mathematics (1145-35-1051)

AMS Special Session on Mathematics in the Realm of Cyber Research, II

1:00 PM – 5:45 PM **Room 332, BCC**

Organizers: **Daniel Bennett**, Army Cyber Institute
Paul Goethals, United States Military Academy
Natalie Scala, Towson University

1:00PM ► (1715) *Blockchain Applications for Distributed Data.* Preliminary report.
James P Howard, II, Johns Hopkins University Applied Physics Laboratory (1145-68-3005)

2:00PM (1716) *Isogenous components of 2-dimensional reducible Jacobians.*
Lubjana Beshaj, Army Cyber Institute (1145-11-2286)

2:30PM ► (1717) *A Mathematical Model of Conciousness, with Applications to AI.* Preliminary report.
Jorge Diaz*, University of Puerto Rico at Rio Piedras, and **Christian Romero**, University of Puerto Rico at Carolina (1145-68-2164)

3:00PM ► (1718) *A Case Study of the Noordin Terrorist Network.*
Elie Alhajjar, United States Military Academy (1145-94-1228)

3:30PM (1719) *Topology of basic blocks.* Preliminary report.
Steve Huntsman*, BAE Systems FAST Labs, and **Michael Robinson**, American University (1145-55-141)

4:00PM ► (1720) *Quantum correlation sets and quantum communication.* Preliminary report.
Travis B Russell, United States Military Academy (1145-81-1229)

4:30PM (1721) *Cluster-based Vulnerability Assessment: Some Empirical Studies.*
Michel Cukier*, **Yazdan Movahedi**, University of Maryland - College Park, and **Ilir Gashi**, City University London (1145-68-2471)

5:00PM ► (1722) *Modeling Threats to Maryland's Electoral Voting System*
Paul L. Goethals*, United States Military Academy, and **Natalie M. Scala**, Towson University (1145-90-54)

AMS Special Session on Multiscale Problems in the Calculus of Variations, II

1:00 PM – 5:50 PM **Room 329, BCC**

Organizers: **Elisa Davoli**, University of Vienna, Austria
Rita Ferreira, King Abdullah University of Science and Technology, Saudi Arabia

1:00PM (1723) *A two-dimensional labile aether arising out of homogenization.*
G. A. Francfort, Universite Paris Nord, France (1145-74-548)

2:00PM (1724) *Relaxation of nonlocal supremal functionals.*
Carolin Kreisbeck*, Utrecht University, and **Elvira Zappale**, University of Salerno (1145-49-1272)

2:30PM (1725) *Stochastic Homogenisation of Free-Discontinuity Problems.*
Filippo Cagnetti, University of Sussex (1145-49-657)

3:00PM (1726) *A corrected Sadowsky functional for inextensible elastic ribbons.*
Lorenzo Freddi, Università di Udine, Italy, **Peter Hornung**, TU Dresden, Germany, **Maria Giovanna Mora***, Università di Pavia, Italy, and **Roberto Paroni**, Università di Pisa, Italy (1145-49-697)

4:00PM (1727) *Injective nonlinear elasticity: recent developments and new ideas for a computational approach.*
Stefan Krömer* and **Jan Valdman**, Institute of Information Theory and Automation of the CAS, Prague (1145-35-1332)

4:30PM (1728) *Second-order Gamma-convergence for Cahn-Hilliard energies.*
Ryan Murray, The Pennsylvania State University (1145-49-762)

5:00PM (1729) *Relaxation of Nonlocal Energies in the context of structured deformations.* Preliminary report.
Elvira Zappale, Università degli Studi di Salerno, Italy (1145-49-1536)

5:30PM (1730) *Analysis of a perturbed Cahn-Hilliard model for Langmuir-Blodgett films.* Preliminary report.
Marco Bonacini, Institute for Applied Mathematics, University of Bonn, **Elisa Davoli**, University of Vienna, and **Marco Morandotti***, Politecnico di Torino (1145-35-804)

AMS Special Session on Orthogonal Polynomials, Quantum Probability, Harmonic and Stochastic Analysis, I

1:00 PM – 5:50 PM **Room 321, BCC**

Organizers: **Nobuhiro Asai**, Aichi University of Education, Kariya, Japan

Rodica Costin, The Ohio State University

Aurel I. Stan, The Ohio State University at Marion

Hiroaki Yoshida, Ochanomizu University, Tokyo, Japan

1:00PM (1731) *Möbius inversion, Wick products, and product formulas.* Preliminary report. **Michael Anshelevich**, Texas A&M University (1145-46-738)

2:00PM (1732) *Quantum Structures from Association Schemes.* Preliminary report. **Radhakrishnan Balu**, US Army Research Lab (1145-81-161)

3:00PM (1733) *Exit Times and The Law of the Iterated Logarithm for a Class of SPDEs.* **Parisa Fatheddin***, University of Pittsburgh, **P. Sundar**, Louisiana State University, and **Jie Xiong**, Southern University of Science and Technology (1145-60-47)

3:30PM (1734) *Two-parameter eigenvalue problems for Jacobi matrices.* **Maxim Derevyagin**, University of Connecticut (1145-47-846)

4:00PM (1735) *Large deviations for additive functionals of semi-Markov processes.* **Adina Oprisan**, Canisius College (1145-60-1453)

4:30PM (1736) *On the hypercontractivity of a convolution operator.* **Florin Catrina***, St. John's Unviersity, and **Aurel I. Stan**, The Ohio State University at Marion (1145-44-686)

5:00PM (1737) *On the Variance of the Number of Roots of Complex Random Orthogonal Polynomials Spanned by OPUC.* **Aaron Michael Yeager**, Oklahoma State University (1145-60-69)

► 5:30PM (1738) *New degenerate Bernoulli and Euler polynomials arising from non-classical Umbral Calculus.* Preliminary report. **Orli Herscovici**, Department of Mathematics, Technion – Israel Institute of Technology (1145-11-295)

AMS Special Session on Recent Advances in Biological Modeling and Related Dynamical Analysis, II

1:00 PM – 5:50 PM **Room 326, BCC**

Organizers: **Joshi Raj Hem**, Xavier University

Yanyu Xiao, University of Cincinnati

► 1:00PM (1739) *Multiscale Competition Between Defective Interfering Particles and Wild Type Poliovirus.* **Adrienna Bingham***, William and Mary, **Elsa Rousseau**, IBM Almaden Research Center, **Leah Shaw**, William and Mary, **Simone Bianco**, IBM Almaden Research Center, and **Raul Andino**, University of California, San Francisco (1145-92-2503)

► 1:30PM (1740) *Target Reproduction Numbers: A General Framework for Threshold Parameters in Population Dynamics.* Preliminary report. **Zhisheng Shuai**, University of Central Florida (1145-92-2828)

► 2:00PM (1741) *Application of SIR Model and Optimal Control.* **Hem Raj Joshi**, Xavier University, Cincinnati, OH (1145-34-2269)

2:30PM (1742) *Transmission dynamics and oscillations in a model of West Nile virus.* **Chunhua Shan***, The University of Toledo, Ohio, USA, **Guihong Fan**, Columbus State University, Georgia, USA, and **Huaiping Zhu**, York University, Canada (1145-92-2050)

► 3:00PM (1743) *Role of the immune status of infected individuals on the transmission dynamics of HIV: From within-host to between-hosts models.* **Naveen K. Vaidya**, San Diego State University, California (1145-92-1867)

► 3:30PM (1744) *Growth on Two Limiting Essential Resources in a Self-Cycling Fermentor.* **Ting Hao Hsu**, Department of Mathematics/University of Miami, Coral Gables, **Tyler Meadows**, Department of Mathematics and Statistics/McMaster University, **Lin Wang**, Department of Matheamtics and Statistics/University of New Brunswick, and **Gail S.K. Wolkowicz***, Department of Mathematics and Statistics/McMaster University (1145-92-1568)

4:00PM (1745) *Impulse model of Leptospirosis in Cattle.* Preliminary report. **Ibrahim Halil Aslan**, University of Tennessee Knoxville (1145-92-498)

4:30PM (1746) *A renewal reward approach for studying intracellular transport models.* **Maria-Veronica Ciocanel***, Mathematical Biosciences Institute at the Ohio State University, **John Fricks**, Arizona State University, **Peter Kramer**, Rensselaer Polytechnic Institute, and **Scott McKinley**, Tulane University (1145-60-289)

5:00PM (1747) *Two Waves of Pandemic Influenza: An Agent-based Exploration.* Preliminary report. **Anna Mummert***, **Roger Estep**, Marshall University, **Robert Hughes**, Univeristy of Pennsylvania, and **Jessica Shiltz**, West Virginia Department of Health and Human Resources (1145-92-2625)

5:30PM ► (1748) *Social status-dependent regulation of endocannabinoids and modulation of spinal motor circuits: Empirical and computational analysis.* Preliminary report.
Sungwoo Ahn*, East Carolina University, Greenville, NC, **Choongseok Park**, North Carolina A&T State University, **Katie N Clements** and **Fadi A A Issa**, East Carolina University (1145-92-1355)

AMS Special Session on Recent Advances in Inverse Problems and Imaging, II

1:00 PM – 5:50 PM **Room 330, BCC**

Organizers: **Kui Ren**, University of Texas at Austin
Yang Yang, Michigan State University

1:00PM (1749) *Reduced Order Models For Spectral Domain Inversion: Galerkin Equivalence And Generation Of Internal Data.* Preliminary report.
Shari Moskow*, Drexel University, **Liliana Borcea**, University of Michigan, **Vladimir Druskin**, WPI, **Alex Mamonov**, University of Houston, and **M. Zaslavsky**, Schlumberger-Doll Research (1145-65-2410)

1:30PM (1750) *Resonances for Photonic Nanocavities and Their Optimal Design.*
Junshan Lin, Department of Mathematics and Statistics, Auburn University (1145-35-2191)

2:00PM (1751) *A backscattering model based on corrector theory of homogenization for the random Helmholtz equation.*
Olivier Pinaud, Colorado State University (1145-35-1038)

2:30PM (1752) *Low rankness in forward and inverse kinetic theory.*
Ke Chen, **Qin Li*** and **Steve Wright**, UW-Madison (1145-45-660)

3:00PM Break

3:30PM ► (1753) *Inversion and imaging with acoustic waves via model order reduction.*
Alexander V Mamonov*, University of Houston, **Vladimir Druskin**, Worcester Polytechnic Institute, and **Mikhail Zaslavsky**, Schlumberger-Doll Research Center (1145-65-948)

4:00PM (1754) *Global uniqueness for the semilinear fractional Schrödinger equation.*
Ru-Yu Lai*, University of Minnesota, and **Yi-Hsuan Lin**, University of Jyvaskyla (1145-35-862)

4:30PM (1755) *Reconstruction of acoustic and optical properties in PAT from multispectral data.*
Yimin Zhong*, University of California, Irvine, and **Kui Ren**, Columbia University (1145-03-1231)

5:00PM (1756) *On some new applications of the theory of A-analytic maps in Tomography.* Preliminary report.
Kamran Sadiq, Radon Institute for Computational and Applied Mathematics, and **Alexandru Tamasan***, University of Central Florida (1145-35-1282)

5:30PM (1757) *Theoretically exact solution of the inverse source problem for the wave equation with spatially and temporally reduced data.*
Ngoc Do* and **Leonid Kunyansky**, University of Arizona (1145-35-601)

AMS Special Session on Stochastic Analysis and Applications in Finance, Actuarial Science and Related Fields, II

1:00 PM – 5:50 PM **Room 345, BCC**

Organizers: **Julius N. Esunge**, University of Mary Washington
See Keong Lee, University of the Sciences, Malaysia
Aurel I. Stan, The Ohio State University at Marion

1:00PM ► (1758) *Forecasting Monthly Stock Return through K-Means Clustering and Support Vector Machine.* Preliminary report.
Chong Sun, Baylor University (1145-62-885)

1:30PM ► (1759) *Credit Risk Valuation Based on Machine Learning.*
Xuan Xu, Tsinghua University, and **Yifan Wu***, Beijing Normal University (1145-91-2244)

2:00PM (1760) *Asymptotic analysis of the expected utility maximization problem with respect to perturbations of the numeraire.*
Oleksii Mostovyi, University of Connecticut (1145-60-404)

2:30PM (1761) *The expected utility model on carrying capacity allocation for express carriers.*
Cheng-Chang Lin, Dept. Transportation Science, National Cheng Kung University (1145-90-294)

3:00PM ► (1762) *Contagion in Heterogeneous Financial Networks.*
Yuanying Guan* and **Micah Pollak**, Indiana University Northwest (1145-91-566)

3:30PM (1763) *Optimal trading rules in a partial observable market.*
Duy Nguyen, Marist College (1145-60-682)

4:00PM (1764) *Linear and Non Linear GARCH(p,q) - Delay Fokker Planck Equation.*
Isabelle Kemajou-Brown*, Morgan State University, **Rachel Kuske**, Georgia Institute of Technology, School of Mathematics, and **Fatemeh Norouzi**, Morgan State University (1145-60-2784)

4:30PM (1765) *Caputo and Canavati fractional Approximation by Choquet integrals.* **George A Anastassiou**, University of Memphis (1145-41-148)

5:00PM (1766) *Analysis of variance based financial instruments: swaps and price indices.* **Aziz Issaka***, University of North Carolina Charlotte, and **Indranil SenGupta**, North Dakota Sate University (1145-60-2565)

5:30PM (1767) *Hedging oil, corn, and soybean using the Barndorff-Nielsen and Shephard model.* **Indranil SenGupta***, **William Wilson** and **William Nganje**, North Dakota State University (1145-60-82)

AMS Special Session on Topology, Structure and Symmetry in Graph Theory, II

1:00 PM – 5:50 PM **Room 338, BCC**

Organizers: **Lowell Abrams**, George Washington University

Mark Ellingham, Vanderbilt University

1:00PM ► (1768) *The even-faced genus of complete graphs and the Even Map Color Theorem.* **Beifang Chen**, Hong Kong University of Science and Technology, China, **Mark Ellingham***, Vanderbilt University, **Nora Hartsfield**, deceased, **Serge Lawrencenko**, Russian State University of Tourism and Service, Russia, **Wenzhong Liu**, Nanjing University of Aeronautics and Astronautics, China, **Hui Yang**, Guizhou University, China, **Dong Ye** and **Xiaoya Zha**, Middle Tennessee State University (1145-05-818)

1:30PM ► (1769) *A new $Y\Delta$ equivalence class of projective planar maps.* **Atsuhiro Nakamoto*** and **Yuta Omizo**, Yokohama National University (1145-05-871)

2:00PM ► (1770) *Quadrangulated Immersions of Cubic Graphs in the Sphere.* **Lowell Abrams***, George Washington University, and **Vance Faber**, Big Pine Key, FL (1145-05-847)

2:30PM ► (1771) *Lobe- and Edge-Transitivity of Countable Graphs of Connectivity 1.* Preliminary report. **Jack E. Graver** and **Mark E. Watkins***, Syracuse University (1145-05-748)

3:00PM (1772) *Partial Duals of Oriented Embeddings.* **Jonathan L Gross***, Columbia University, **Toufik Mansour**, University of Haifa, and **Thomas W Tucker**, Colgate University (1145-05-733)

3:30PM (1773) *Log-Concavity for Graph Imbedding Polynomials.* Preliminary report. **Thomas W. Tucker***, Colgate University, **Jonathan L. Gross**, Columbia University, and **Toufik Mansour**, University of Haifa (1145-05-771)

4:00PM (1774) *Origami Knotting in Graphs.* Preliminary report. **Joanna A. Ellis-Monaghan**, Saint Michael's College (1145-05-792)

4:30PM (1775) *The Computational Power of Deterministic Tile Self-assembly.* **N. Jonoska***, University of South Florida, USA, **J. Durand-Lose**, Université d'Orléans, France, and **H.J. Hoogeboom**, Leiden University, the Netherlands (1145-05-1205)

5:00PM ► (1776) *Mathematical models for describing molecular self-assembly.* Preliminary report. **Margherita Maria Ferrari*** and **Nataša Jonoska**, University of South Florida (1145-92-904)

5:30PM ► (1777) *Applications of topological graph theory to 2-manifold learning.* **Steven Schluchter*** and **Tyrus Berry**, Department of Mathematical Sciences, George Mason University (1145-05-327)

MAA Invited Paper Session on Mathematical Thinking for Modern Data Science Problems

1:00 PM – 3:20 PM **Room 317, BCC**

Organizers: **Rick Cleary**, Babson College

Diana Thomas, U.S. Military Academy

1:00PM ► (1778) *Data Science for Mathematicians: What We Already Know and What We Need to Learn.* **Rick Cleary**, Babson College, and **Talithia Williams***, Harvey Mudd College (1145-AB-2016)

1:30PM ► (1779) *The Mathematics of Data Science with Applications to National Security.* **Mary Lynn Reed**, National Security Agency (1145-AB-1401)

2:00PM Discussion

2:30PM (1780) *Determining mathematically based thresholds from wearable sensors: Insights from NHANES accelerometer data.* **Bryan E Adams**, United States Military Academy (1145-AB-2071)

3:00PM ► (1781) *A machine learning approach relating 3D body scans to body composition in humans.* **James D Pleuss***, **Kevin Talty**, **Morse Steven**, **Patrick Kuiper**, **Michael Scioletti**, United States Military Academy, **Steven B. Heymsfield**, Pennington Biomedical Research Lab, and **Diana Thomas**, United States Military Academy (1145-AB-630)

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

1:00 PM – 5:50 PM **Room 314, BCC**

Organizers: **Sloan Despeaux**, Western Carolina University

Jemma Lorenat, Pitzer College
Daniel E. Otero, Xavier University
Adrian Rice, Randolph-Macon College

1:00PM ► (1782) *Mathematics and Justice in Ancient Egypt.*
Annette Imhausen, Department of History, Goethe-University Frankfurt, Germany (1145-01-595)

1:30PM ► (1783) *Serenus' Sections of a Cylinder and Sections of a Cone.* Preliminary report.
Colin B. P. McKinney, Wabash College (1145-01-2126)

2:00PM ► (1784) *The mathematics of eclipse diagrams in Sanskrit astronomy.*
Kim Plofker, Union College, NY (1145-01-2204)

2:30PM ► (1785) *Cracking Al-Kāshī's Tables.*
Elizabeth Cornwall, University of Canterbury/Dixie State University (1145-01-1429)

3:00PM ► (1786) *Max Dehn in America.* Preliminary report.
Marjorie Senechal, Smith College (1145-01-281)

3:30PM ► (1787) *Newton Has a Headache but Clairaut Makes it Go Away.*
Lawrence Arthur D'Antonio, Ramapo College of New Jersey (1145-01-1505)

4:00PM ► (1788) *Edward Hatton's Mercantile Mathematics.*
Duncan J. Melville, St. Lawrence University (1145-01-1503)

4:30PM ► (1789) *Moral Arithmetic: Decisions, values, and the likelihood of death from the Count de Buffon.* Preliminary report.
Dominic Klyve, Central Washington University (1145-01-1976)

5:00PM ► (1790) *Analysis and Synthesis in A.-M. Legendre's Éléments de géométrie.* Preliminary report.
Amy Ackerberg-Hastings, Independent Scholar (1145-01-689)

5:30PM ► (1791) *Servois on Numerical Integration.*
Robert E. Bradley* and **Salvatore J. Petrilli**, Adelphi University (1145-01-1128)

MAA Minicourse #3: Part B

1:00 PM – 3:00 PM **Holiday Ballroom 1, 2nd Floor, Hilton**

Advanced Authoring in WeBWorK: Turn good math problems into great ones & submit them to the OpenProblemLibrary

Presenters: **Marianna Bonanome**, NYC College of Technology
Samar ElHitti, NYC College of Technology
Michael E. Gage, University of Rochester
K. Andrew Parker, NYC College of Technology

MAA Minicourse #12: Part A

1:00 PM – 3:00 PM **Holiday Ballroom 3, 2nd Floor, Hilton**

Keep Teaching Statistics using R and RStudio

Presenters: **Shonda Kuiper**, Grinnell College
Randall Pruim, Calvin College

MAA Minicourse #4: Part B

1:00 PM – 3:00 PM **Holiday Ballroom 2, 2nd Floor, Hilton**

Teaching an Undergraduate Computational Science Course

Presenters: **Joseph Eichholz**, Rose-Hulman Insitute of Technology
Allen Holder, Rose-Hulman Insitute of Technology

AMS Contributed Paper Session on Combinatorics and Graph Theory, II

1:00 PM – 5:40 PM **Room 313, BCC**

1:00PM ► (1792) *Realization spaces of arrangements of 11 complex projective lines.* Preliminary report.
Jordan Buhmann, **Moshe Cohen***, **Alexander May** and **Shiyu Shu**, Vassar College (1145-05-1556)

1:15PM ► (1793) *Magnitude Homology: Structure and Torsion.*
Radmila Sazdanovic and **Victor William Summers***, North Carolina State University (1145-05-2876)

1:30PM ► (1794) *Matched Products and Stirling Numbers of Graphs.*
Daryl R. DeFod, CSAIL MIT (1145-05-1991)

1:45PM ► (1795) *Distinguishing numbers and generalizations.*
Caleb Ji, Washington University in St. Louis (1145-05-1028)

2:00PM ► (1796) *Advancing Results in Maximum Toughness.*
Kevin K Ferland, Bloomsburg University of PA (1145-05-270)

2:15PM (1797) *On the Discrepancy Between Two Zagreb Indices.*
Mehtaab Sawhney* and **Ashwin Sah**, Massachusetts Institute of Technology (1145-05-1270)

2:30PM ► (1798) *Failed power domination: complexity and other select results.*
Bonnie C Jacob*, **Abraham Glasser**, **Emily Lederman** and **Stanislaw Radziszowski**, Rochester Institute of Technology (1145-05-2480)

2:45PM ► (1799) *A Tight Lower Bound for the Split Domination Number of a Regular Tournament.*
Kim A.S. Factor, Marquette University, **Larry J Langley*** and **Sarah K Merz**, University of the Pacific (1145-05-741)

3:00PM ► (1800) *On roots of Wiener polynomials of trees.*
Danielle Wang, MIT (1145-05-1202)

3:15PM ► (1801) *Spectra of Oriented Hypergraphs.*
Nathan Reff* and **Luke Duttweiler**, SUNY Brockport (1145-05-2881)

3:30PM ► (1802) *Arithmetical structures on Dynkin graphs D_n.* Preliminary report.
Kassie Archer, The University of Texas at Tyler, **Abigail C. Bishop**, Iona College, **Alexander Diaz-Lopez**, Villanova University, **Luis D. García Puente**, Sam Houston State University, **Darren Glass**, Gettysburg College, and **Joel Louwsma***, Niagara University (1145-05-1539)

3:45PM ► (1803) *Introducing 3-path Domination.* Preliminary report.
Rebecca Lynn Jackson, Charleston Southern University (1145-05-685)

4:00PM ► (1804) *On K Banhatti indices.*
Seyyedeh Tahereh Jalali* and **Masoud Ghods**, Semnan University (1145-05-814)

4:15PM ► (1805) *The Sandpile Group of Cayley Graphs.*
Jared Marx-Kuo*, University of Chicago, **Jiyang Gao**, Massachusetts institute of technology, **Vaughan McDonald** and **Amal Mattoo**, Harvard University (1145-05-1169)

4:30PM ► (1806) *Statistics on rooted trees.* Preliminary report.
Kassie Archer*, University of Texas at Tyler, and **Megan Martinez**, Ithaca College (1145-05-2328)

4:45PM ► (1807) *Characteristics of graphs admitting only constant splines.*
Katie Anders*, University of Texas at Tyler, **Alissa S. Crans**, Loyola Marymount University, **Briana Foster-Greenwood**, California State Polytechnic University, Pomona, **Blake Mellor**, Loyola Marymount University, and **Julianna Tymoczko**, Smith College (1145-05-1040)

5:00PM ► (1808) *Expected Chromatic Number of Random Subgraphs.*
Catherine Lee*, **Henry Reichard**, **David Townley**, **Ross Berkowitz** and **Patrick Devlin**, Yale University (1145-05-1959)

5:15PM ► (1809) *On the Distribution of Range for Tree-Indexed Random Walks.*
Aaron Berger*, Massachusetts Institute of Technology, **Caleb Ji**, Washington University, St. Louis, and **Erik Metz**, University of Maryland (1145-05-1513)

5:30PM (1810) *Binary subtrees with fewest labeled paths; simulations and illustrations.*
Mojtaba Moniri, Normandale Community College (1145-05-390)

AMS Contributed Paper Session on Number Theory, III

1:00 PM – 4:55 PM **Room 311, BCC**

1:00PM (1811) *Computing A Database of Belyi Maps.*
Sam Schiavone, Dartmouth College (1145-11-2544)

1:15PM (1812) *Variants of Chabauty's Method and the Thrice-Punctured Projective Line.* Preliminary report.
Nicholas Triantafillou, MIT (1145-11-278)

1:30PM (1813) *Asymptotic counting of $\mathrm{Sp}_{2g}(\mathbb{Z})$-orbits on quadratic forms.*
Alison Beth Miller, Harvard University (1145-11-2525)

1:45PM (1814) *Jacobian group operations for typical divisors on curves.*
Kamal Khuri-Makdisi, American University of Beirut (1145-11-523)

2:00PM (1815) *Elliptic Curves and Paramodular Forms.*
Manami Roy, University of Oklahoma (1145-11-1439)

2:15PM (1816) *Lower Bounds on the Modified Szpiro Ratio.*
Alexander J Barrios, Carleton College (1145-11-330)

2:30PM ► (1817) *Classifying the image of the Arboreal Galois representation.*
Michael Cerchia, Wake Forest University (1145-11-1827)

2:45PM (1818) *Supercharacters, Elliptic Curves, and the Sixth Moment of Kloosterman Sums.*
Stephan Ramon Garcia, Pomona College, and **George Todd***, Union College (1145-11-2679)

3:00PM (1819) *Effective bounds for Fourier coefficients of certain weakly holomorphic modular forms.*
Daniel Garbin, Queensborough Community College of the City University of New York (1145-11-2397)

3:15PM ► (1820) *Lacunarity of Han-Nekrasov-Okounkov q-series.*
Katherine Gallagher*, University of Notre Dame, **Katja Vassilev**, Princeton University, and **Lucia Li**, Wellesley College (1145-11-960)

3:30PM (1821) *Computing Special L-Values of Certain Modular Forms with Complex Multiplication.*
Wen-Ching Winnie Li, Pennsylvania State University, **Ling Long** and **Fang-Ting Tu***, Louisiana State University (1145-11-1571)

3:45PM (1822) *Algebraic modular forms on $\mathbf{SO}_5(\mathbb{Q})$ and the computation of paramodular forms.*
Watson Bernard Ladd*, Cloudflare, **Jeffery Hein**, Rockville, Maryland, and **Gonzalo Tornaria**, Universidad de la República (1145-11-508)

4:00PM ► (1823) *Eigenform Product Identities for Degree-Two Siegel Modular Forms.* Preliminary report.
Jim Brown, **Hugh Geller**, Clemson University, **Rico Vicente**, California State University, Long Beach, and **Alexandra Walsh***, Brown University (1145-11-111)

4:15PM ► (1824) *Shifted Convolution L-Series Values for Elliptic Curves.*
Nitya Mani*, Stanford University, and **Asra Ali**, MIT (1145-11-231)

4:30PM (1825) *A Couple of Results in Analytic Number Theory.*
Badih N. Ghusayni, Lebanese University (1145-11-27)

4:45PM ► (1826) *Predicting Zeros of the Riemann Zeta Function Using Machine Learning: A Comparative Analysis.* Preliminary report.
Jennifer Noelle Kampe*, California State University Northridge, and **Artem Vysogorets**, University of Massachusetts (1145-11-200)

AMS Contributed Paper Session on Operations Research, Mathematical Programming, Optimization, Game Theory, Economics, and Mathematics in the Social and Behavioral Sciences

1:00 PM – 5:10 PM **Room 335, BCC**

1:00PM ► (1827) *A Population-based Metaheuristic Approach for Solving the Multi-demand Multidimensional Knapsack Problem.* Preliminary report.
Yun Lu*, **Francis Vasko** and **Charles Saternos**, Kutztown University (1145-90-1844)

1:15PM (1828) *Binarizations of Continuous Metaheuristics to Solve the Set Covering Problem: Simpler is Better.* Preliminary report.
Francis J Vasko* and **Yun Lu**, Kutztown University (1145-90-1816)

1:30PM ► (1829) *Logical Analysis of Data using Multi-Objective Optimization.*
Nandini Rakala*, **Munevver Mine Subasi** and **Ersoy Subasi**, Florida Institute of Technology (1145-90-2491)

1:45PM ► (1830) *Computational Fact-Checking through Relational Similarity based Path Mining.* Preliminary report.
Himanshu Ahuja, Delhi Technological University, and **Alexander C Michels***, Westminster College (1145-90-1881)

2:00PM ► (1831) *Multi-Choice Stochastic Programming Problems Using Genetic Algorithm.* Preliminary report.
D K Mohanty*, Department of Mathematics, IIT Kharagpur, Kharagpur - 721 302, India, **R K Jana**, IIM Raipur, GEC Campus, Sejbahar, CG-492 015, and **M P Biswal**, Department of Mathematics, IIT Kharagpur (1145-90-220)

2:15PM ► (1832) *$\mathcal{P}$-Play in Candy Nim.*
Nitya Mani*, Stanford University, **Rajiv Nelakanti**, Yale University, **Simon Rubinstein-Salzedo** and **Alex Tholen**, Euler Circle (1145-91-746)

2:30PM ► (1833) *Forecasting U.S. elections with compartmental models.* Preliminary report.
Alexandria Volkening*, Mathematical Biosciences Institute, Ohio State University, **Daniel Linder**, Augusta University, **Mason A Porter**, University of California, Los Angeles, and **Grzegorz Rempala**, Ohio State University (1145-91-1929)

2:45PM ► (1834) *Dog Vaccination and Quarantine: A Mathematical Approach on Rabies.*
Vince Nicolas Salas Campo*, **John Lawrence Palacios**, **Hideo Nagahashi PhD.**, **Hyunju Oh Ph.D** and **JaeYong Choi**, University of Guam (1145-91-2212)

3:00PM ► (1835) *Adaptive Zero Determinant Strategies in the Iterated Prisoner's Dilemma Tournament.* Preliminary report.
Emmanuel M Estrada, San Jose State University (1145-91-2388)

3:15PM ► (1836) *Shapley-like values without symmetry.* Preliminary report.
Jacob North Clark* and **Stephen Montgomery-Smith**, University of Missouri (1145-91-225)

3:30PM (1837) *Approximation of A Class of Non-Zero-Sum Investment and Reinsurance Games for Regime-Switching Jump-Diffusion Models.*
Trang T.H Bui*, Wayne State University, **Xiang Cheng**, **Zhuo Jin**, The University of Melbourne, and **George Yin**, Wayne State University (1145-91-483)

3:45PM (1838) *Order in chaos - decentralized hedging, BTW sand piles, and directed self-organized criticality, an explanatory mathematical model for causally connected defaults in the derivative market.* Preliminary report.
Alexander Munson, unemployed (1145-91-1316)

4:00PM ► (1839) *Respect for Improvements and Comparative Statics in Matching Markets.*
Scott Duke Kominers, Harvard University (1145-91-756)

4:15PM ► (1840) *Object-Label-Order effect in a noisy learning environment.*
Timmy Ma, Dartmouth College (1145-91-2598)

4:30PM (1841) *A Kinetic Theory Approach to Pedestrian Motion.* Preliminary report.
Daewa Kim*, University of Houston, and **Annalisa Quaini**, Univesity of Houston (1145-91-2520)

4:45PM ► (1842) *Obamacare proofs give more healthcare: ditching and replacing the IRS fixed-point iteration.*
Samuel J Ferguson, Courant Institute, NYU (1145-91-2000)

5:00PM (1843) ► *Combining plurality and alternative voting.*
Andrew Lazowski, Sacred Heart University (1145-91-2088)

AMS Contributed Paper Session on Operator Theory

1:00 PM – 5:10 PM **Room 334, BCC**

1:00PM (1844) *A Product Formula for Functional Integrals over Rational Adelic Paths.*
David Eric Weisbart, University of California, Riverside (1145-60-2398)

1:15PM (1845) *Weighted Composition Operators from Analytic Function Spaces into Zygmund-Type Spaces.*
Flavia Colonna, George Mason University, and **Shams Alyusof***, Vienna, VA (1145-47-1552)

1:30PM (1846) *A Nevanlinna-Pick theorem in the context of the weighted Hardy algebra over a W^*-correspondence.*
Rachael M. Norton, Northwestern University (1145-47-1809)

1:45PM (1847) *Invariant Operator Ranges in von Neumann Algebras.* Preliminary report.
Ali Zarringhalam, University of New Hampshire, Durham, NH (1145-47-2788)

2:00PM (1848) *A general view of reflexivitgy for absolutely convex sets.* Preliminary report.
Don Hadwin, University of New hampshire, and **Mahtab Lak***, University of New Hampshire (1145-47-1086)

2:15PM (1849) *A Generalized Voiculescu Theorem of AH-algebras into Semifinite von Neumann Algebras.* Preliminary report.
Wenjing Liu* and **Don Hadwin**, University of New Hampshire (1145-47-1097)

2:30PM (1850) *Lie centralizers on triangular rings and nest algebras.*
Ajda Fosner, Faculty of Management, University of Primorska, Slovenia, and **Wu Jing***, Fayetteville State University, USA (1145-47-186)

2:45PM (1851) *Open projections and Murray-von Neumann equivalence.*
Masayoshi Kaneda* and **Thomas Schick**, Georg-August-Universität Göttingen (1145-47-1874)

3:00PM (1852) *Frame - preserving operators.* Preliminary report.
Gabriel Prajitura*, **Ruhan Zhao**, SUNY Brockport, and **Jasbir Singh Manhas**, Sultan Qaboos University, Oman (1145-47-1583)

3:15PM (1853) *Topological Degrees for Quasibounded Multivalued (S_+)-Perturbations of Maximal Monotone Operators.*
Dhruba R. Adhikari, Kennesaw State University (1145-47-1531)

3:30PM (1854) *Common Fixed Point Theorems for $\psi-$Expansive Mappings in $G-$Metric Spaces.*
M. Akram*, Penn State Harrisburg, Middletown, PA,, and **Nosheen Zakariya**, Jinnah College for Women University of Peshawar, Pakistan (1145-47-2373)

3:45PM (1855) *Limit laws for R-diagonals.*
Cong Zhou, Indiana University at Bloomington (1145-47-2709)

4:00PM (1856) *The nabladot operator for integrated calculus of hybrid functions with continuous and discrete variables.*
Claudio Cioffi-Revilla, George Mason University (1145-47-28)

4:15PM (1857) *Operator matrices with Hankel and Toeplitz entries.*
Ji Eun Lee*, Sejong University, **Robin Harte**, Trinity College, and **Eungil Ko**, Ewha Womans University (1145-47-512)

4:30PM (1858) *Admissibility of C*-Covers and Crossed Products of Operator Algebras.*
Mitch Hamidi, University of Nebraska-Lincoln (1145-47-2601)

4:45PM (1859) ► *Let $\varphi(z) = 1/4(1+z)^2$ be a self-mapping of the unit disk. Does the composition operator C_φ lie within a strongly-continuous semigroup of composition operators on $H^2(\mathbf{D})$?* Preliminary report.
William M. Higdon, Indianapolis, Indiana (1145-47-992)

5:00PM (1860) *Complex Dynamics on the Projective Spectrum of the Infinite Dihedral Group.*
Bryan Goldberg* and **Rongwei Yang**, State University of New York at Albany (1145-47-441)

AMS Contributed Paper Session on Partial Differential Equations, IV

1:00 PM – 5:55 PM **Room 312, BCC**

1:00PM (1861) *Electro-neutral models for a dynamic Poisson-Nernst-Planck System.*
Zilong Song*, **Xiulei Cao** and **Huaxiong Huang**, York University and Fields Institute (1145-35-1221)

1:15PM (1862) *Decay and vanishing of some axially symmetric D-solutions of the Navier-Stokes equations.*
Bryan Carrillo*, Department of Mathematics, University of California, Riverside, **Xinghong Pan**, Department of Mathematics, Nanjing University of Aeronautics and Astronautics, and **Qi S Zhang**, Department of Mathematics, University of California, Riverside (1145-35-1890)

1:30PM (1863) ► *Numerical Iterative Method in solutions to Navier-Stokes Equations as In-compressible Fluid Flow Models.* Preliminary report.
Lina Wu*, Borough of Manhattan Community College, and **Jia Liu**, University of West Florida (1145-35-878)

1:45PM (1864) *Observation of domain walls in Stokes waves on deep water.*
Foteini Tsitoura, University of Massachusetts, Amherst, MA (1145-35-2770)

2:00PM (1865) *Normal Mode Analysis of 3D Incompressible Viscous Fluid Flow Models.* Preliminary report.
Guoping Zhang* and **Mingchao Cai**, Math Department, Morgan State University (1145-35-1192)

2:15PM (1866) *A Second Order Fully-discrete Linear Energy Stable Numerical Scheme of a Binary Compressible Viscous Fluid Model.*
Xueping Zhao* and **Qi Wang**, University of South Carolina (1145-35-209)

2:30PM (1867) *Thermodynamics-based nonlinear electrochemistry transport problems.*
Maxim Zyskin, University of Oxford (1145-35-2942)

2:45PM (1868) *Stable travelling-wave solutions of the periodic dispersion-managed NLS equation.*
Oreoluwa Adekoya* and **John P Albert**, University of Oklahoma, Norman, OK (1145-35-1707)

3:00PM (1869) *The Diffusion Phenomenon with Time-Dependent Dirichlet Forms.*
Montgomery Taylor, University of Tennessee, Knoxville (1145-35-2943)

3:15PM (1870) *On the existence and instability of solitary water waves with a finite dipole.*
Hung D Le, University of Missouri (1145-35-1310)

3:30PM (1871) *Determining both the source of a wave and its speed in a medium from boundary measurements.*
Christina Knox* and **Amir Moradifam**, University of California, Riverside (1145-35-1796)

► 3:45PM (1872) *Pricing European and American Options Using Numerical Methods.* Preliminary report.
Upama Neupane*, **Joseph Morgan**, **Sharan Khanal** and **Narayan Thapa**, Cameron University (1145-35-1588)

4:00PM (1873) *Euler flows for multicomponent fluids.*
Xiaokai Huo*, King Abdullah University of Science and Technology, **Ansgar Jüngel**, Vienna University of Technology, and **Athanasios Tzavaras**, King Abdullah University of Science and Technology (1145-35-848)

4:15PM (1874) *On the global well-posedness of the 2D Boussinesq equations with partial dissipation.*
Dhanapati Adhikari, Marywood Univeristy (1145-35-2308)

4:30PM (1875) *Asymptotic Analysis for a Homogeneous Bubbling Regime Vlasov-Fokker-Planck/Navier-Stokes System.* Preliminary report.
Joshua Ballew, Slippery Rock University of Pennsylvania (1145-35-184)

4:45PM (1876) *Nanopteron traveling waves for mass-in-mass lattices in the small mass limit.*
Timothy E Faver, Leiden University (1145-35-2477)

► 5:00PM (1877) *High-frequency homogenization for modeling acoustic waves propagation in multi-scale periodic media.* Preliminary report.
Viktoria Savatorova and **Aleksei Talonov***, University of Nevada Las Vegas (1145-35-833)

5:15PM (1878) *The 2D magneto-micropolar equations with partial dissipation.*
Dipendra Regmi, University of North Georgia (1145-35-481)

5:30PM (1879) *Wave-packet dynamics in a slowly modulated photonic graphene.* Preliminary report.
Peng Xie* and **Yi Zhu**, Tsinghua University, China (1145-35-1211)

► 5:45PM (1880) *Parameter Identification in an Initial Boundary Value Problem through Finite Difference Method.* Preliminary report.
Michael Demmin*, **Nadab JuarezFlores**, **Gregory Herring** and **Narayan Thapa**, Cameron University (1145-35-2486)

MAA Contributed Paper Session on Approaches to Mathematics Remediation in Baccalaureate-Granting Institutions, I

1:00 PM – 2:55 PM **Room 301, BCC**

Organizers: **Michael Boardman**, Pacific University
Helen E. Burn, Highline College
Mary E. Pilgrim, Colorado State University

1:00PM (1881) *Exploring Mathematics Placement Indicators.*
Katie Louchart, Northern Arizona University (1145-P1-1704)

► 1:20PM (1882) *Changing the Numbers Game: Guided Math Placement and Co-requisite Math Courses at Utah Valley University.* Preliminary report.
Kathy Andrist* and **Carolyn Hamilton**, Utah Valley University (1145-P1-1389)

► 1:40PM (1883) *Remediation Beyond The Classroom: Assessing efforts to improve the remediation process in addition to developmental coursework.* Preliminary report.
Kimberly J Presser* and **James Hamblin**, Shippensburg University (1145-P1-936)

► 2:00PM (1884) *Instantaneous Rate of Change: Overhauling Developmental Math and Campus Practice in One Year.* Preliminary report.
Judith E Canner, California State University, Monterey Bay (1145-P1-1308)

2:20PM ► (1885) *Co-requisite design across first-year mathematics and statistics courses.* **Jennifer Elyse Clinkenbeard*** and **Jeffrey Wand**, California State University Monterey Bay (1145-P1-1381)

2:40PM ► (1886) *Adapting General Education Mathematics Courses to Support Underprepared Students.* Preliminary report. **Alana Unfried*** and **Peri Shereen**, California State University, Monterey Bay (1145-P1-1307)

MAA Contributed Paper Session on Fostering Creativity in Undergraduate Mathematics Courses, I

1:00 PM – 2:55 PM **Room 302, BCC**

Organizers: **Emily S. Cilli-Turner**, University of Washington Tacoma
Houssein El Turkey, University of New Haven
Gulden Karakok, University of Northern Colorado
Milos Savic, University of Oklahoma
Gail Tang, University of La Verne

1:00PM ► (1887) *A framework for fostering mathematical creativity in the undergraduate classroom.* Preliminary report. **Milos Savic***, **Paul Regier**, University of Oklahoma, **Kimberley Cadogan**, University of Northern Colorado, **Emily Cilli-Turner**, University of La Verne, **Houssein El Turkey**, University of New Haven, **Gail Tang**, University of La Verne, and **Gulden Karakok**, University of Northern Colorado (1145-P5-2902)

1:20PM ► (1888) *Outcomes of Three Creative Math Art Projects Integrated into Undergraduate Probability and Statistics.* **Margaret Smolinka Adams**, South Georgia State College (1145-P5-807)

1:40PM ► (1889) *Inspiring Wonder in Calculus Through Student-Designed Projects.* **Emerald T Stacy**, Washington College (1145-P5-1062)

2:00PM ► (1890) *How Creativity Influenced my Academic Work and Lifestyle.* Preliminary report. **Samuel H. Lee**, University of Maryland, College Park (1145-P5-1935)

2:20PM ► (1891) *Running a Project-Based Linear Algebra Course Through MATLAB.* Preliminary report. **Stephen Balady**, Oberlin College (1145-P5-2461)

2:40PM ► (1892) *Creative assignments in upper level undergraduate courses inspired by mentoring undergraduate research projects.* **Malgorzata Marciniak**, LaGuardia Community College of the City University of New York (1145-P5-1484)

MAA Contributed Paper Session on Inclusive Excellence - Attracting, Involving, and Retaining Women and Underrepresented Groups in Mathematics, II

1:00 PM – 3:55 PM **Room 303, BCC**

Organizers: **Francesca Bernardi**, University of North Carolina at Chapel Hill
Meghan DeWitt, St Thomas Aquinas College
Semra Kilic-Bahi, Colby-Sawyer College
Minah Oh, James Madison University

1:00PM (1893) *A Better Path to Math Careers.* **Tim McEldowney*** and **Po-Ning Chen**, University of California, Riverside (1145-Q1-831)

1:20PM ► (1894) *Pitching a Passion for Mathematics and Computer Science in a Summer Camp Setting for Females Entering Grades 7 through 12.* **Yevgeniya Rivers** and **Yasanthi Kottegoda***, University of New Haven (1145-Q1-861)

1:40PM ► (1895) *InForMMS: Investigating Forensic Mysteries through Mathematics and Science.* **Eugene Fiorini***, **Gail Marsella** and **James Russell**, Muhlenberg College (1145-Q1-892)

2:00PM ► (1896) *Mathematics, Science, and Engineering at Hispanic Serving Institutions (HSIs): Recommendations for Better Serving Undergraduate Students.* **Guadalupe Lozano***, Department of Mathematics, and Center for University Education Scholarship, The University of Arizona, **Marla Franco**, Student Affairs & Enrollment Management, Academic Initiatives & Students Success, The University of Arizona, and **Vignesh Subbian**, Department of Biomedical Engineering, Department of Systems & Industrial Engineering, The University of Arizona (1145-Q1-993)

2:20PM ► (1897) *Girls Talk Math: Pursuit of Representation through Media.* **Cara Peters*** and **Sarah Burnett**, University of Maryland - College Park (1145-Q1-1278)

2:40PM ► (1898) *PROMYS Math Circles and PROMYS Math Circle Girls.* **Li-Mei Lim**, Boston University (1145-Q1-1366)

3:00PM ► (1899) *Encouraging Women to Study Mathematics.* Preliminary report. **Lyn McQuaid**, Kutztown University of Pennsylvania (1145-Q1-1488)

► 3:20PM (1900) *Starting Young: Connecting Kids to the University.* Preliminary report.
Christina Therkelsen* and **Vita Borovyk**, University of Cincinnati (1145-Q1-1822)

► 3:40PM (1901) *GirlsDoMath Summer Camp at Colorado Mesa University.* Preliminary report.
Tracii Friedman* and **Cathy Bonan-Hamada**, Colorado Mesa University (1145-Q1-1954)

MAA Contributed Paper Session on Inquiry-Based Learning and Teaching, III

1:00 PM – 5:55 PM **Room 339, BCC**

Organizers: **Susan Crook**, Loras College
Eric Kahn, Bloomsburg University
Brian Katz, Augustana College
Amy Ksir, United States Naval Academy
Victor Piercey, Ferris State University
Candice Price, University of San Diego
Xiao Xiao, Utica College

1:00PM (1902) *Using Guided Inquiry in Geometry – First-time Reflections.* Preliminary report.
Anna Mummert, Marshall University (1145-O5-2380)

► 1:20PM (1903) *Can IBL mathematics pedagogy transfer across disciplines?* Preliminary report.
Carl Mummert, Marshall University (1145-O5-2562)

1:40PM (1904) *Math Circles of Inquiry.*
Ryan Gantner, St. John Fisher College (1145-O5-2132)

2:00PM (1905) *Preparing students to succeed in subsequent math courses through mixed instructional approaches.*
Rachid Ait Maalem Lahcen, University of Central Florida, Orlando, Florida (1145-O5-2364)

► 2:20PM (1906) *Can Complex Instruction and Inquiry-Based-Learning make a first-semester Real Analysis course more accessible for students?* Preliminary report.
Lipika Deka, California State University, Monterey Bay (1145-O5-2715)

2:40PM (1907) *Assessing Student Engagement and Responsibility through Inquiry-Based Learning.*
Aaron Trocki* and **Ryan Bernardi**, Elon University (1145-O5-1251)

► 3:00PM (1908) *How Interactive is Your Class? Tracking Student Engagement with Active Learning Logs.* Preliminary report.
Jamie Sutherland, University of Delaware (1145-O5-1065)

► 3:20PM (1909) *IBL Calculus: Classroom Management and Assessment.* Preliminary report.
Heather A. Lewis, Nazareth College (1145-O5-1875)

► 3:40PM (1910) *An IBL First-Year Experience in Mathematics and Social Choice.*
Steven W Morics, University of Redlands (1145-O5-2743)

► 4:00PM (1911) *From Candy to Social Justice.* Preliminary report.
Sara Jensen, Carthage College (1145-O5-2485)

► 4:20PM (1912) *Role-Playing Simulations in an Inquiry-Based Learning Quantitative Reasoning Class.* Preliminary report.
Victor I. Piercey, Ferris State University (1145-O5-852)

4:40PM (1913) *A Lab Approach to Calculus.*
Aviva Halani and **John Mosley***, Phillips Exeter Academy (1145-O5-2085)

► 5:00PM (1914) *Critiquing Activities in a Discussion-Based Introductory Proof Class.*
Aviva Halani, Phillips Exeter Academy (1145-O5-2060)

5:20PM (1915) *Shifting Beliefs about Mathematics in Future Elementary Teachers.*
Elizabeth Thoren, Pepperdine University (1145-O5-2990)

5:40PM (1916) *New context, Same educator?*
Brian P Katz, Augustana College (IL) & Avenues: The World School (NY) (1145-O5-2835)

MAA Contributed Paper Session on It's Circular: Conjecture, Compute, Iterate

1:00 PM – 4:55 PM **Room 306, BCC**

Organizers: **Thomas J. Clark**, Dordt College
James Taylor, Math Circles Collaborative of New Mexico

1:00PM ► (1917) *Grids in the Circle.*
Gabriella A Pinter* and **Istvan G Lauko**, University of Wisconsin-Milwaukee (1145-M5-2807)

► 1:20PM (1918) *Nim and Jim - Solving Combinatorial Games through Data Collection, Conjecture, and Proof.*
Paul Ellis, Manhattanville College, **Sam Coskey**, Boise State University, and **Japheth Wood***, Bard College (1145-M5-1530)

► 1:40PM (1919) *"Math Taught the Right Way": Curriculum from Overseas, Adapted to the U.S. Educational Reality and Implemented Parallel to the Berkeley Math Circle.*
Zvezdelina Entcheva Stankova, University of California at Berkeley and Berkeley Math Circle (1145-M5-2925)

► 2:00PM (1920) *The Number Machine.*
Thomas J Clark, Dordt College (1145-M5-1769)

2:20PM (1921) *The Combinatorics of SET (the card game).*
Maya Schwartz, Bard College (1145-M5-2505)

► 2:40PM (1922) *Bulgarian Solitaire - Understanding combinatorial patterns through data collection, conjecture, and proof.*
Samuel Coskey, Boise State University, **Paul Ellis***, Manhattanville College, and **Japheth Wood**, Bard College (1145-M5-2297)

► 3:00PM (1923) *The Community Alliance for Mathematics.*
Aris Winger*, Georgia Gwinnett College/Mathematicians of Color Alliance, **Brianna Donaldson**, American Institute of Mathematics/Math Teachers' Circle Network, **Mark Saul**, Julia Robinson Mathematics Festival, **Tatiana Shubin**, San Jose State University/Alliance of Indigenous Math Circles, and **Diana White**, University of Colorado Denver/National Association of Math Circles (1145-M5-2746)

► 3:20PM (1924) *Minimum Volume between a Surface and its Tangent Plane.*
Philip B. Yasskin, Texas A&M University (1145-M5-1295)

► 3:40PM (1925) *A new book in the Mathematical Circles Library series - Mathematics: Rhyme and Reason.*
Mel Currie, Baltimore, Maryland (1145-M5-2587)

► 4:00PM (1926) *What I Learned About Sharing Long After Kindergarten.*
Matthew G Jones, Cal State University Dominguez Hills (1145-M5-720)

► 4:20PM (1927) *Equidistant Dot on Grid.* Preliminary report.
Rebin Abdulkader Muhammad, Ohio Univeristy (1145-M5-333)

4:40PM (1928) *The Coastal Paradox.*
T. T. Craig, Coastal Carolina University (1145-M5-1414)

MAA Contributed Paper Session on Mathematical Themes in a First-Year Seminar

1:00 PM – 4:15 PM **Room 322, BCC**

Organizers: **Jennifer Bowen**, College of Wooster
Mark Kozek, Whittier College
Pamela Pierce, College of Wooster
Jennifer Schaefer, Dickinson College

► 1:00PM (1929) *Scientific Revolutions - A First Year Seminar Course Design.*
Helmut Knaust, The University of Texas at El Paso (1145-N1-2937)

1:20PM (1930) *Beyond Elementary Functions: Introducing students to college-level academic culture in a math-based first year seminar.*
Sarah Dumnich, Saint Vincent College (1145-N1-2859)

1:40PM (1931) *Not so fearful symmetry – how "partition of unity" works for teaching First-Year Seminar.* Preliminary report.
P. P. Yu, Westminster College (1145-N1-2779)

► 2:00PM (1932) *Math in Pop Culture: A First-Year Writing Seminar on Mathematics.* Preliminary report.
Mark Kozek, Whittier College (1145-N1-2752)

► 2:20PM (1933) *Exploring the Mathematics and Impacts of Gambling.*
Lesley W. Wiglesworth, Centre College (1145-N1-2508)

► 2:40PM (1934) *The Art of Mathematics.*
Marie P. Sheckels, University of Mary Washington (1145-N1-2426)

► 3:00PM (1935) *Infographics: A First Year Seminar on Visual Communication.*
Debra L. Hydorn, University of Mary Washington (1145-N1-1808)

► 3:20PM (1936) *Precalculus Mathematics Through First Year Seminar.*
Matthew J Prudente, Alvernia University (1145-N1-1745)

► 3:40PM (1937) *Mathematics & Sustainability as a First Year Seminar Course.* Preliminary report.
Katrina Palmer, Appalachian State (1145-N1-801)

► 4:00PM (1938) *A MatheMAGICAL First Year Seminar.*
Ricardo V Teixeira, University of Houston - Victoria (1145-N1-731)

MAA Contributed Paper Session on Research in Undergraduate Mathematics Education (RUME), IV - the Teaching and Learning of Calculus

1:00 PM – 4:15 PM **Room 340, BCC**

Organizers: **Stacy Brown**, California State Polytechnic University
Megan Wawro, Virginia Tech
Aaron Weinberg, Ithaca College

► 1:00PM (1939) *Students' reports of precalculus and calculus course experiences.* Preliminary report.
Kristen Vroom*, Portland State University, **Naneh Apkarian**, Western Michigan University, **Jessica Gehrtz**, **Jessica Ellis Hagman**, Colorado State University, **Matthew Voigt** and **Antonio Martinez**, San Diego State University (1145-J5-1081)

1:20PM (1940) *Multiple Representations of the Enacted Fundamental Theorem of Calculus, Student Understanding, and Gender.* **Ileana Vasu**, University of Massachusetts and Holyoke Community College (1145-J5-1565)

1:40PM (1941) *Putting Students on the Right Track: Predicting Final Grades in Calculus using Early-Semester Data.* Preliminary report. **Steve Bennoun***, Cornell University, and **Matthew Thomas**, Ithaca College (1145-J5-783)

2:00PM (1942) *Calculus variations as figured worlds for math identity development.* **Matthew Voigt**, **Antonio Martinez***, San Diego State University & UC San Diego, and **Chris Rasmussen**, San Diego State University (1145-J5-1887)

2:20PM (1943) *Contextual Reasoning in Calculus: A Qualitative Study of How Students from the Biological and Life Sciences Solve Calculus Accumulation Tasks.* **William L Hall***, Washington State University, and **Karen A Keene**, North Carolina State University (1145-J5-2495)

2:40PM (1944) *Undergraduate Students' Interpretations of Graphs of Real-Valued Functions with Statements from Calculus.* **Erika J. David**, Arizona State University (1145-J5-2613)

3:00PM (1945) *Business Calculus Students' Understanding of Marginal Functions.* Preliminary report. **Ralph E. Chikhany*** and **William L Hall**, Washington State University (1145-J5-962)

3:20PM (1946) *An APOS Analysis of Calculus Student Comprehension of Continuity and Related Topics.* **Jayleen L. Wangle**, State University of New York College at Oneonta (1145-J5-2367)

3:40PM (1947) *Are They Doing the Homework or Only Finding the Answers?* **Kedar M Nepal***, Mercer University, and **Khyam Paneru**, University of Wisconsin-Whitewater (1145-J5-1574)

4:00PM (1948) *Investigating Students' Mathematical Challenges and Corresponding Successful Support Strategies at a Quantitative Learning Center.* **Melissa Newell*** and **Fabiana Cardetti**, University of Connecticut (1145-J5-2570)

MAA Contributed Paper Session on Technology and Resources in Statistics and Data Science Education

1:00 PM – 4:55 PM **Room 305, BCC**

Organizer: **Karl RB Schmitt**, Valparaiso University

Moderator: **Stacey Hancock**, Montana State University

1:00PM (1949) *Teaching a Technology-Rich Intro Stat course in a Traditional Classroom.* Preliminary report. **Patti Frazer Lock**, St. Lawrence University (1145-N5-725)

1:20PM (1950) *Using the Islands in an Introductory Statistics Course.* **Carl Clark*** and **Rita Lindsay**, Indian River State College (1145-N5-408)

1:40PM (1951) *StatPowers - A Simple Web-Based Statistics Suite for Introductory Statistics.* Preliminary report. **Brian R Powers**, Arizona State University (1145-N5-179)

2:00PM (1952) *The View from the Trenches: Teaching Introductory Statistics in a Digital World.* **Bernadette L. Lanciaux**, Rochester Institute of Technology (1145-N5-324)

2:20PM (1953) *Nexus Degrees: Using Analytics to Create New Curricula in Mathematics, Computer Science and Beyond!* **Robert S. Owor**, **Zephyrinus C. Okonkwo**, Albany State University, and **Anilkumar Devarapu***, Albany State university (1145-N5-2851)

2:40PM (1954) *Using R Programming to Enhance Mathematical and Statistical Learning.* Preliminary report. **William Adamczak** and **Joseph McCollum***, Siena College (1145-N5-373)

3:00PM (1955) *Computational Experience for Linear Regression and Time Series using R.* **Rasitha R. Jayasekare**, Butler University, Indianapolis, IN (1145-N5-1047)

3:20PM (1956) *Statistics teaching and research with R.* **Leon Kaganovskiy**, Touro College (1145-N5-213)

3:40PM (1957) *GAISEing into the Future with Fun, Flexible Mobile Data Collection and Analysis.* **Adam F Childers*** and **David G Taylor**, Roanoke College (1145-N5-1023)

4:00PM (1958) *Written Versus Digital Feedback; Which Improves Student Learning?* **William Corson**, **David R. Galbreath***, **Bryan E. Adams** and **Kayla K. Blyman**, United States Military Academy (1145-N5-767)

4:20PM (1959) *Using authentic data in spreadsheet assignments and quizzes to improve students' attitudes towards elementary statistics.* Preliminary report. **Daniel A Showalter**, Eastern Mennonite University (1145-N5-1275)

4:40PM (1960) *Democratizing Data: Expanding Opportunities for Students in Data Science.* **Robin L Angotti***, **Johnny Arenas**, **Bethany Leach** and **Dion Thompson**, University of Washington Bothell (1145-N5-671)

MAA Contributed Paper Session on The Teaching and Learning of Undergraduate Ordinary Differential Equations

1:00 PM – 4:55 PM **Room 324, BCC**

Organizers: **Christopher S. Goodrich**, Creighton Preparatory School

Beverly H. West, Cornell University

1:00PM ► (1961) *Hamiltonian, Exact, or Conservative? YES!* **Chris Oehrlein**, Oklahoma City Community College (1145-O1-177)

1:20PM (1962) *Teaching an ODE Course with CoCalc, Sage, Jupyter Notebooks, and LaTeX.* **Thomas W Judson**, Stephen f. Austin State University (1145-O1-219)

1:40PM (1963) *Undergraduate ODEs and Linear Algebra for engineering majors: studying the foundations and learning by doing.* **Viktoria Savatorova*** and **Aleksei Talonov**, University of Nevada Las Vegas (1145-O1-244)

2:00PM (1964) *Stability of ODEs and Limits Superior/Inferior as Reinforcing Concepts.* **Itai Seggev**, Wolfram Research, Inc. (1145-O1-507)

2:20PM (1965) *Mobile Apps for Exploring Ordinary and Partial Differential Equations.* **Timothy A Lucas**, Pepperdine University (1145-O1-1247)

2:40PM ► (1966) *An Enticing Simulation in Ordinary Differential Equations that predict tangible results.* **Satyanand Singh**, New York City College of Technology of CUNY (1145-O1-1373)

3:00PM ► (1967) *Teaching the SIR model in historical context: primary sources to modern applications.* **Francesca Bernardi***, Florida State University, and **Manuchehr Aminian**, Colorado State University (1145-O1-2143)

3:20PM (1968) *Analyzing systems of differential equations by first-year life-science majors.* Preliminary report. **Amine Benkiran***, **Eric Simring**, **Andrew M. Baxter** and **Andrew Belmonte**, Penn State University, University Park (1145-O1-2365)

3:40PM ► (1969) *Newton Cooling in the Attic: Applying ODEs at Home.* **Dan Kalman**, American University (1145-O1-3033)

4:00PM Informal discussion on the teaching and learning of undergraduate ordinary differential equations.

MAA General Contributed Paper Session on Applied Mathematics, II

1:00 PM – 5:55 PM **Room 341, BCC**

Organizers: **Emelie Kenney**, Siena College

Kim Roth, Juniata College

Melvin Royer, Indiana Wesleyan University

1:00PM ► (1970) *Using Network Topology in Fingerprint Identification.* Preliminary report. **Mehmet Emin Aktas**, University of Central Oklahoma (1145-VN-2322)

1:15PM ► (1971) *Attributed Network Clustering: A Topological Data Analysis Approach.* Preliminary report. **Warren Keil*** and **Mehmet Emin Aktas**, University of Central Oklahoma (1145-VN-2337)

1:30PM (1972) *Numerical Calculation of Weak Inertial Lift on Arbitrarily Shaped Objects Near a Plane.* Preliminary report. **Forest Mannan*** and **Karin Leiderman**, Colorado School of Mines (1145-VN-247)

1:45PM (1973) *Fast Algorithms for AUC Maximization.* **Michael Natole Jr.***, **Yiming Ying** and **Siwei Lyu**, University at Albany (1145-VN-2588)

2:00PM ► (1974) *MD simulations of acoustically-controlled defect dynamics: An analog of Born's law in QM.* Preliminary report. **Stephen H. Harnish**, Bluffton University (1145-VN-2606)

2:15PM (1975) *Structured Sparsity Promoting Functions.* **Erin E. Tripp**, Syracuse University (1145-VN-2616)

2:30PM (1976) *The Metastable Dynamics of an Aggregation Model.* **Adam T Wilander***, James Madison University, and **Scott G McCalla**, Montana State University (1145-VN-2721)

2:45PM ► (1977) *Traveling Circus Particle Model.* Preliminary report. **Darleen Perez-Lavin***, University of Kentucky, **James B Kowalkowski**, **Stephen Mrenna**, Fermi National Federal Laboratory, and **Sven Leyffer**, Argonne National Lab (1145-VN-2730)

3:00PM (1978) *An improved first order local regularization method for ill-posed Volterra equations.* Preliminary report. **Cara D. Brooks***, Florida Gulf Coast University, and **Patricia K. Lamm**, Michigan State University (1145-VN-2791)

3:15PM ► (1979) *Option Pricing by Wavelet filtering and Machine learning Based Monte Carlo Method.*
Yinqi Chen*, Department of Math, University of Connecticut, **Hieu Nguyen**, Department of Computer Science, Michigan State University, **Srihita Mediboina**, Department of Math, Stony Brook University, **Mingyang Zhang**, UCLA, and **Xiaodi Wang**, Western Connecticut State University (1145-VN-2926)

3:30PM (1980) *Transport Phenomena in Biological Field Effect Transistors.*
Ryan M Evans*, **Arvind Balijepalli** and **Anthony Kearsley**, National Institute of Standards and Technology (1145-VN-2940)

3:45PM ► (1981) *Analysis of A Calibrated Tumor Growth Model in Response to a Combination Therapy Involving 4-1BB & IL-12.*
Qing Wang*, **Zhijun Wang**, Shepherd University, and **David J Klinke**, West Virginia University (1145-VN-2979)

4:00PM (1982) *Privacy-preserving support vector regression and deep learning.*
Kevin Li*, Somers High School, Somers, New York, **Mingyang Zhang**, Department of Math, UCLA, and **Xiaodi Wang**, Western Connecticut State University (1145-VN-2993)

4:15PM (1983) *Solution Of Multiple Travelling Salesmen Problem Using Non Probabilistic Distribution Algorithm.* Preliminary report.
Gurcharan Singh Buttar*, Associate Professor, Department of Mathematics, Chandigarh University Mohali, India, and **Vikramjeet Singh**, I.K. Gujral Punjab Technical University (1145-VN-3014)

4:30PM ► (1984) *Math in the Mountains- Undergraduate Consulting.*
Terry F Cox, Carroll College (1145-VN-3020)

4:45PM (1985) *New Methods on Approximation by Spline Functions.*
Hossein Behforooz, Utica College, Utica, New York (1145-VN-475)

5:00PM ► (1986) *The Dense Submatrix discovery.* Preliminary report.
Bombina Polina* and **Brendan Ames**, The University of Alabama (1145-VN-518)

5:15PM (1987) *Long term behavior of a random hopfield neural lattice model.*
Basiru Usman*, **Xiaoying Maggie Han** and **Peter Kloeden**, Auburn University, Auburn, AL (1145-VN-589)

5:30PM (1988) *Tax Policy to Minimize the 20:20 Index.* Preliminary report.
Michael McAsey* and **Libin Mou**, Bradley University (1145-VN-704)

5:45PM (1989) *Comparison of non-standard finite difference methods for cross-diffusion models.*
KC Patidar* and **A Ramanantoanina**, Department of Mathematics and Applied Mathematics, University of the Western Cape, Bellville 7535, South Africa (1145-VN-851)

MAA General Contributed Paper Session on Probablity and Statistics, I

1:00 PM – 6:10 PM **Room 348, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

1:00PM (1990) *Discrete-time queue with batch renewal input and random serving capacity rule.*
Farida Parvez Barbhuiya*, Indian Institute of Technology Kharagpur, Kharagpur, India, and **Umesh Chandra Gupta**, Indian Institute of Technology Kharagpur (1145-VT-1002)

1:15PM ► (1991) *Robust Signal Processing with the Convex Floating Body.* Preliminary report.
Joseph Anderson, Salisbury University (1145-VT-1048)

1:30PM ► (1992) *An Algebraic Approach to Minimum Chi-Square Estimation.* Preliminary report.
Grant L Innerst* and **David J Kahle**, Baylor University (1145-VT-1049)

1:45PM ► (1993) *Multivariate generalizations of F-G-M copulas.*
Xiaonan Zhu* and **Tonghui Wang**, New Mexico State University (1145-VT-1075)

2:00PM (1994) *On the quenched CLT for stationary random fields under projective criteria.*
Na Zhang*, University of Cincinnati, **Lucas Reding**, Université de Rouen, and **Magda Peligrad**, University of Cincinnati (1145-VT-1127)

2:15PM ► (1995) *Markov Plays Prime Climb.*
David A Nash* and **Shaun Ceci**, Le Moyne College (1145-VT-1175)

2:30PM (1996) *Spatiotemporal trend of extreme monthly precipitation of the USA.*
Bhikhari Tharu, Spelman College, Atalanta, GA (1145-VT-1267)

2:45PM ► (1997) *Cybersecurity: A New Predictive Analytical Model for Software Vulnerability Discovery Process.*
Netra P Khanal, The University of Tampa (1145-VT-1353)

3:00PM (1998) *A Numerical Likelihood-Based Approach to Synthesizing Correlation Matrices.*
Myung Soon Song, Kutztown University of Pennsylvania (1145-VT-1440)

3:15PM (1999) *Estimation of a Stress-Strength Index for Exponential Populations.*
Tulika Rudra Gupta*, Indian Institute of Technology Kharagpur, and **Somesh Kumar**, Indian Institute of Technology, Kharagpur (1145-VT-1450)

► 3:30PM (2000) *Probabilities for Penney's Game with an Unfair Coin.*
Robert W Vallin, Lamar University (1145-VT-1477)

► 3:45PM (2001) *A discrete Distribution on the Unit Interval and Its Application to Simulation of Sampling Distributions.* Preliminary report.
Gerald Y. Agbegha*, **Anthony Thomas**, **Adrian Heinz** and **Junkoo Park**, Georgia Gwinnett College (1145-VT-166)

4:00PM (2002) *A generalized family of lifetime distributions and survival models.*
Mahmoud Aldeni, Central Michigan University (1145-VT-1674)

► 4:15PM (2003) *Recovery of Low-Coherence Dictionary Atoms under Restricted Signal Assumptions.*
Enrico Au-Yeung*, Department of Mathematical Sciences, DePaul University, Chicago, IL, and **Greg Zanotti**, DePaul University, Chicago, IL (1145-VT-1695)

4:30PM (2004) *Estimating the mean direction in a wrapped Cauchy distribution.*
Shreyashi Basak*, Indian Institute of Technology, Kharagpur, and **Somesh Kumar**, Indian Institute of Technology Kharagpur (1145-VT-1708)

► 4:45PM (2005) *A Comparison of ROC Regression Techniques.*
Melissa Innerst* and **Jack Tubbs**, Baylor University (1145-VT-1869)

5:00PM (2006) *Asymptotic Analysis of the Least Squares as Estimator of the Linear Regression Model.*
Dawud Adebayo Agunbiade, Olabisi Onabanjo University, Nigeria (1145-VT-2231)

5:15PM (2007) *Random Processes of the Form* $X_{n+1} = AX_n + B_n$ *(mod p).* Preliminary report.
Kseniya Klyachko, University at Albany (1145-VT-2108)

5:30PM (2008) *Prediction Limits for the Mean of a Sample from a Lognormal Distribution: Uncensored and Censored Cases.*
Kalimuthu Krishnamoorthy and **Md Sazib Hasan***, University of Louisiana at Lafayette (1145-VT-2187)

► 5:45PM (2009) *Importance of renewal of a coherent system using two cold standbys.*
Achintya Roy* and **Nitin Gupta**, Department of Mathematics, Indian Institute of Technology Kharagpur (1145-VT-2217)

► 6:00PM (2010) *Stochastic comparisons in multivariate reversed frailty model.*
Shilpa Bansal* and **Nitin Gupta**, Department of Mathematics, Indian Institute of Technology Kharagpur (1145-VT-2229)

SIAM Minisymposium on Recent Developments in Numerical Methods for Fluids.

1:00 PM – 5:45 PM **Room 342, BCC**

Organizer: **Leo Rebholz**, Clemson University

1:00PM (2011) *Recent advances for exactly incompressible elements.* Preliminary report.
L. Ridgway Scott, University of Chicago (1145-65-1227)

2:00PM (2012) *A mass conserving mixed stress formulation for incompressible flows.*
Jay Gopalakrishnan, Portland State University, Oregon, USA, **Philip Lukas Lederer*** and **Joachim Schöberl**, Technical University of Vienna, Vienna, Austria (1145-65-1112)

2:30PM (2013) *Analysis of Algebraic Chorin Temam splitting for incompressible Navier-Stokes equations.*
Leo Rebholz, Clemson University, **Alex Viguerie**, Universita di Pavia, and **Mengying Xiao***, College of William & Mary (1145-65-156)

3:00PM (2014) *An explicit divergence-free DG method for incompressible flow.* Preliminary report.
Guosheng Fu, Brown University (1145-65-182)

3:30PM (2015) *Nodal finite elements for de Rham complexes.*
Snorre H Christiansen, University of Oslo, **Jun Hu**, Peking University, and **Kaibo Hu***, University of Minnesota (1145-65-1286)

4:00PM (2016) *Pressure-induced locking in mixed methods for time-dependent (Navier–)Stokes equations.* Preliminary report.
Leo Rebholz*, Clemson University, and **Alexander Linke**, Weierstrass Institute for Applied Analysis and Stochastics (1145-65-1774)

4:30PM (2017) *Stabilized continuous finite element schemes for problems in plasma physics.*
Sibusiso Mabuza*, **John N Shadid**, **Eric C Cyr**, **Thomas M Smith**, Sandia National Laboratories, and **Dmitri Kuzmin**, TU Dortmund University (1145-65-2039)

5:00PM (2018) *Exact smoothed piecewise polynomial sequences on Alfeld splits.*
Michael Neilan*, University of Pittsburgh, **Johnny Guzman** and **Guosheng Fu**, Brown University (1145-65-157)

NAM Haynes-Granville-Browne Session of Presentations by Recent Doctoral Recipients

1:00 PM – 4:30 PM **Room 333, BCC**

1:00PM ► (2019) *Developing Non-Standard Finite Difference (NSFD) Schemes for a System of Coupled Second Order Differential Equations.*
Seye E Adekanye, Wilmington, Delaware (1145-34-1758)

1:30PM (2020) *Factorization in Polynomial Rings with Zero Divisors.* Preliminary report.
Ranthony A.C. Edmonds, The Ohio State University (1145-13-2861)

2:00PM (2021) *Frequency of Upstream propagating soliton generation in the forced Korteweg-de Vries Equation.* Preliminary report.
Quentin Robinson, North Carolina Central University (1145-76-2276)

2:30PM ► (2022) *Minimal Models of Rational Elliptic Curves with non-Trivial Torsion.*
Alexander J Barrios, Carleton College (1145-11-1410)

3:00PM ► (2023) *The UVI Growth Model: A model for retention and persistence for STEM undergraduates.* Preliminary report.
Nadia Monrose Mills, University of the Virgin Islands (1145-97-2875)

3:30PM ► (2024) *Classifying the Fine Structures of Involutions Acting on Root Systems.* Preliminary report.
Samuel J Ivy, United States Military Academy (1145-15-2629)

4:00PM ► (2025) *Counting Rainbow Triples.* Preliminary report.
Anisah N. Nu'Man, Ursinus College (1145-05-2868)

MAA Panel

1:00 PM – 2:20 PM **Room 349, BCC**

MAA Instructional Practices Guide's Value for Your Department

Organizers: **Linda Braddy**, Tarrant County College
Kevin Charlwood, Washburn University
Daniel Maki, Indiana University Bloomington
Catherine Murphy, Purdue University Northwest

Panelists: **Martha Abell**, Georgia Southern University
Linda Braddy, Tarrant County College
Rick Cleary, Babson College
Doug Ensley, Mathematical Association of America
Lew Ludwig, Denison University

Project NExT Workshop

1:00 PM – 2:15 PM **Room 308, BCC**

Mentoring Undergraduate Research for Beginners

Organizers: **Jacob Duncan**, Saint Mary's College
Rebecca Everett, Haverford College
Bhuvaneswar Sambandham, Dixie State University
Yan Zhuang, Davidson College

ASL Invited Address

2:00 PM – 2:50 PM **Room 315, BCC**

(2026) *Some questions and results for classical algebraic structures.*
Sergey Goncharov, Novosibirsk State University (1145-00-39)

AMS Directors of Graduate Studies

2:00 PM – 3:30 PM **Key Ballroom 2, 2nd Floor, Hilton**

Rocky Mountain Mathematics Consortium Board of Directors Meeting

2:15 PM – 4:00 PM **Ravens, 1st Floor, Marriott Inner Harbor**

Presentations by MAA Teaching Award Recipients

2:30 PM – 3:40 PM **Room 309/310, BCC**

Organizers: **Deanna Haunsperger**, Carleton College
James Sellers, Pennsylvania State University

2:30PM ► (2027) *Green pens, purple paper, whiteboards, and other stories: feedback structures that support student learning.*
Suzanne I Dorée, Augsburg University (1145-A0-2114)

2:55PM ► (2028) *Teaching statistics using real-Time hands-on activities.*
Carl Lee, Department of Mathematics Central Michigan University, Mt. Pleasant, Michigan (1145-A0-282)

3:20PM ► (2029) *When a mathematics department connects*.
Jennifer Switkes, California State Polytechnic University, Pomona (1145-A0-947)

AMS Committee on Science Policy Hosts a Conversation with Dr. Anne Kinney (Head, Directorate for Mathematical & Physical Sciences at the National Scie

2:30 PM – 4:00 PM **Room 316, BCC**

ASL Contributed Paper Session

3:00 PM – 5:20 PM **Room 315, BCC**

3:00PM (2030) *Constructing a fixed point of the structural jump.*
Daniel Turetsky, Victoria University of Wellington (1145-03-976)

3:30PM (2031) *On Generic Automorphisms.*
Ermek Nurkhaidarov, Pennsylvania State University (1145-03-3011)

► 4:00PM (2032) *Reverse mathematics and colorings of hypergraphs.*
Jeffry L. Hirst, Department of Mathematical Sciences, Appalachian State University (1145-03-662)

4:30PM (2033) *Neutrally expandable models of arithmetic.*
Athar Abdul-Quader*, SUNY Purchase College, and **Roman Kossak**, The Graduate Center, CUNY (1145-03-1371)

5:00PM (2034) *Addition with or without multiplication: algorithms, maximality, and near-linearity.*
Mojtaba Moniri, Normandale Community College (1145-03-1434)

MAA General Contributed Paper Session on Geometry

3:15 PM – 6:10 PM **Room 301, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

3:15PM (2035) *Real hyperbolic hyperplane complements in the complex hyperbolic plane.*
Barry Minemyer, Bloomsburg University (1145-VO-1264)

► 3:30PM (2036) *Curves, Pointwise Curvature, and Conformal Transformations.*
Richard G Ligo, Gannon University (1145-VO-1302)

► 3:45PM (2037) *Five-dimensional Lie-Einstein metrics.*
Rishi Raj Subedi, Florida Agricultural and Mechanical University (1145-VO-2226)

► 4:00PM (2038) *A Curve Satisfying $\frac{\tau}{\kappa}=\frac{1}{s}$ With Constant $\kappa > 0$.*
Yun Myung Oh and **Devin German Garcia***, Andrews University (1145-VO-2354)

4:15PM (2039) *Geometry of Asymptotically harmonic manifolds with minimal horospheres.*
Hemangi Shah, Harish-Chnadra Research Instiitute (1145-VO-99)

► 4:30PM (2040) *Gregory's theorem for inscribed and circumscribed regular polygons.*
Tom Edgar, Pacific Lutheran University, and **David Richeson***, Dickinson College (1145-VO-2581)

► 4:45PM (2041) *Maximizing the number of vertices of the d-cube that can be covered by a ball of given radius.* Preliminary report.
Oliver T.B. Meldrum, Oberlin College (1145-VO-2726)

► 5:00PM (2042) *Ricci-positive metrics on arbitrary connected sums of products of spheres.* Preliminary report.
Bradley Lewis Burdick, University of Oregon (1145-VO-2745)

5:15PM (2043) *Central splitting of manifolds with no conjugate points.*
James Dibble, University of Iowa (1145-VO-2886)

5:30PM (2044) *On positively curved manifolds of dimension 6.*
Yuhang Liu, University of Pennsylvania (1145-VO-431)

► 5:45PM (2045) *Enchanting Geometry.* Preliminary report.
Oliver Thakar* and **Katherine Socha**, The Park School of Baltimore (1145-VO-713)

► 6:00PM (2046) *Outline of Point-Geometry.*
Hongguang Fu*, University of Electronic Science and Technology of China, **Jingzhong Zhang**, Guangzhou University, Guangzhou 510006, China, **Zengxiang Tong**, Otterbein University, Westerville, OH 43081, and **Xicheng Peng**, Central China Normal University (1145-VO-718)

Consortium for Ordinary Differential Equations Educators Meet-and-Greet Hour

4:00 PM – 5:00 PM **Room 323, BCC**

CODEE invites all who teach ODEs to join us for a meet-and-greet hour.

Organizers: **Christopher S. Goodrich**, Creighton Preparatory School
Beverly H. West, Cornell University

SIGMAA on Business, Industry, and Government (BIG SIGMAA) Guest Lecture

4:30 PM – 5:15 PM **Room 302, BCC**

Organizer: **Rob Burks**

MAA Student Poster Session

4:30 PM – 6:00 PM **Exhibit Hall G, 100 Level, BCC**

Organizers: **Eric Ruggieri**, College of the Holy Cross
Chasen Smith, Georgia Southern University

AMS Congressional Fellowship Session

4:30 PM – 6:30 PM **Room 316, BCC**

Organizer: **Karen Saxe**, American Mathematical Society

Speakers: **James Ricci**, AMS Congressional Fellow 2018-19

AWM Workshop: Poster Presentations by Women Graduate Students and Reception

5:00 PM – 6:15 PM **Pratt St Lobby, adjacent to JMM registration, BCC**

Organizers: **Matilde Lalin**, Universit/'e de Montr/'eal

Liz Vivas, Ohio State University

Sarah Witherspoon, Texas A&M

5:00PM (2047) *Establishing Several Infinite Families of Quantum Modular and Mock Modular Forms.*
Allison Arnold-Roksandich, Oregon State University

5:00PM (2048) *The Sato-Tate conjecture and Nagao's conjecture.*
Seoyoung Kim, Brown University

► 5:00PM (2049) *Double Affine Bruhat Order.* Preliminary report.
Amanda Welch, Virginia Tech University

5:00PM (2050) *A Turán-type Problem in Finite Groups.*
Emelie J Curl, Iowa State University

5:00PM (2051) *The* GL_4 *Rapoport-Zink Space.* Preliminary report.
Maria Fox, Boston College

5:00PM (2052) *The constrained minimization of the Functionalized Cahn-Hilliard Free Energy.*
Hayriye Guckir Cakir* and **Keith Promislow**, Michigan State University

5:00PM (2053) *Compute Conservation Law Using* L_1 *Minimization.* Preliminary report.
Anne Gelb, Dartmouth College, **Qin Li** and **Xiao Hou***, University of Wisconsin - Madison

► 5:00PM (2054) *Multidimensional scaling: Infinite Metric Measure Spaces.*
Henry Adams, **Mark Blumstein** and **Lara Kassab***, Colorado State University

5:00PM (2055) *Some paramodular forms connected with elliptic curves.*
Manami Roy, University of Oklahoma

► 5:00PM (2056) *An AMG Approach in Solving Graph Laplacians of Protein Networks Based on Diffusion State Distance Metrics.*
Junyuan Lin, Tufts University

5:00PM (2057) *Resolutions of ideals associated to subspace arrangements.*
Francesca Gandini* and **Harm Derksen**, University of Michigan

► 5:00PM (2058) *Analyzing the Structural Properties of Pulmonary Arterial Networks.*
Megan J Chambers, North Carolina State University

5:00PM (2059) *Diffusive Optical Tomography in the Bayesian Framework.*
Kit Newton*, **Qin Li**, University of Wisconsin-Madison, and **Andrew Stuart**, California Institute of Technology

► 5:00PM (2060) *Estimating the Extinction Time of infection in a spatial stochastic SIR model.* Preliminary report.
Keisha Cook, The University of Alabama

► 5:00PM (2061) *Multiplying Curves in the Thickened T – Shirt.*
Rhea Palak Bakshi*, **Sujoy Mukherjee**, The George Washington University, **Marithania Silvero**, Instituto de Matemáticas, Universidad de Sevilla, **Józef H. Przytycki**, The George Washington University, and **Xiao Wang**, Jilin University, Changchun, China

► 5:00PM (2062) *Stability of traveling wave solutions of nonlinear conservation laws for image processing.* Preliminary report.
Jeungeun Park, The University of Iowa

5:00PM (2063) *Quaternary Lattices of Discriminant 4p.*
Lisa Kaylor, Wesleyan University

5:00PM (2064) *Efficient Denoising of High Resolution Color Digital Images Utilizing Krylov Subspace Spectral Methods.*
Eva Comino, University of Southern Mississippi

5:00PM (2065) *Stanley-Reisner Rings and Thickenings.*
Jennifer Kenkel, University of Utah

MAA Panel

5:00 PM – 7:00 PM **Room 349, BCC**

Advising Actuarial Science Students

Organizers: **Kevin Charlwood**, Washburn University

Michelle Guan, Indiana University Northwest

Steve Paris, Florida State University

Barry Smith, Lebanon Valley College

Sue Staples, Texas Christian University

Panelists: **Kevin Charlwood**, Washburn University

Rick Gorvett, Casualty Actuary Society

Michelle Guan, Indiana University Northwest

Stuart Klugman, Society of Actuaries

Steve Paris, Florida State University

Barry Smith, Lebanon Valley College

Sue Staples, Texas Christian University

SIGMAA on Business, Industry, and Government (BIG SIGMAA) Reception

5:15 PM – 6:00 PM **Room 302, BCC**

Organizer: **Rob Burks**

SIGMAA On Mathematical and Computational Biology (BIO SIGMAA) Reception and Business Meeting

6:00 PM – 7:00 PM **Room 303, BCC**

Organizer: **Tim Comar**

SIGMAA on Mathematics Instruction Using the WEB (WEB SIGMAA) Business Meeting, Reception, and Guest Lecture

6:00 PM – 6:45 PM **Room 324, BCC**

Organizer: **Paul Seeberger**

6:00PM ► (2066) *Using CalcPlot3D to Create Dynamic Figures for OER Textbooks and to 3D Print Surfaces for Multivariable Calculus and Beyond.* Preliminary report. **Paul E Seeburger**, Monroe Community College (1145-A0-2162)

Mathematically Bent Theater

6:00 PM – 7:00 PM **Room 309/310, BCC**

Performed by Colin Adams and the Mobiusbandaid Players.

SIGMAA on Undergraduate Research Business Meeting

6:00 PM – 7:00 PM **Room 322, BCC**

AMS Mathematical Reviews Reception

6:00 PM – 7:00 PM **Promenade, 1st Floor, Marriott Inner Harbor**

SIGMAA on Inquiry Based Learning Business Meeting

6:30 PM – 7:30 PM **Room 339, BCC**

SIGMAA on Math Circles for Students and Teachers Business Meeting

6:30 PM – 7:30 PM **Room 306, BCC**

Organizers: **Sarah Bryant**, Dickinson College

Lance Bryant, Shippensburg University

SIGMAA on Mathematical Knowledge for Teaching Business Meeting

6:30 PM – 7:30 PM **Room 340, BCC**

SIGMAA on Statistics Education Business Meeting

6:30 PM – 7:30 PM **Room 323, BCC**

SIGMAA on Mathematical and Computational Biology Guest Lecture

7:00 PM – 7:45 PM **Room 303, BCC**

Organizer: **Tim Comar**

7:00PM (2067) *Mathematics in medicine.* **Reinhard Laubenbacher**, University of Connecticut School of Medicine and Jackson Laboratory for Genomic Medicine (1145-A0-3036)

MAA Special Presentation:

7:00 PM – 8:30 PM **Room 301, BCC**

Poetry Reading

Organizers: **Gizem Karaali**, Pomona College

Lawrence M. Lesser, University of Texas at El Paso

Douglas Norton, Villanova University

JoAnne Growney

SIGMAA On Statistics Education Guest Lecture

7:30 PM – 8:30 PM **Room 323, BCC**

Organizer: **Bonnie Gold**, Monmouth University (retired)

NAM Cox-Talbot Address

7:45 PM – 8:35 PM **Holiday Ballroom 6, 2nd Floor, Hilton**

► (2068) *A Seat at the Table: Equity and Social Justice in Mathematics Education.* **Talithia Denese Williams**, Harvey Mudd College (1145-97-965)

Project NExT Reception

8:00 PM – 10:00 PM **Stadium Ballroom, 2nd Floor, Marriott Inner Harbor**

All Project NExT Fellows, consultants, and other friends of Project NExT are invited.

Backgammon!

8:00 PM – 10:00 PM **Key Ballroom 9 & 10, 2nd Floor, Hilton**

Learn to play backgammon from expert players.

Organizer: **Arthur Benjamin**, Harvey Mudd College

Saturday, January 19

Joint Meetings Registration

7:30 AM – 1:00 PM **Pratt Street Lobby, 300 Level, BCC**

Email Center

7:30 AM – 1:00 PM **Pratt Street Lobby, 300 Level, BCC**

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

8:00 AM – 9:50 AM **Room 344, BCC**

Organizers: **Darren A. Narayan**, Rochester Institute of Technology
Khang Tran, California State University, Fresno
Mark David Ward, Purdue University
John Wierman, The Johns Hopkins University

8:00AM (2069) *Rendezvous Search on the Edges of Vertex-Transitive Solids.* Preliminary report.
Elanor West* and **Xiao Xie**, Johns Hopkins University (1145-05-1019)

► 8:30AM (2070) *Multi-Step Strategies for Rendezvous Search on the Platonic Solids.* Preliminary report.
Xiao Xie* and **Elanor West**, Johns Hopkins University (1145-05-2408)

► 9:00AM (2071) *Progress on the Symmetric Rendezvous Problem on the Line.* Preliminary report.
Jeffrey A Braun* and **John C Wierman**, Johns Hopkins University (1145-90-2475)

► 9:30AM (2072) *Probabilistic Counting-Out Game on a Line.* Preliminary report.
Tingting Ou* and **Michelle Shu**, Johns Hopkins University (1145-60-2574)

AMS Special Session on Advances and Applications in Integral and Differential Equations, I

8:00 AM – 11:50 AM **Room 331, BCC**

Organizers: **Jeffrey T. Neugebauer**, Eastern Kentucky University
Min Wang, Kennesaw State University

8:00AM (2073) *An Avery Fixed Point Theorem applied to a Hammerstein Integral Equation.*
Paul W Eloe, University of Dayton, and **Jeffrey T Neugebauer***, Eastern Kentucky University (1145-45-537)

8:30AM (2074) *Existence of Solutions for Integral Equations with Changing Sign Green's Functions.*
Wenying Feng*, Departments of Computing & Information Systems and Mathematics, and **Ankai Liu**, Queen's University, Canada (1145-34-856)

9:00AM (2075) *Quasilinearization and Boundary Value Problems for Riemann-Liouville Fractional Differential Equations.*
Paul Eloe*, University of Dayton, and **Jaganmohan Jonnalagaddda**, Birla Institute of Technology and Science Pilani (1145-34-1025)

9:30AM (2076) *Linear Sturm-Liouville Problems with Riemann-Stieltjes Integral Boundary Conditions.*
Qingkai Kong, Northern Illinois University, and **Thomas E St. George***, Carroll University (1145-34-2127)

10:00AM (2077) *New Variation of Parameters Formula that Leads to Stability in Integro-differential Equations.* Preliminary report.
Youssef Naim Raffopul, University of Dayton (1145-34-921)

10:30AM (2078) *Analysis of Stagnation Point Flow of an Upper-Convected Maxwell Fluid.*
Joseph Paullet, Penn State Behrend (1145-34-1352)

11:00AM (2079) *Fractional Lyapunov-type Inequalities with Mixed Boundary Conditions on univariate and multivariate domains.*
Sougata Dhar*, University of Maine, and **Qingkai kong**, Northern Illinois University (1145-34-951)

► 11:30AM (2080) *A fractional inventory model for bike share systems.*
Min Wang, Kennesaw State University (1145-34-920)

AMS Special Session on Advances by Early Career Women in Discrete Mathematics, I

8:00 AM – 11:50 AM **Room 338, BCC**

Organizers: **Jessalyn Bolkema**, State University of New York at Oswego
Jessica De Silva, California State University, Stanislaus

► 8:00AM (2081) *On the enumeration of pattern-avoiding inversion sequences.*
Megan A. Martinez, Ithaca College (1145-05-1784)

► 8:30AM (2082) *Lewis Carroll and the Red Hot Potato.*
Melanie Dennis, Dartmouth College (1145-05-2246)

9:00AM (2083) *Connecting partial orderings and alternating sign matrices.*
Andrew Beveridge, Macalester College, **Ian Calaway**, National Bureau of Economic Research, and **Kristin Heysse***, Macalester College (1145-05-2690)

9:30AM (2084) *The size of a family forbidding the $Y_{k,2}$ poset and its dual.*
Ryan R Martin, Iowa State University, **Abhishek Methuku**, Central European University, **Andrew Uzzell**, Grinnell College, and **Shanise Walker***, University of Wisconsin-Eau Claire (1145-05-433)

10:00AM (2085) *Counting restricted tilings of rectangular arrays and applications.*
Katie Haymaker, Villanova University (1145-05-2059)

10:30AM (2086) *A Graph Connectivity Problem Based on Low-degree Luby Transform Codes.* Preliminary report.
Carolyn Mayer* and **William J. Martin**, Worcester Polytechnic Institute (1145-05-1806)

11:00AM ► (2087) *Expander codes and local properties.* Preliminary report.
Rutuja Kshirsagar, Virginia Tech (1145-94-2262)

11:30AM ► (2088) *Coding to thwart adversarial interference.*
Allison Beemer*, Arizona State University, **Joerg Kliewer**, New Jersey Institute of Technology, and **Oliver Kosut**, Arizona State University (1145-94-1893)

AMS Special Session on Advances in Quantum Walks, Quantum Simulations, and Related Quantum Theory, I

8:00 AM – 11:20 AM **Room 337, BCC**

Organizers: **Radhakrishnan Balu**, US Army Research Lab

Chaobin Liu, Bowie State University

Takuya Machida, Nihon University, Japan

8:00AM ► (2089) *Machine-learning-assisted search for a quantum-annealing speedup.* Preliminary report.
Archismita Dalal, **Seyed Shakib Vedaie**, University of Calgary, **Radhakrishnan Balu**, US Army Research Laboratory, Maryland, and **Barry Cyril Sanders***, University of Calgary (1145-81-2744)

8:30AM (2090) *GKSL Generators and Digraphs: Computing Invariant States.*
Alexander K Wiedemann* and **George Androulakis**, University of South Carolina (1145-81-2575)

9:00AM (2091) *Kinematics and Dynamics of Quantum Walks in terms of Systems of Imprimitivity.*
Radhakrishnan Balu, US Army Resaerch Lab (1145-81-539)

9:30AM (2092) *Bell inequality that cannot be maximally violated with finite amount of entanglement.* Preliminary report.
Zhengfeng Ji, Centre for Quantum Software and Information, University of Technology Sydney, Australia, **Debbie Leung***, Institute for Quantum Computing, University of Waterloo, Canada, and **Thomas Vidick**, California Institute of Technology, USA (1145-81-1527)

10:00AM (2093) *On Quantum Phase Estimation Algorithm in Quantum Chemistry Calculation.* Preliminary report.
Yutaka Shikano, Quantum Computing Center, Keio University (1145-81-165)

10:30AM ► (2094) *Is quantum state transfer monogamous?*
Christino Tamon, Clarkson University (1145-15-703)

11:00AM (2095) *Long-Step Path-Following Algorithm for Nonlinear Symmetric Problems with Applications to Quantum Entropy Optimization.*
Cunlu Zhou* and **Leonid Faybusovich**, University of Notre Dame (1145-90-821)

AMS Special Session on Algebraic, Discrete, Topological and Stochastic Approaches to Modeling in Mathematical Biology, I

8:00 AM – 11:50 AM **Room 347, BCC**

Organizers: **Olcay Akman**, Illinois State University

Timothy D. Comar, Benedictine University

Daniel Hrozencik, Chicago State University

Raina Robeva, Sweet Briar College

8:00AM (2096) *Predicting neural network dynamics from graph structure.*
Katherine Morrison, University of Northern Colorado (1145-92-1147)

8:30AM (2097) *On The Implementation of Artificial Neural Networks For Estimation Of Gene Regulatory Network Propensities.*
Dan Hrozencik*, Chicago State University, and **Olcay Akman**, Illinois State University (1145-92-2900)

9:00AM ► (2098) *The Dynamic Nature of Functional Brain Networks of Emotion Regulation.* Preliminary report.
Reinhard Laubenbacher*, Jackson Laboratory for Genomic Medicine and UConn Health, **Sherli Koshy Chenthittayil**, **Paola Vera-Licona**, Center for Quantitative Medicine, UConn Health, **Michael Stevens** and **Andrew Poppe**, Hartford Hospital, Hartford, CT (1145-92-1001)

9:30AM (2099) *Reversion of the attractor landscapes of an intracellular regulatory network for triple-negative breast cancer.* Preliminary report.
Lauren Marazzi and **Paola Vera-Licona***, Center for Quantitative Medicine, UConn Health (1145-92-2333)

► 10:00AM (2100) *Topological modeling of DNA recombination.*
Mariel Vazquez, Departments of Mathematics and of Microbiology & Molecular Genetics, University of California, Davis (1145-57-2464)

► 10:30AM (2101) *Topological Entanglement in Macromolecules.*
Kenneth Cary Millett, University of California, Santa Barbara (1145-57-1772)

11:00AM (2102) *A topological study of protein folding kinetics.*
Eleni Panagiotou*, Department of Mathematics University of Tennessee at Chattanooga, and **Kevin W Plaxco**, Department of Chemistry and Biochemistry and Center for Bioengineering University of California Santa Barbara (1145-92-2130)

► 11:30AM (2103) *Enhancing the detection of Atrial Fibrillation from existing models using Persistent Homology-based feature.*
Esteban G Escobar, Mathematical Sciences Research Institute (1145-54-3022)

AMS Special Session on Enumerative Combinatorics, I

8:00 AM – 11:50 AM **Room 318, BCC**

Organizers: **Miklos Bona**, University of Florida
Cheyne Homberger, University of Maryland, Baltimore County

► 8:00AM (2104) *Saturation for Induced Subposets.*
Michael Ferrara, University of Colorado, **Bill Kay**, Ryerson University, **Lucas Kramer**, Briar Cliff University, **Ryan M. Martin**, Iowa State University, **Benjamin Reiniger**, Chicago, IL, **Heather C. Smith***, Davidson College, and **Eric Sullivan**, University of Colorado (1145-05-1933)

8:30AM (2105) *Using Experimental Data to Deconvolve Structural Signals.*
Torin Greenwood*, Rose-Hulman Institute of Technology, and **Christine E Heitsch**, Georgia Institute of Technology (1145-05-1408)

► 9:00AM (2106) *Lassalle's Sequence Counts Uniquely Sorted Permutations.*
Colin Defant*, Princeton University, **Michael Engen**, University of Florida, and **Jordan A Miller**, Washington State University (1145-05-358)

9:30AM (2107) *Central Limit Theorems from the Roots of Probability Generating Functions.*
Marcus Michelen, The University of Pennsylvania (1145-60-933)

► 10:00AM (2108) *How many chord diagrams have no short chords?* Preliminary report.
Peter Doyle, Dartmouth College, **Jay Pantone***, Marquette University, and **Everett Sullivan**, Lewis & Clark College (1145-05-1354)

► 10:30AM (2109) *Universal Permutations.*
Michael T Engen, University of Florida (1145-05-1736)

► 11:00AM (2110) *Vertical Paths in Simple Varieties of Trees.*
Keith J. Copenhaver, University of Florida (1145-05-1876)

11:30AM (2111) *Asymptotics of the number of bosonic string states.*
Lida Ahmadi* and **Mark Daniel Ward**, Purdue University (1145-30-932)

AMS Special Session on Group Representation Theory and Character Theory, I

8:00 AM – 11:50 AM **Room 330, BCC**

Organizers: **Mohammad Reza Darafsheh**, University of Tehran, Iran
Manouchehr Misaghian, Prairie View A&M University

8:00AM (2112) *Embedding $\mathfrak{sl}_k$ in $\mathfrak{sl}_n$ as a small subalgebra and the representations of the symmetric group.* Preliminary report.
Alexander M. Heaton, **Songpon Sriwongsa** and **Jeb F. Willenbring***, University of Wisconsin - Milwaukee (1145-20-1834)

9:00AM (2113) *Monodromy for some rank two Galois representations over CM fields.*
Patrick Allen*, University of Illinois at Urbana-Champaign, and **James Newton**, Kings College London (1145-11-2975)

9:30AM (2114) *New Developments in Quaternionic Analysis from the Point of View of Representation Theory.*
Matvei Libine, Indiana University, Bloomington (1145-32-1164)

10:00AM (2115) *Brauer characters and normal Sylow p-subgroups.*
Hung P Tong-Viet, Binghamton University (1145-20-1119)

10:30AM (2116) *One rational irreducible characters of finite groups.* Preliminary report.
M R Darafsheh, university of Tehran (1145-20-468)

11:00AM (2117) *Maximal abelian subgroups of semi-extraspecial groups and partitions by centers of centralizers.*
Mark L. Lewis, Department of Mathematical Sciences, Kent State University (1145-20-432)

11:30AM (2118) *Rational Class Sizes and Their Implications About The Structure of Finite Groups.*
Hossein Shahrtash, University of Florida (1145-20-424)

AMS Special Session on Localization and Delocalization for Disordered Quantum Systems, I

8:00 AM – 11:50 AM **Room 326, BCC**

Organizers: **Peter D. Hislop**, University of Kentucky
Christoph A. Marx, Oberlin College
Jeffery Schenker, Michigan State University

8:00AM (2119) *On ground states and excitations in certain disordered quantum spin chains.* Preliminary report.
Matthew Cha*, **Rodrigo Matos**, **Jeffery Schenker** and **F Zak Tilocco**, Michigan State University (1145-82-2693)

8:30AM (2120) *Recent Progress on the Quantum XXZ Spin Model on General Graphs.*
Houssam Abdul-Rahman, University of Arizona, **Christoph Fischbacher*** and **Gunter Stolz**, University of Alabama at Birmingham (1145-82-1782)

9:00AM (2121) *Lieb-Robinson bounds and conditional expectations for lattice fermion systems.*
Bruno Nachtergaele, UC Davis, **Robert Sims** and **Amanda Young***, University of Arizona (1145-82-1653)

9:30AM (2122) *Universal hierarchical structure of eigenfunctions of the Maryland model.*
Rui Han, Georgia Tech, **Svetlana Jitomirskaya**, UC Irvine, and **Fan Yang***, Georgia Tech (1145-47-1662)

10:00AM (2123) *Random band matrices in the delocalized phase.*
Paul Bourgade*, NYU Courant Institute, **Fan Yang**, UCLA, **Horng-Tzer Yau**, Harvard, and **Jun Yin**, UCLA (1145-60-822)

10:30AM (2124) *Positivity of the Lyapunov exponent for potentials generated by hyperbolic base dynamics.*
Zhenghe Zhang, UC Riverside (1145-37-1654)

11:00AM ► (2125) *Discrete Bethe-Sommerfeld Conjecture.*
Jake Fillman, Virginia Tech, **Rui Han***, Georgia Tech, and **Svetlanta Jitomirskaya**, UC Irvine (1145-47-1657)

11:30AM (2126) *WKB and absence of the singular continuous spectrum for perturbed periodic Schrödinger operators.*
Wencai Liu, UC Irvine (1145-42-1186)

AMS Special Session on Mathematicians at Sea (in the Sky, or on Land): Defense Applications of Mathematics, I

8:00 AM – 11:50 AM **Room 332, BCC**

Organizers: **Tegan Emerson**, Naval Research Laboratory
Timothy Doster, Naval Research Laboratory
George Stantchev, Naval Research Laboratory

8:00AM ► (2127) *Large fluctuations, rare event prediction and control in complex networks.*
Ira B. Schwartz*, US Naval Research Laboratory, **Klimka Szwaykowska**, Syntek,Inc., **Thomas W. Carr**, Southern Methodist University, Math Department, **Jason Hindes**, US Naval Research Laboratory, and **Leah B. Shaw**, College of William and Mary, Department of Mathematics (1145-82-666)

9:00AM (2128) *Characterization of Radar Signals via Topological Data Analysis and Spiking Neuron Networks.*
Justin Mauger, Space and Naval Warfare Systems Center Pacific (1145-55-1913)

9:30AM ► (2129) *Adaptive Individualized Technology to Facilitate Teamwork in Human-Agent Military Teams.* Preliminary report.
Addison W Bohannon, US Army Research Laboratory (1145-93-717)

10:00AM ► (2130) *Topological Defense Analysis: the how and why of US Department of Defense research.*
Robert Ghrist, University of Pennsylvania (1145-55-1721)

11:00AM ► (2131) *A Mathematical Modeling Perspective on the US Navy, Humanitarian Aid, and International Relations.*
Stephen L. Hobbs, Space and Naval Warfare Systems Center (1145-90-1416)

11:30AM ► (2132) *Donald Trump vs. Kim Jong-Un: Can Game Theory Help Explain Their Nuclear Relationship?* Preliminary report.
Kelly A Rooker, Johns Hopkins University Applied Physics Laboratory (1145-91-1333)

AMS Special Session on Mathematics of Coding Theory and Applications, I

8:00 AM – 11:50 AM **Room 319, BCC**

Organizers: **Hiram Lopez-Valdez**, Clemson University
Felice Manganiello, Clemson University
Gretchen L. Matthews, Virginia Tech

8:00AM (2133) *The Service Rates of Codes and Vertex Covers of Graphs.*
Emina Soljanin, Rutgers, The State University of New Jersey (1145-05-2243)

8:30AM (2134) *Repairing Reed-Solomon Codes.*
Weiqi Li, **Zhiying Wang*** and **Hamid Jafarkhani**, University of California, Irvine (1145-94-1297)

9:00AM (2135) *Absorbing sets of LDPC codes from finite incidence structures.*
Katie Haymaker*, Villanova University, **Allison Beemer**, Arizona State University, and **Christine A Kelley**, University of Nebraska-Lincoln (1145-94-2054)

9:30AM (2136) *Service Rate Region of Coded Storage Systems.*
Sarah E. Anderson*, University of St. Thomas, **Ann Johnston**, Penn State University, **Gauri Joshi**, Carnegie Mellon University, **Gretchen L. Matthews**, Virginia Tech, **Carolyn Mayer**, Worcester Polytechnic Institute, and **Emina Soljanin**, Rutgers University (1145-94-2147)

10:00AM (2137) *Reproducible Codes and Cryptographic Applications.* Preliminary report.
Edoardo Persichetti, Florida Atlantic University (1145-14-1409)

10:30AM (2138) *Codes With Hierarchical Locality from Maps Between Algebraic Curves.*
Sean Ballentine, University of Maryland (1145-14-2267)

11:00AM (2139) *Pure gaps on curves with many rational places.*
Daniele Bartoli, Universita degli Studi di Perugia, **Ariane Masuda***, New York City College of Technology, CUNY, **Maria Montanucci**, Universita degli Studi della Basilicata, and **Luciane Quoos**, Universidade Federal do Rio de Janeiro (1145-94-1096)

11:30AM (2140) *Recent advances in spatially coupled codes and applications in data storage systems.*
Lara Dolecek*, **Homa Esfahanizadeh** and **Ahmed Hareedy**, UCLA (1145-05-1395)

AMS Special Session on Network Science, I

8:00 AM – 11:50 AM **Room 320, BCC**

Organizers: **David Burstein**, Swarthmore College
Franklin Kenter, United States Naval Academy
Feng 'Bill' Shi, University of North Carolina

8:00AM (2141) *Universality of the configuration-dynamics relationship in nonlinear networks.*
Simone Evans*, SUNY New Paltz, and **Anca Radulescu**, State University of New York at New Paltz (1145-37-1143)

8:30AM (2142) *Spanning tree modulus for secure broadcast games.*
Kapila G Kottegoda, Kansas State University (1145-00-1287)

9:00AM (2143) *Recent progress on bounding bond percolation thresholds.* Preliminary report.
John C. Wierman, Johns Hopkins University (1145-60-216)

10:00AM (2144) *Connections between multicommodity maximum flow and modulus.* Preliminary report.
Negar Orangi-Fard, Kansas state University (1145-00-1167)

10:30AM (2145) *Syntax and inductive rewriting for open networks.*
Daniel Michael Cicala, University of California, Riverside (1145-18-1944)

11:00AM (2146) *Temporal and topological patterns of reposting dynamics reveal online influence inflation in social media.*
Xingru Chen* and **Feng Fu**, Dartmouth College (1145-91-1743)

11:30AM (2147) *Leveraging local network communities to predict academic performance.*
David Burstein, Fifth Third Bank, **Franklin Kenter***, United States Naval Academy, and **Feng Shi**, University of North Carolina at Chapel Hill (1145-97-1778)

AMS Special Session on Not KNerds: A Community for Knot Theory, I

8:00 AM – 11:50 AM **Room 329, BCC**

Organizers: **Moshe Cohen**, Vassar College
Elizabeth Denne, Washington and Lee University
Adam Lowrance, Vassar College

8:00AM (2148) *The geometry of fibered knots and links.*
David Futer, Temple University (1145-57-1088)

9:00AM (2149) *Singular Branched Covers of the Four-Sphere.*
Ryan Blair, California State University, Long Beach, **Patricia Cahn***, Smith College, and **Alexandra Kjuchukova**, Max Planck (1145-57-1918)

9:30AM (2150) *Thin Posets and Homology Theories.* Preliminary report.
Alex A Chandler, North Carolina State University (1145-18-2754)

10:00AM (2151) *Searching for structure in the knot concordance group.*
Constance Leidy, Wesleyan University (1145-57-2163)

11:00AM (2152) *A lower bound for the double slice genus.*
Wenzhao Chen, Michigan State University (1145-57-1472)

11:30AM (2153) *Link Concordance and Groups.*
Matthew Hedden, Michigan State University, and **Miriam Kuzbary***, Rice University (1145-57-1754)

AMS Special Session on Number Theory, Arithmetic Geometry, and Computation, I

8:00 AM – 11:50 AM **Room 325, BCC**

Organizers: **Brendan Hassett**, Brown University

Drew Sutherland, Massachusetts Institute of Technology

John Voight, Dartmouth College

8:00AM (2154) *Non-abelian Chabauty and rational points on curves.*
Jan Vonk, University of Oxford (UK) (1145-11-490)

8:30AM (2155) *Progress on Mazur's Program B.*
David Zureick-Brown, Emory University (1145-11-492)

9:00AM (2156) *A-gonality and points of degree d on curves.* Preliminary report.
Maarten Derickx, MIT / Simons Collaborationon Arithmetic Geometry, Number Theory, and Computation (1145-11-385)

9:30AM (2157) *Torsion Points and Isogenies on CM Elliptic Curves.*
Abbey Bourdon*, Wake Forest University, and **Pete L. Clark**, University of Georgia (1145-11-2330)

10:00AM (2158) *Elliptic Curves of Prime Conductor.* Preliminary report.
Aly Deines, Center for Communications Research La Jolla (1145-11-2648)

10:30AM (2159) *Modular symbols for Fermat Curves.*
Ozlem Ejder, Colorado State University (1145-11-2154)

11:00AM (2160) *2-Group Belyi Maps.*
Michael James Musty, Dartmouth College (1145-11-2469)

11:30AM (2161) *An $\ell - p$ switch trick to obtain a new proof of a criterion for arithmetic equivalence.*
Guillermo Mantilla-Soler, Bogotá, Colombia. (1145-11-1324)

AMS Special Session on Orthogonal Polynomials, Quantum Probability, Harmonic and Stochastic Analysis, II

8:00 AM – 11:20 AM **Room 343, BCC**

Organizers: **Nobuhiro Asai**, Aichi University of Education, Kariya, Japan

Rodica Costin, The Ohio State University

Aurel I. Stan, The Ohio State University at Marion

Hiroaki Yoshida, Ochanomizu University, Tokyo, Japan

8:00AM (2162) *Probability distributions of a field operator associated with a q-deformed algebra.* Preliminary report.
Nobuhiro Asai, Department of Mathematics, Aichi University of Education (1145-60-753)

9:00AM (2163) *The Gaussian limit of High Dimensional Spherical Means.*
Amy Elizabeth Peterson, University of Connecticut (1145-46-1800)

9:30AM (2164) *Non-commutative disintegration.*
Arthur J Parzygnat*, University of Connecticut, and **Benjamin P Russo**, Farmingdale State College (SUNY) (1145-47-579)

► 10:00AM (2165) *Reconstruction of piece-wise smooth functions from non-uniform Fourier data.* Preliminary report.
Congzhi Xia, Clarkson University (1145-42-1258)

10:30AM (2166) *Integration on the infinite sphere.* Preliminary report.
Irfan Alam, Louisiana State University (1145-28-2527)

► 11:00AM (2167) *A characterization of probability measures in terms of their semi-quantum operators.* Preliminary report.
Aurel I Stan, The Ohio State University at Marion (1145-60-1597)

AMS Special Session on Partition Theory and Related Topics, I

8:00 AM – 11:50 AM **Room 321, BCC**

Organizers: **Dennis Eichhorn**, University of California, Irvine

Tim Huber, University of Texas, Rio Grande Valley

Amita Malik, Rutgers University

8:00AM (2168) *Dyson's Favorite Identity and Chebyshev Polynomials.*
George E Andrews, The Pennsylvania State University (1145-11-907)

8:30AM (2169) *Combinatorics of some second-order mock theta functions.*
Hannah E Burson, University of Illinois at Urbana-Champaign (1145-11-1832)

9:00AM (2170) *Congruences related to an eighth order mock theta function of Gordon and McIntosh.*
James A Sellers, Penn State University (1145-11-1609)

9:30AM (2171) *An Unusual Identity from Ramanujan's Notebooks.*
Zhu Cao, Department of Mathematics, Kennesaw State University (1145-05-1888)

10:00AM (2172) *Polynomial Identities Implying Capparelli's Partition Theorems.* **Ali K Uncu***, Research Institute for Symbolic Computation, Johannes Kepler University, Linz, and **Alexander Berkovich**, University of Florida (1145-11-1968)

10:30AM (2173) *Order ideals, lattice paths, and core partitions.* **Jineon Baek**, University of Michigan, **Hayan Nam***, University of California, Irvine, and **Myungjun Yu**, University of Michigan (1145-05-2688)

11:00AM ► (2174) *Hecke-Rogers series for Ramanujan's mock theta functions.* Preliminary report. **Frank Garvan**, University of Florida (1145-11-2083)

11:30AM (2175) *Kanade–Russell conjectures and linked partition ideals.* **Shane Chern*** and **Zhitai Li**, Department of Mathematics, The Pennsylvania State University (1145-05-977)

AMS Special Session on Statistical, Variational, and Learning Techniques in Image Analysis and their Applications to Biomedical, Hyperspectral, and Other Imaging, I

8:00 AM – 11:45 AM **Room 346, BCC**

Organizers: **Justin Marks**, Gonzaga University
Laramie Paxton, Washington State University
Viktoria Taroudaki, Eastern Washington University

8:00AM ► (2176) *A Consistent Density-Based Clustering Algorithm and its Application to Microstructure Image Segmentation.* **Marilyn Vazquez Landrove***, Institute for Computational and Experimental Research in Mathematics, **Tim Sauer**, **Tyrus Berry**, George Mason University, and **Gunay Dogan**, Theiss Research (1145-65-763)

8:30AM (2177) *Automatic Detection of Breast Masses and Location of the Prostate.* **Jue Wang**, Union College (1145-92-1688)

9:00AM ► (2178) *A Survey of Liver Tumor Image Segmentation Techniques.* **Laramie Paxton**, Washington State University (1145-68-2729)

9:30AM ► (2179) *An Optimization Algorithm for Elastic Shape Distances between 2d Object Boundaries.* **Gunay Dogan***, Theiss Research, National Institute of Standards and Technology, **Javier Bernal** and **Charles R Hagwood**, National Institute of Standards and Technology (1145-53-2563)

10:30AM (2180) *Learning Geometry for Image Decomposition.* Preliminary report. **Stacey Levine**, Duquesne University (1145-35-2833)

11:00AM (2181) *Tensor Dictionaries for Applications in Imaging.* **Misha E Kilmer*** and **Elizabeth Newman**, Tufts University, Department of Mathematics (1145-15-1771)

AMS Special Session on Topological Data Analysis: Theory and Applications, I

8:00 AM – 11:50 AM **Room 345, BCC**

Organizers: **Justin Curry**, University at Albany, State University of New York
Mikael Vejdemo-Johansson, College of Staten Island, City University of New York
Sara Kalisnik Verovsek, Wesleyan University

8:00AM (2182) *Towards a Spectral Theory of Cellular Sheaves.* **Jakob Hansen** and **Robert Ghrist***, University of Pennsylvania (1145-57-1724)

8:30AM (2183) *Analyzing data with the consistency filtration of a sheaf assignment.* **Michael Robinson**, American University (1145-18-1376)

9:00AM (2184) *A Persistent Homology Measure for Morse Functions.* Preliminary report. **Alexander Wagner**, University of Florida (1145-55-1337)

9:30AM (2185) *Homotopy types and persistence of metric gluings.* **Ellen Gasparovic**, Union College (1145-55-897)

10:00AM ► (2186) *Topological Periodicity Analysis in Multimedia Time Series.* **Christopher John Tralie**, Postdoctoral Associate, Duke University Department of Mathematics (1145-68-154)

10:30AM (2187) *Statistical analysis and parameter selection for Mapper.* **Mathieu Carriere**, Columbia University Medical Center (1145-55-1787)

11:00AM (2188) *Stability of a Multi-Parameter Persistent Homology Approach to Functional and Structural Data.* **Haibin Hang***, Florida State University, **Woojin Kim**, **Facundo Memoli**, Ohio State University, and **Washington Mio**, Florida State University (1145-55-2429)

11:30AM (2189) *Algebra and geometry of persistence.* Preliminary report. **Ezra Miller**, Duke University (1145-55-2193)

AMS Special Session on Using Modeling to Motivate the Study of Differential Equations, I

8:00 AM – 11:50 AM **Room 336, BCC**

Organizers: **Robert Kennedy**, Centennial High School, Ellicott City MD

Audrey Malagon, Virginia Wesleyan University

Brian Winkel, SIMIODE, Cornwall NY

Dina Yagodich, Frederick Community College

8:00AM ► (2190) *An Effort to Assess the Impact a Modeling First Approach has in a Traditional Differential Equations Class.* **Rosemary C Farley*** and **Patrice G Tiffany**, Manhattan College (1145-34-2651)

8:30AM (2191) *Using Real Data to Study the Heat Equation.* **Kimberly Spayd**, Gettysburg College (1145-97-95)

9:00AM ► (2192) *Virtual Experiments and Differential Equations Models.* **Chris McCarthy**, Borough of Manhattan Community College CUNY (1145-34-60)

9:30AM (2193) *Engaging and supporting students as they explore mathematical modeling in differential equations.* **Christine Sample***, Emmanuel College, and **Joanna A Bieri**, University of Redlands (1145-34-2146)

10:00AM ► (2194) *Teaching Differential Equations and Their Applications Using Projects, Online Resource, and More.* Preliminary report. **W. Y. Chan**, Texas A&M University - Texarkana (1145-97-378)

10:30AM ► (2195) *Using Projects to Flip the Differential Equations Classroom.* Preliminary report. **Corban Harwood**, George Fox University (1145-34-1306)

11:00AM ► (2196) *A Data-Driven Approach to Teaching Modeling with Differential Equations.* Preliminary report. **Becky Sanft***, UNC Asheville, and **Anne Walter**, St. Olaf College (1145-34-2105)

11:30AM ► (2197) *Connecting Partner Disciplines with Mathematics through Applications in Differential Equations.* **Rebecca A Segal**, Virginia Commonwealth University (1145-97-1770)

MAA Invited Paper Session on Beauty and Art from Research Mathematics

8:00 AM – 10:50 AM **Room 323, BCC**

Organizer: **Diana Davis**, Swarthmore College

8:00AM ► (2198) *Galactic vistas from imaginary quadratic fields.* Preliminary report. **Daniel E. Martin**, University of Colorado (1145-AD-631)

8:30AM ► (2199) *Fungal fractals from post-critically finite polynomials.* **Jasmine Powell**, University of Michigan (1145-AD-436)

9:00AM ► (2200) *Sunsets from Heavy Cantilever Oscillations.* **Sophia T Santillan**, Duke University (1145-AD-1636)

9:30AM ► (2201) *Rings of fire from postcritically finite interval self-maps.* **Kathryn A Lindsey**, Boston College (1145-AD-1709)

10:00AM ► (2202) *Crafting contours of complex functions based on dynamical properties.* **Julie Barnes***, Western Carolina University, and **Beth Schaubroeck**, U. S. Air Force Academy (1145-AD-1627)

10:30AM ► (2203) *Artistic Patterns from the Universe Projected onto the Unit Sphere.* **Jessica M. Libertini**, Virginia Military Institute (1145-AD-1984)

AMS-MAA-ICHM Special Session on History of Mathematics, II

8:00 AM – 11:50 AM **Room 314, BCC**

Organizers: **Sloan Despeaux**, Western Carolina University

Jemma Lorenat, Pitzer College

Daniel E. Otero, Xavier University

Adrian Rice, Randolph-Macon College

8:00AM ► (2204) *Divergent Series near the turn of the 20^{th} century.* Preliminary report. **Brenda Davison**, Simon Fraser University (1145-01-2173)

8:30AM (2205) *Notions of continua in E.V. Huntington's work.* Preliminary report. **Laura E Turner**, Monmouth University (1145-01-2129)

9:00AM ► (2206) *Internationalize first, ask questions later: Headlong diplomacy and American mathematical hegemony, 1920-1950.* **Michael J. Barany**, University of Edinburgh (1145-01-1367)

9:30AM ► (2207) *Solving the "Shortage of Trained Brains": The Engineering, Science and Management War Training Program During the Second World War.* **Brit Shields**, University of Pennsylvania (1145-01-2395)

10:00AM ► (2208) *A Morsel from Euler.* **William Dunham**, Bryn Mawr College (1145-01-110)

10:30AM ► (2209) *Measuring Scouts and Trained Noses: Subjectivity, Objectivity, and the History of Mathematics.* **Christopher J. Phillips**, Carnegie Mellon University (1145-01-723)

11:00AM ► (2210) *The Bateman–Horn conjecture.* **Stephan Ramon Garcia**, Pomona College (1145-01-582)

11:30AM Discussion

MAA Minicourse #11: Part B

8:00 AM – 10:00 AM **Holiday Ballroom 2, 2nd Floor, Hilton**

Object Based Learning and the Smithsonian Learning Lab

Presenters: **Jane H. Long**, Stephen F. Austin State University

Gabriella Pinter, University of Wisconsin Milwaukee

Diana White, University of Colorado Denver and National Association of Math Circles

AMS Contributed Paper Session on Combinatorics and Graph Theory, III

8:00 AM – 11:40 AM **Room 313, BCC**

8:00AM (2211) *Circuit axiomatizations of symplectic matroids.*
Zhexiu Tu, Centre College (1145-05-1321)

8:15AM ► (2212) *Difference Sets and Grassmannian Packings.*
Emily J King, University of Bremen, Germany (1145-05-1611)

8:30AM ► (2213) *Pappus Configurations in Finite Projective Planes.* Preliminary report.
Lorinda Leshock, University of Delaware (1145-05-1391)

8:45AM ► (2214) *The Probability Four Lines in $\mathbb{F}_q\mathbb{P}^3$ Meet Two Lines.*
Adam Buck, University of Wisconsin - Milwaukee (1145-05-2739)

9:00AM ► (2215) *Stack sorting tiers and r-tiers.*
Toufik Mansour, University of Haifa, **Howard Skogman** and **Rebecca Smith***, SUNY Brockport (1145-05-2842)

9:15AM ► (2216) *A bivariate central limit theorem for descents and major indices in fixed conjugacy classes.*
Gene B. Kim*, University of Southern California, and **Sangchul Lee**, University of California, Los Angeles (1145-05-2593)

9:30AM ► (2217) *Combinatorics of the Boolean-Catalan Numbers.* Preliminary report.
Chetak Hossain, North Carolina State University (1145-05-1639)

9:45AM ► (2218) *Generating All Odd Primitive Abundant Numbers with d Prime Divisors.*
Jacob Liddy* and **Jeffrey M. Riedl**, University of Akron (1145-05-127)

10:00AM ► (2219) *Avoiding Patterns and Making the Best Choice.*
Brant Jones, James Madison University (1145-05-2517)

10:15AM ► (2220) *The Game of Best Choice and Some Variations.*
Kaitlyn B. Myers*, Rowan University, **Madeline P. Crews**, Rose-Hulman Institute of Technology, **Michael T. Urbanski**, Western New England University, and **Breeann M. Wilson**, Whitworth University (1145-05-2158)

10:30AM (2221) *Cyclic Sieving, Necklaces, Branching Rules, and Thrall's problem.*
Connor Thomas Ahlbach* and **Joshua P Swanson**, University of Washington, Seattle (1145-05-927)

10:45AM ► (2222) *A Walk Counting Combinatorial Identity for Recurrence Sequences.*
Nathan T. Moyer, Whitworth University (1145-05-226)

11:00AM ► (2223) *Digit Sum of Integers Generalizing Binomial Coefficients.* Preliminary report.
Ji Young Choi, Shippensburg University (1145-05-1161)

11:15AM ► (2224) *Generating Functions for f-vectors and the cd-index of Weight Polytopes.*
Vaughan K McDonald, Harvard College, and **Jiyang Gao***, Massachusetts Institute of Technology (1145-05-1595)

11:30AM ► (2225) *Number Sequences for Truncated and Bitruncated Cross-Polytopes.*
Anna C. Truman*, **Grace C. Shook** and **Caleb T. Scutt**, Grove City College (1145-05-2463)

AMS Contributed Paper Session on Geometry

8:00 AM – 11:40 AM **Room 311, BCC**

8:00AM ► (2226) *Symmetries of the Eikonal equation.*
Ryad Ghanam*, Virginia Commonwealth University in Qatar, and **Gerard Thompson**, University of Toledo (1145-53-116)

8:15AM (2227) *Zhong-Yang eigenvalue lower bound for the Laplacian on closed manifolds with integral Ricci curvature bounds.* Preliminary report.
Xavier Ramos Olive*, University of California, Riverside, **Shoo Seto**, University of California, Irvine, **Guofang Wei**, University of California, Santa Barbara, and **Qi S. Zhang**, University of California, Riverside (1145-58-830)

8:30AM (2228) *Harmonic manifolds with minimal horospheres.*
Hemangi M Shah*, Harish-Chandra Research Instituite, and **Akhil S Ranjan**, Indian Institute of Technology, Powai, Bombay (1145-53-117)

8:45AM (2229) *Uniqueness of Conformal Ricci Flow using Energy Methods.*
Thomas Andrew Bell, Southern Virginia University (1145-53-618)

9:00AM ► (2230) *On the Total Curvature and Betti Numbers of Complex Projective Manifolds.*
Joseph Ansel Hoisington, Smith College (1145-53-2052)

9:15AM (2231) *Polynomial Entropy and the Heisenberg Group.* Preliminary report.
Jonathan Epstein, University of Oklahoma (1145-53-2939)

9:30AM (2232) *On the Fundamental Group of Symplectic Embeddings of 4-dimensional Ellipsoids.*
Edward Burkard, Randolph-Macon College (1145-53-1649)

9:45AM (2233) *Symmetry rank of non-negatively curved manifolds.*
Zheting Dong, Oregon State University (1145-53-2423)

10:00AM ► (2234) *Predictability Heat Maps of Chaotic Attractors.*
Matthew A Morena, Christopher Newport University (1145-53-2324)

10:15AM (2235) *Higher dimensional flat origami and non-crossing conditions.*
Thomas C. Hull, Western New England University (1145-52-1638)

10:30AM (2236) *A new upper density bound on binary packings of disks of radius 0.7 and 1 in the plane.*
Ali Mohajer, University of Illinois at Chicago (1145-52-1957)

10:45AM (2237) *A Division of the Space of Knots, 3D Equilateral Polygons, into Isometric Simplexes.*
Kyle Leland Chapman, University of Georgia (1145-52-2661)

11:00AM ► (2238) *Special Sets of Vertices in Paley Graphs.* Preliminary report.
Emily Barranca*, Swarthmore College, **Clara Buck**, Carleton College, and **Lauren Hartmann**, Westfield State University (1145-52-527)

11:15AM ► (2239) *The Behavior of Iterations of Compositions of Inversions Preserving a Circle.*
Yizhen Chen, Princeton International School of Mathematics and Science (1145-51-205)

11:30AM ► (2240) *Exploring the foundations of Symplectic Geometry.*
David M Bronicki, Grand Valley State University (1145-51-1812)

AMS Contributed Paper Session on Linear Algebra and Algebraic Geometry

8:00 AM – 11:55 AM **Room 333, BCC**

8:00AM (2241) *A system coupled Sylvester-type tensor equations over quaternion and its applications.*
Zhuo-Heng He, Department of Mathematics, Shanghai University, Shanghai 200444, P. R. China, **Jianzhen Liu***, Medaille College, **Tin-Yau Tam**, Department of Mathematics and Statistics, University of Nevada, Reno, NV 88557-0084, USA, and **Qing-Wen Wang**, Department of Mathematics, Shanghai University, Shanghai 200444, P. R. China (1145-15-2787)

8:15AM ► (2242) *On the Spectral Radius of an Equitable Quotient Matrix.* Preliminary report.
Wasin So, San Jose State University (1145-15-773)

8:30AM (2243) *Spectrally arbitrary patterns over rings with unity.*
Jillian L Glassett* and **Judith J McDonald**, Washington State University (1145-15-2036)

8:45AM (2244) *On the structure of a class of Hankel-like Positive Definite Kernels.*
Troy V Banks, Salisbury University (1145-15-2846)

9:00AM (2245) *Extension of some* log*-majorization inequalities to Lie groups.* Preliminary report.
Sima Ahsani, Auburn University (1145-15-2552)

9:15AM (2246) *Determining the maximum nullity and minimum rank field independence for some graphs.*
Derek D Young, Iowa State University (1145-15-1204)

9:30AM (2247) *On Signed Graphs Whose Minimum semidefinite Rank Is Equal To Two.*
Nancy Matar* and **Sivaram Narayan**, Central Michigan University (1145-15-2352)

9:45AM (2248) *Twisted K-theory of compact Lie groups and extended Verlinde algebras.* Preliminary report.
David Baraglia, **Chi-Kwong Fok*** and **Varghese Mathai**, School of Mathematical Sciences, the University of Adelaide (1145-22-2790)

10:00AM (2249) *Galois representations of moduli spaces of sheaves.*
Sarah Frei, University of Oregon (1145-14-2391)

10:15AM (2250) *The growth of the number of semistable G-bundles on curves over finite fields.*
Dmitrii Kubrak, Massachusetts Institute of Technology (1145-14-331)

10:30AM (2251) *Sectional monodromy groups of projective curves and Galois groups of generic trinomials.*
Borys Kadets, Massachusetts Institute of Technology (1145-14-332)

10:45AM (2252) *The Witten Conjecture for κ-classes on the Moduli Space of Curves.*
Vance Blankers, Colorado State University (1145-14-2287)

11:00AM (2253) *θ-Twisted Involution Graphs of S_n with non-standard generating sets.* Preliminary report.
Jeb Collins*, University of Mary Washington, **Matt Welz**, Fort Lewis College, **Jessie Lenarz** and **Kristine Pelatt**, St. Catherine's University (1145-14-1744)

11:15AM (2254) *Computing the regular locus of a finitely presented scheme over $\mathbb{Z}$.*
James Parson, Hood College (1145-14-2777)

11:30AM (2255) *An algorithm to determine the three torsion of the Brauer Group of an elliptic curve.* Preliminary report.
Charlotte Ure, Michigan State University (1145-14-1138)

11:45AM (2256) *A New Poncelet Porism.*
Ben Thompson* and **Emma Previato**, Boston University (1145-14-2387)

AMS Contributed Paper Session on Statistics

8:00 AM – 11:40 AM **Room 334, BCC**

8:00AM (2257) *Characterizations of Exponential Distribution Based on Two-Sided Random Shifts.*
Santanu Chakraborty*, University of Texas Rio Grande Valley, Edinburg, Texas, and **George P Yanev**, University of Texas Rio Grande Valley (1145-62-1137)

8:15AM (2258) *On the Gamma-Logistic-Pareto Distribution.*
Louis R. Camara, Middle Georgia State University (1145-62-1993)

8:30AM (2259) *Non-Mixture Cure Model for right censored data with modified Gompertz Distribution.*
Durga H Kutal, Wake Forest University (1145-62-2145)

8:45AM (2260) *Robust Signed-Rank Variable Selection in Monotone Single-Index Models with Wavelets via the Adaptive LASSO.*
Brice Merlin Nguelifack*, United States Naval Academy, and **Eddy Kwessi**, Trinity University (1145-62-298)

9:00AM (2261) *Clustering in Statistical Inverse Problems.*
Rasika Udara Rajapakshage* and **Marianna Pensky**, University of Central Florida (1145-62-242)

9:15AM (2262) *Prediction of Remaining Lifetime Distribution from Functional Trajectories Under Censoring Data.*
Izzet Sozucok, Mathematics Department of University of Texas at Arlington (1145-62-2536)

9:30AM ► (2263) *Counting Sheep: Why Sleep Apnea is a Real Concern for Individuals with Down Syndrome.* Preliminary report.
Mason Remington*, **Levi Lefebure** and **Graham Brooks**, Simpson College (1145-00-456)

9:45AM ► (2264) *Threshold optimization in multiple binary classifiers for extreme rare events using predicted positive data.*
Edgar E. Robles, University of Costa Rica, **Ching Pui Wan**, Hong Kong Universtiy of Science and Technology, **Fatima Zaidouni***, University of Rochester, **Joanne Beckford**, Williams College, and **Aliki Mavromoustaki**, University of California, Los Angeles (1145-00-2757)

10:00AM (2265) *Clustering in Popularity Adjusted Stochastic Block Model.*
Majid Noroozi* and **Marianna Pensky**, University of Central Florida (1145-62-926)

10:15AM ► (2266) *Comparing Object Correlation Metrics for Effective Space Traffic Management.*
Julie Zhang*, University of Washington, **Adam Quinn Jaffe**, Stanford University, **Theodore Faust**, Michigan State University, and **Marvin Pena**, California State University San Marcos (1145-62-917)

10:30AM ► (2267) *SHM Factor Validation on Airframes.*
Kevin J Lin, Air Force Institute of Technology (1145-62-1864)

10:45AM (2268) *A Longitudinal Targeted Likelihood Estimator for an Optimal Time-to-Switch Treatment Rule.* Preliminary report.
Andre K Waschka, University of California, Berkeley (1145-62-2811)

11:00AM ► (2269) *Nonlinear Additive Modelling with Applications to the Assessment of House Prices.* Preliminary report.
Royal J Wang*, College of William & Mary, and **Daniel Vasiliu**, Virginia Commonwealth University (1145-62-1471)

11:15AM (2270) *Modeling of Market Equilibrium Price for Nairobi Security Exchange with Respect to Demand and Supply of Shares.*
Dr. Joseph Omondi Ouno*, Department of Mathematics and Physical Sciences, Maasai Mara University, Kenya, and **Dr. Boniface Otieno Kwach**, Department of Mathematics and Statistics, Kibabii University, Kenya (1145-62-1567)

11:30AM (2271) *Determinantal Generalizations of Instrumental Variables.*
Luca Weihs, University of Washington, **Bill Robinson***, Denison University, **Emilie Dufresne**, University of Nottingham, **Jennifer Kenkel**, University of Utah, **Kaie Kubjas**, Aalto University, **Reginald Reginald II**, Mathematical Biosciences Institute, **Nhan Nguyen**, University of Montana, **Elina Robeva**, Massachusetts Institute of Technology, and **Mathias Drton**, University of Washington (1145-62-2999)

MAA Contributed Paper Session on Approaches to Mathematics Remediation in Baccalaureate-Granting Institutions, II

8:00 AM – 10:55 AM **Room 301, BCC**

Organizers: **Michael Boardman**, Pacific University
Helen E. Burn, Highline College
Mary E. Pilgrim, Colorado State University

8:00AM (2272) *Getting College Ready at The University Illinois: Co-Requisite Support College Algebra at a R1 University.*
Alison Ahlgren Reddy, University of Illinois Urbana Champaign (1145-P1-1220)

8:20AM (2273) *Corequisite Remediation for GenEd Mathematics and Statistics Courses: Year Two.*
Ben Atchison, Framingham State University (1145-P1-2860)

8:40AM ► (2274) *Corequisite Mathematics Remediation: An Impetus for College Completion?*
Alice E Petillo, Marymount University, Arlington VA (1145-P1-2590)

9:00AM ► (2275) *A student-centered redesign of college algebra.* Preliminary report.
Ian Besse* and **Chris Lane**, Pacific University (1145-P1-2210)

9:20AM ► (2276) *Two-Semester College Algebra Stretch Course for Developmental Students.* Preliminary report.
Sarah V Cook, Washburn University (1145-P1-2316)

9:40AM ► (2277) *Examining the Effectiveness of an Online Summer Bridge Course to Prepare Students for Calculus.* Preliminary report.
Matthew Jura* and **Ira Gerhardt**, Manhattan College (1145-P1-2863)

10:00AM ► (2278) *Calculus Readiness.* Preliminary report.
Ryan Shifler*, **Erika Gerhold**, **Steve Hetzler** and **Lori Carmack**, Salisbury University (1145-P1-494)

10:20AM (2279) *The Challenges – and Successes – of Remediation in Calculus.*
Paul N Runnion, Missouri University of Science and Technology (1145-P1-2484)

10:40AM ► (2280) *Analyzing the effectiveness of two-track calculus with built in algebra review.* Preliminary report.
Victoria Brown, **Adam Childers**, **Jan Minton**, **Hannah Robbins***, **Kristin Emrich** and **David Taylor**, Roanoke College (1145-P1-410)

MAA Contributed Paper Session on Fostering Creativity in Undergraduate Mathematics Courses, II

8:00 AM – 11:35 AM **Room 302, BCC**

Organizers: **Emily S. Cilli-Turner**, University of Washington Tacoma
Houssein El Turkey, University of New Haven
Gulden Karakok, University of Northern Colorado
Milos Savic, University of Oklahoma
Gail Tang, University of La Verne

8:00AM ► (2281) *Creativity in Problem Solving for non-STEM Majors in Calculus Courses.*
Kimberley Cadogan*, **Gulden Karakok** and **Spencer Bagley**, University of Northern Colorado (1145-P5-641)

8:20AM ► (2282) *Connecting Class Topics to Student Interests.*
Sarah Vigliotta, Yale University (1145-P5-2646)

8:40AM ► (2283) *How much pavement do you need? A simple prompt with rich opportunities for creativity in first semester Calculus.*
Justin R. Dunmyre, Frostburg State University (1145-P5-1690)

9:00AM ► (2284) *Juggling: Mathematical exploration through play.*
Ceire H Monahan*, **Ashwin Vaidya**, Montclair State University, and **Mika Munakata**, Montlair State University (1145-P5-1859)

9:20AM ► (2285) *Developing storytelling using improvisation.*
Andrea Young, Ripon College (1145-P5-2740)

9:40AM ► (2286) *Designing in Multivariable Calculus.* Preliminary report.
Annela R Kelly, Regis College (1145-P5-2716)

10:00AM ► (2287) *Outside-the-Box Thinking about Number Theory for Future Elementary Teachers...and for Math Majors.* Preliminary report.
J. Lyn Miller, Slippery Rock University (1145-P5-2947)

10:20AM ► (2288) *A problem of their own: using student creativity to create ownership of learning.* Preliminary report.
Julia Eaton, University of Washington Tacoma (1145-P5-2660)

10:40AM ► (2289) *Children Literature Project in a Number and Operations Course for K-6 Teachers.*
Maria G Fung* and **Pamela Hollander**, Worcester State University (1145-P5-1455)

11:00AM ► (2290) *Teaching mathematical paradoxes as a general education course.*
Yajun An*, University of Washington, Tacoma, **Alan Bartlett**, **Ryan Card** and **Haley Skipper**, University of Washington Tacoma (1145-P5-243)

11:20AM ► (2291) *An Experiment in Assessing Creativity and Critical Thinking in a Freshman-Level Mathematical Modeling Course.*
Kayla K. Blyman, **Kristin M. Arney*** and **Lisa Bromberg**, United States Military Academy – West Point (1145-P5-2713)

MAA Contributed Paper Session on Inclusive Excellence - Attracting, Involving, and Retaining Women and Underrepresented Groups in Mathematics, III

8:00 AM – 11:55 AM **Room 303, BCC**

Organizers: **Francesca Bernardi**, University of North Carolina at Chapel Hill
Meghan DeWitt, St Thomas Aquinas College
Semra Kilic-Bahi, Colby-Sawyer College
Minah Oh, James Madison University

8:00AM ► (2292) *Queer Spectrum Students in Undergraduate Mathematics: How their Identity impacts their instructional experience and views of mathematics.* Preliminary report.
Matthew Voigt, San Diego State University & UC San Diego (1145-Q1-1980)

8:20AM ► (2293) *NSF S-STEM – Creating Opportunities for Applying Mathematics.* Preliminary report.
Yuju Kuo* and **Rick Adkins**, Indiana University of Pennsylvania (1145-Q1-2092)

8:40AM ► (2294) *Hidden Figures in a History of Mathematics Course.* Preliminary report.
Zoë Misiewicz, State University of New York at Oneonta (1145-Q1-2095)

9:00AM (2295) *Enabling Student Persistence and Success in the Calculus Sequence.* Preliminary report.
Joel Kilty, Centre College, **Alison Marr**, Southwestern University, and **Alex M. McAllister***, Centre College (1145-Q1-2437)

9:20AM ► (2296) *A Mathematics Learning Community on Inclusive Teaching: Improving Understanding and Implementation of Inclusive Instruction.*
P. Gavin LaRose* and **Nina White**, University of Michigan (1145-Q1-2572)

9:40AM ► (2297) *Programs to support underrepresented students in STEM and the role of mathematics departments.* Preliminary report.
Matthew Voigt, San Diego State University & UC San Diego, **Jessica R. Gehrtz** and **Jess Ellis Hagman***, Colorado State University (1145-Q1-2635)

10:00AM ► (2298) *Increasing Women's and Underrepresented Groups' Sense of Belonging through High Impact Practices.*
Cayla D. McBee, Providence College (1145-Q1-2803)

10:20AM ► (2299) *An analysis of student perceptions of positive instructional practices that potentially disrupt racial-gender marginalization in undergraduate mathematics classrooms.*
Luis A Leyva*, Vanderbilt University - Peabody College of Education & Human Development, **Emily A Wolf**, **Kristen Amman** and **Dan Battey**, Rutgers University (1145-Q1-2911)

10:40AM ► (2300) *Redefining mathematics and mathematicians.* Preliminary report.
Kathleen Wong*, Tustin, CA, and **Devonna Alatorre**, Summit Public Schools: Tahoma (1145-Q1-2934)

11:00AM ► (2301) *Girls Math Club: Connecting Female Math Majors with Middle School Girls.* Preliminary report.
Lauren L Rose, Bard College (1145-Q1-2952)

11:20AM ► (2302) *Converging support towards includes excellence at Central Washington University.*
Brandy S Wiegers, Central Washington University (1145-Q1-2963)

11:40AM ► (2303) *Women in Mathematics Badge/Patch for Girl Scouts.* Preliminary report.
Sarah J Greenwald, Appalachian State University (1145-Q1-155)

MAA Contributed Paper Session on Incorporating Programming and Computing in the Math Major Curriculum

8:00 AM – 11:35 AM **Room 305, BCC**

Organizers: **Holly Peters Hirst**, Appalachian State University
Gregory S. Rhoads, Appalachian State University

8:00AM ► (2304) *Designing a Computational Mathematics Course for Math Majors.*
Holly Hirst* and **Gregory Rhoads**, Appalachian State University (1145-R1-2116)

8:20AM ► (2305) *Integrating Programming Education Across the Undergraduate Math Curriculum.*
Eric Sullivan* and **Jodi Fasteen**, Carroll College (1145-R1-1166)

8:40AM ► (2306) *Implementing MATLAB Programming to Beginner Users in Math Courses.*
Mahmud Akelbek, Weber State University (1145-R1-816)

9:00AM ► (2307) *Digital Image Processing in the Math Major Curriculum.*
Yevgeniy V. Galperin, East Stroudsburg University of PA (1145-R1-2698)

9:20AM ► (2308) *Number Theory Through Programming.* Preliminary report.
Scott Zinzer, Aurora University (1145-R1-1398)

9:40AM ► (2309) *Using Smartphone Sensors in Applied Math.*
Albert W Schueller, Whitman College (1145-R1-1026)

10:00AM ► (2310) *Data Camp: Statistical Computing Made Easy.* Preliminary report.
Nicholas Gorgievski, Nichols College (1145-R1-2659)

10:20AM ► (2311) *Embedding python programming experiences in Calculus I with Sage.* Preliminary report.
Kwang Hyun Kim, Queensborough Community College (1145-R1-2691)

10:40AM (2312) *Developing Computing Skills in Calculus Courses.* Preliminary report.
Joel Kilty*, Centre College, **Alison Marr**, Southwestern University, and **Alex M. McAllister**, Centre College (1145-R1-2433)

11:00AM ► (2313) *Case study of MATLAB integration in Calculus II: Insights and Improvements.* Preliminary report.
Andrew J Krause, **Ryan J. Maccombs***, **Willie W Wong** and **Mark Iwen**, Michigan State University (1145-R1-2959)

11:20AM ► (2314) *A Difference Oriented View of Leibniz's Early Ideas.*
Hunter R Johnson, John Jay College, CUNY (1145-R1-2723)

MAA Contributed Paper Session on Innovative Pathways to Quantitative Literacy

8:00 AM – 10:15 AM **Room 304, BCC**

Organizers: **Catherine Crockett**, Point Loma Nazarene University
Keith Hubbard, Stephen F. Austin State University
Jennifer Nordstrom, Linfield College

8:00AM ► (2315) *Mathematical Modeling in the Liberal Arts Course.*
Craig M. Johnson, Marywood University (1145-Q5-2773)

8:20AM ► (2316) *Introduction to Mathematical and Computational Thinking: A New Gen-Ed Math Course.*
Betty Love*, **Victor Winter**, **Michael Matthews** and **Michelle Friend**, University of Nebraska - Omaha (1145-Q5-2284)

8:40AM ► (2317) *Mathematics for Sustainability: A General Education Mathematics Course.*
Russ F. deForest, Pennsylvania State University. (1145-Q5-2178)

9:00AM ► (2318) *Building Quantitative Literacy through the Mathematics of Voting and Elections.* Preliminary report.
Jennifer Anne Bergner, Salisbury University (1145-Q5-1873)

9:20AM ► (2319) *An Inclusive Framework for Quantitative Reasoning.* Preliminary report.
McKenzie Lamb, Ripon College (1145-Q5-2407)

9:40AM ► (2320) *Active Collaborative Learning and Faculty Development in the Redesign of Introductory Mathematics Course.*
Vesna Kilibarda* and **Yuanying Guan**, Indiana University Northwest (1145-Q5-1142)

10:00AM ► (2321) *Measuring the Effectiveness of Quantitative Literacy Curricula—The Importance of Construct Validity in Assessment.*
Samuel Luke Tunstall, Michigan State University (1145-Q5-164)

MAA General Contributed Paper Session on Number Theory, II

8:00 AM – 10:55 AM **Room 348, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

8:00AM ► (2322) *Pythagorean Triples.* Preliminary report.
Alfred S Beebe, Salisbury University (1145-VS-251)

8:15AM ► (2323) *Parameters of locally recoverable codes with multiple recovery sets.* Preliminary report.
Sam Kottler, Colorado College (1145-VS-2526)

8:30AM ► (2324) *Generalizations of the Abundancy Index and Outlaws.*
David Chang Luo, Emory University (1145-VS-2767)

8:45AM ► (2325) *Generalized Rascal Triangles.*
Philip K Hotchkiss, Westfield State University (1145-VS-280)

9:00AM (2326) *The* GL_4 *Rapoport-Zink Space.* Preliminary report.
Maria Fox, Boston College (1145-VS-283)

9:15AM (2327) *The Hodge-index theorem for arithmetic intersections over function fields.*
Alexander Carney, UC Berkeley (1145-VS-2854)

9:30AM (2328) *Large arboreal Galois representations.*
Borys Kadets, Massachusetts Institute of Technology (1145-VS-341)

9:45AM ► (2329) *Exploring Rudolph Ordrejka's Prime Magic Square of Order Three.* Preliminary report.
Jay L Schiffman, Rowan University (1145-VS-55)

10:00AM ► (2330) *Sums of Two Polygonal Numbers in Rings.* Preliminary report.
Theresa Baren, Department of Mathematics, Auburn University, **James Hammer**, **Joshua Harrington**, Department of Mathematics, Cedar Crest College, **Ziyu Liu**, Department of Mathematics, Mount Holyoke College, **Sean Rainville**, Department of Mathematics, Plymouth State University, **Melea Roman***, Department of Mathematics, Cedar Crest College, and **Hongkwon Yi**, Department of Mathematics, University of California Berkeley (1145-VS-2225)

10:15AM (2331) *A Note On Armstrong Numbers.*
Satvik U. Kaushik, Narayana co sindhu bhavan (1145-VS-96)

10:30AM ► (2332) *On the total number of prime factors of an odd perfect number.*
Joshua Zelinsky, Iowa State University (1145-VS-973)

10:45AM ► (2333) *An Ancient Chinese Problem and Two Sequences.*
Justin Moccaldi*, Smithfield, PA, and **Roman Wong**, Washington & Jefferson College (1145-VS-1921)

MAA General Contributed Paper Session on Teaching and Learning Introductory Mathematics

8:00 AM – 11:25 AM **Room 339, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

8:00AM (2334) *What Do Students Who Fail Corequisite Math Need? A Preliminary Report.* Preliminary report. **G Michael Guy***, Queensborough Community College, CUNY, and **Mari Watanabe**, The City University of New York (1145-VI-1937)

8:15AM (2335) *Math Readiness and STEM Boot Camp for Incoming Freshman.* **Stephen Liddle**, George Mason University (1145-VI-1386)

8:30AM (2336) *Teaching Using Non-Traditional Styles.* Preliminary report. **Manyiu Tse**, Molloy College (1145-VI-1533)

8:45AM (2337) *Moving Beyond Conversations and Anecdotes: A Pilot Study of Academic Self-Concept, Word Problem Solving, and Having an Effective "Game Plan" in Introductory College Mathematics.* **Brian D. Darrow, Jr.**, Teacher's College, Columbia University (1145-VI-1581)

9:00AM (2338) *Examining Graduate Teaching Assistants' Noticing of Department-Provided Precalculus Curriculum Materials.* Preliminary report. **Ariel Setniker**, University of Nebraska-Lincoln (1145-VI-1644)

9:15AM (2339) *Smartphone GPS use in an Introductory Statistics Course.* **Donna A. Dietz**, American University (1145-VI-1813)

9:30AM (2340) *Using the "5 Practices" to Actively Engage in Mathematics.* **Sean Corey***, The Wellington School, and **Mary Pilgrim**, San Diego State University (1145-VI-2200)

9:45AM (2341) *An Assessment Study of College Algebra Classrooms.* Preliminary report. **Perry Y.C. Lee*** and **Padraig M. McLoughlin**, Kutztown University of Pennsylvania (1145-VI-2315)

10:00AM (2342) *Recasting Instruction in Trigonometry - A Preliminary Report.* Preliminary report. **George Tintera*** and **Ping-Jung H Tintera**, Texas A&M University-Corpus Christi (1145-VI-2515)

10:15AM (2343) *Strengthening Students' Problem Solving Skills in a Flipped Finite Mathematics Course.* **Kyle L. Golenbiewski**, University of North Alabama (1145-VI-2680)

10:30AM (2344) *Teaching Mathematics Through Games.* Preliminary report. **Jathan Austin**, Salisbury University (1145-VI-53)

10:45AM (2345) *The Integrated Trig-Geometry — A Revolution in Euclidean Geometry and Math Education Happening in China.* **Jingzhong Zhang***, Guangzhou University, Guangzhou 510006, China, **Zengxiang Tong**, Otterbein University, Westerville, OH 43081, and **Hongguang Fu**, University of Electronic Science and Technology of China, Chengdu, China (1145-VI-721)

11:00AM (2346) *Students Participatory Approach in a College Algebra Class.* Preliminary report. **Gangadhar Acharya**, CNM, Albuquerque, NM (1145-VI-881)

11:15AM (2347) *Approaching the Quiet.* Preliminary report. **Melissa Tolley Nink**, Wingate University (1145-VI-1274)

MAA General Contributed Paper Session on Topology

8:00 AM – 11:55 AM **Room 340, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

8:00AM (2348) *Three extension theorems: topological, uniform and large scale.* **Jerzy Dydak** and **Thomas Weighill***, University of Tennessee (1145-VU-1385)

8:15AM (2349) *Surgery Obstructions for Seifert Fibered Integral Homology Spheres.* **Claire C. Zajaczkowski**, North Carolina State University (1145-VU-1464)

8:30AM (2350) *Overlapping Discs Filtration in the Commutative Operad.* **Keely J Grossnickle**, Kansas State University (1145-VU-1967)

8:45AM (2351) *Weaker Separation Axioms and Diagonal Properties and Their Implications in the Class of Second Countable Spaces.* Preliminary report. **Gangadhar R Hiremath**, University of North Carolina Pembroke (1145-VU-1985)

9:00AM (2352) *A Study of Generalized Continuous Functions.* **Zeinab Bandpey***, Morgan State University, and **Bhamini P. Nayar**, Morgan state university (1145-VU-2077)

9:15AM (2353) *A Complete Set of Moves for Petal Words.* **Samantha C Sandberg***, **Cory Glover**, **Leslie Colton** and **Mark Hughes**, Brigham Young University (1145-VU-2186)

9:30AM (2354) *A Functorial Formulation of the Hennings Invariant.*
Matthew J Sequin, Saint Peter's University (1145-VU-2343)

9:45AM ► (2355) *Stratified spaces, Directed Algebraic Topology, and State-Sum TQFTs.* Preliminary report.
Ik Jae Lee*, Rowan University, and **David N Yetter**, Kansas State University (1145-VU-2533)

10:00AM ► (2356) *On the Indeterminacy of the Triple Linking Number.*
Jonah Amundsen, University of Wisconsin Eau Claire (1145-VU-2699)

10:15AM ► (2357) *Deep Reinforcement Learning and Constructive Proofs in Topology.*
Mark Hughes and **Spencer Reschke***, Brigham Young University (1145-VU-2732)

10:30AM ► (2358) *f-Quandles.*
Indu Rasika Churchill, State University of New York at Oswego (1145-VU-2898)

10:45AM (2359) *Iterated Doubles and Quantum Field Theory.*
Joseph W Grenier, Louisiana State University (1145-VU-1242)

11:00AM (2360) *Coarse coherence of metric spaces and groups and its permanence properties.*
Boris Goldfarb and **Jonathan L Grossman***, University at Albany, SUNY (1145-VU-569)

11:15AM (2361) *A variation on an infinite game.*
Jocelyn R Bell, Hobart and William Smith Colleges (1145-VU-825)

11:30AM (2362) *Coarse proximity and proximity at infinity.*
Pawel Grzegrzolka* and **Jeremy Siegert**, University of Tennessee, Knoxville, TN, USA (1145-VU-925)

11:45AM (2363) *Kirby Calculator / KLO software demonstration and feedback.*
Frank J Swenton, Middlebury College (1145-VU-562)

AWM Workshop:WinCompTop: Applied and computational topology, I

8:00 AM – 12:20 PM **Room 307, BCC**

Organizers: **Radmila Sazdanovic**, North Carolina State University
Yusu Wang, The Ohio State University

8:30AM (2364) *Spaces of RNA branching configurations.*
Christine Heitsch, School of Mathematics, Georgia Institute of Technology (1145-92-1842)

9:30AM (2365) *Tropical Statistics & Geometry of Phylogenetic Tree Space.* Preliminary report.
Anthea Monod, Columbia University (1145-52-1608)

10:00AM (2366) *Learning Algebraic Varieties from Samples.*
Bernd Sturmfels, **Paul Breiding**, Max Planck Institute for Mathematics in the Sciences, **Sara Kalisnik***, Wesleyan University, and **Madeleine Weinstein**, UC Berkeley (1145-55-1746)

10:30AM (2367) *Cellular cosheaves for distributed computation of persistent homology.*
Hee Rhang Yoon*, Georgia Institute of Technology, and **Robert Ghrist**, University of Pennsylvania (1145-55-1489)

11:00AM (2368) *The Relationship Between the Intrinsic Cech and Persistence Distortion Distances for Metric Graphs.*
Ellen Gasparovic, Union College (1145-68-902)

11:30AM ► (2369) *An Introduction to Discrete Stratified Morse Theory.*
Bei Wang, University of Utah (1145-55-1872)

NOON (2370) *Invariants for multiparameter persistence and their computation.*
Nina Otter, UCLA and MPI MIS (1145-55-2345)

Project NExT Workshop

8:00 AM – 6:00 PM **Room 308, BCC**

AMS Contributed Paper Session on Mathematics in the Life Sciences, Ecology, and Related Fields, II

8:15 AM – 11:55 AM **Room 312, BCC**

8:15AM ► (2371) *A mathematical model of the transmission and lifecycle of Angiostrongylus cantonensis.* Preliminary report.
Kamuela E Yong, University of Hawaii - West Oahu (1145-92-864)

8:30AM ► (2372) *Modeling an Anthrax Plume: Prioritizing the Delivery of Antibiotics After an Anthrax Bioterrorism Event.*
Devin Akman*, University of Illinois at Urbana-Champaign, **Carlos Bustamante**, **Jordy Cevallos**, Yachay Tech University, **Cui-Hua Wang**, University of Shanghai for Science and Technology, **Jordan Bates**, Arizona State University, **Viswanathan Arunachalam**, Universidad Nacional de Colombia, **Leon M. Arriola**, University of Wisconsin - Whitewater, and **Baojun Song**, Montclair State University (1145-92-2825)

8:45AM ► (2373) *Modeling the Spatio-Temporal Dynamics of Interacting Fish Species in the Northeast Continental Shelf.*
Sara Amato*, Assumption College, **Lauren Moore**, University of Kentucky, **Kaitlin Ragosta**, Boston University, **Shelby Stowe**, Sterling College, **Sarah Gaichas**, NOAA - Northeast Fisheries Science Center, **Burt Tilley** and **Andrea Arnold**, Worcester Polytechnic Institute (1145-92-3027)

9:00AM ► (2374) *Exploration of a Monkeypox Model.*
Istvan Lauko, **Gabriella Pinter** and **Rachel Elizabeth TeWinkel***, UW-Milwaukee (1145-92-1524)

9:15AM ► (2375) *Combating tuberculosis: using time-dependent sensitivity analysis to develop strategies for treatment and prevention.* Preliminary report.
Kendall Clark, Park School of Baltimore, **Mayleen Cortez***, California State University Channel Islands, **Cristian Hernandez**, Regis University, and **Beth Thomas**, St. Mary's College of Maryland (1145-92-1518)

9:30AM (2376) *Evaluating vaccination strategies for tuberculosis in endemic and non-endemic settings.* Preliminary report.
Marissa Renardy* and **Denise Kirschner**, University of Michigan (1145-92-760)

9:45AM (2377) *An Improved Mathematical Model of Pathogen Dynamics in Water Distribution Networks.*
Alvaro A Ortiz Lugo*, **BenJamin L Vaughan**, University of Cincinnati, and **Sadiqah Al Marzooq**, Al Yamamah University (1145-92-967)

10:00AM ► (2378) *Decoys and dilution: the impact of incompetent hosts on prevalence of Chagas disease.*
Mondal Hasan Zahid* and **Christopher Kribs**, University of Texas at Arlington (1145-92-532)

10:15AM ► (2379) *Avoiding Surprises: Understanding the Impact of the Deepwater Horizon Oil Spill on the Decisions of Fishers and the Management of Fisheries in the Gulf of Mexico using an Agent-Based Moel.* Preliminary report.
Brian R. Powers*, **Xuetao Lu** and **Steven Saul**, Arizona State University (1145-92-632)

10:30AM (2380) *Modeling Pinyon-Juniper Dispersal in Real Landscapes.*
Ram C Neupane*, Texas A&M University-Texarkana, and **James Powell**, Utah State University (1145-92-1435)

10:45AM ► (2381) *The interaction of disturbances and conspecific inhibition and their effect on biodiversity in forests.* Preliminary report.
David Chan*, VCU, **Ben Ramage**, Randolf Macon College, **Matthew Mills** and **John Atwood**, VCU (1145-92-405)

11:00AM ► (2382) *Timing of Carbon Release from Harvested Wood Products: Implications for Climate Policy.*
Eric Marland* and **Gregg Marland**, Appalachian State University (1145-92-2247)

11:15AM ► (2383) *Reducing severe malaria incidence with gut microbiota.*
Scott Greenhalgh*, Siena College, Department of Mathematics, and **Veda Chandwani**, Siena College (1145-92-576)

11:30AM ► (2384) *Mathematical modeling of hepatitis delta virus (HDV) dynamics during prenylation inhibitor lonafarnib (LNF) treatment.* Preliminary report.
Preeti Dubey, Loyola University Medical Center, IL, USA (1145-92-1400)

11:45AM ► (2385) *Modeling the effects of insecticides resistance on malaria vector control in endemic regions of Kenya.*
Josephine Wairimu Kagunda*, University of Nairobi, Kenya, **Faraimunashe Chirove**, Unversity of KwaZulu Natal, South Africa, **Marilyn Chepkrui Ronoh**, University of Nairobi, Kenya, and **David Malonza**, Kenyatta University, Kenya (1145-97-1619)

MAA General Contributed Paper Session on Graph Theory, II

8:15 AM – 11:40 AM **Room 341, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

8:15AM (2386) *Multivariate Change Detection and Localization Using Degree-K Nearest Neighbors.*
Matthew A Hawks, United States Naval Academy (1145-VP-2292)

8:30AM ► (2387) *Graph Complement Conjecture for the Minimum Semidefinite Rank.* Preliminary report.
Monsikarn Jansrang, Central Michigan University (1145-VP-233)

8:45AM ► (2388) *A Generalization of a Result of Catlin: 2-Factors in Line Graphs.*
Emily A Hynds*, Samford University, and **Ronald J Gould**, Emory University (1145-VP-207)

9:00AM ► (2389) *Calculating Fries Deficit in Large Fullerenes.*
Joshua Fenton, Syracuse University (1145-VP-2385)

9:15AM (2390) *Extending Vertex and Edge Pancyclicity.*
Megan Cream, Cedar Crest College (1145-VP-2405)

9:30AM (2391) *PM-compact graphs and cycle-forced graphs.*
Ju Zhou, Kutztown University of PA (1145-VP-2417)

9:45AM ► (2392) *The closure chromatic number of the plane, and of Euclidean space.* **Mike Krebs**, California State University, Los Angeles (1145-VP-2504)

10:00AM ► (2393) *On the Domination Number of Permutation Graphs and an Application to Strong Fixed Points.* Preliminary report. **Daniel McGinnis**, New College of Florida, **Peter Gardner***, Western Carolina University, **Tess Baren**, Auburn University, **Michael Corey**, **Mia Friedberg**, University of Florida, **Riley Waechter**, Northern Arizona University, **James Hammer**, **Joshua Harrington**, Cedar Crest College, and **Tony Wong**, Kutztown University (1145-VP-2573)

10:15AM ► (2394) *Forbidden subgraphs for Hamiltonian problems on 2-trees.* Preliminary report. **Caitlin M Owens***, Rowan University, and **Garth Isaak**, Lehigh University (1145-VP-2880)

10:30AM ► (2395) *Cartesian Product of Palindromic Graphs.* **Jamie L. Shive**, Virginia Commonwealth University (1145-VP-2653)

10:45AM ► (2396) *Nimbers of Node-kayles on Certain Families of Graphs.* **Sean Rainville***, Plymouth State University, **Eugene Fiorini**, Muhlenberg College, **Tony H. W. Wong**, Kutztown University of Pennsylvania, **Sierra Brown**, Creighton University, **Spencer Daugherty**, Mount Holyoke College, **Barbara Maldonado**, University of Houston, and **Riley Waechter**, Northern Arizona University (1145-VP-2664)

11:00AM (2397) *Ultimately Economical Multigraphs.* Preliminary report. **Curtis Clark**, Morehouse College (1145-VP-2776)

11:15AM ► (2398) *On Spanning Trees with few Branch Vertices.* **Ronald J Gould** and **Warren E Shull***, Emory University (1145-VP-2778)

11:30AM ► (2399) *Classifying the difficulty of the k-clique problem.* **L Bookman***, **J Ubnoske** and **D Zwillinger**, BAE Systems, Inc (1145-VP-2785)

AMS Special Session on Geometry of Representation Spaces, I

8:30 AM – 11:45 AM **Room 328, BCC**

Organizers: **Sean Lawton**, George Mason University

Chris Manon, University of Kentucky

Daniel Ramras, Indiana University-Purdue University Indianapolis

8:30AM (2400) *Harmonic maps, pleated surfaces, and the asymptotic structure of the SL(2,C) character variety of a surface group.* Preliminary report. **Richard Alan Wentworth**, University of Maryland (1145-53-1720)

9:30AM ► (2401) *Toric Degenerations of SL(2)-character varieties of surfaces.* Preliminary report. **Adam S Sikora**, University at Buffalo, SUNY (1145-57-2329)

10:30AM (2402) *Homological stability of representation spaces.* **Daniel A Ramras**, Indiana University - Purdue University Indianapolis, and **Mentor Stafa***, Tulane University (1145-55-722)

11:00AM (2403) *Geometric correspondances between singular fibres of the Hitchin fibration.* Preliminary report. **Laura P. Schaposnik***, University of Illinois at Chicago, **Steve Bradlow**, University of Illinois at Urbana Champaign, **Lucas Branco**, MPI Bonn, and **Sebastian Schulz**, University of Texas at Austin (1145-53-1384)

AMS Special Session on Latinx in Math, I

8:30 AM – 11:50 AM **Room 327, BCC**

Organizers: **Alexander Diaz-Lopez**, Villanova University

Laura Escobar, University of Illinois

Juanita Pinzón-Caicedo, North Carolina State University

8:30AM (2404) *Topology of Commuting Matrices.* **Alejandro Adem**, University of British Columbia (1145-55-1789)

9:30AM ► (2405) *Rigidity of lattices of Lie groups: Geometry and Dynamics.* **Sebastian Hurtado**, University of Chicago (1145-22-502)

10:00AM ► (2406) *The Hurewicz theorem for Lie algebroids and Lie groupoids.* **Ivan Contreras***, Amherst College, and **Rui Fernandes**, University of Illinois, Urbana-Champaign (1145-53-1185)

10:30AM ► (2407) *"I Don't Wanna Let Others Know That I Don't Know": Detailing Undergraduate Latinx Students' Reflections on Racialized-Gendered Instructional Moments in Entry-Level Mathematics Courses.* **Luis Antonio Leyva**, Vanderbilt University - Peabody College of Education & Human Development (1145-97-1099)

11:30AM Discussion

MAA Invited Paper Session on Research in Undergraduate Mathematics Education: Highlights from the Annual SIGMAA on RUME Conference

8:30 AM – 10:50 AM **Room 317, BCC**

Organizers: **Megan Wawro**, Virginia Tech
Aaron Weinberg, Ithaca College

8:30AM ► (2408) *The Generation and Use of Examples to Promote Authentic Engagement in Calculus Classrooms.*
Vicki L Sealey*, **Nicole M Infante**, **Matthew P Campbell** and **Johnna Bolyard**, West Virginia University (1145-AI-2090)

9:00AM ► (2409) *The next time around: Scaffolding and shifts in argumentation in initial and subsequent implementations of inquiry-oriented instructional materials.*
Christine Andrews-Larson and **Shelby McCrackin***, Florida State University (1145-AI-1628)

9:30AM ► (2410) *E-IBL: An Exploration of Theoretical Relationships Between Equity-Oriented Instruction and Inquiry-based Learning.*
Stacy A. Brown, Cal Poly Pomoma (1145-AI-67)

10:00AM ► (2411) *Revisiting Reducing Abstraction in Abstract Algebra.*
Kathleen Melhuish*, Texas State University, **Anna Marie Bergman**, Portland State University, and **Jennifer Czocher**, Texas State University (1145-AI-2237)

10:30AM ► (2412) *The use(s) of 'is' in mathematics.*
Paul Dawkins, Northern Illinois University, **Matthew Inglis**, Loughborough University, and **Nicholas Wasserman***, Teachers College, Columbia University (1145-AI-699)

SIAM Minisymposium on Analytical Techniques in Imaging Electrical Properties of Tissue in Coupled Physics Models.

8:30 AM – NOON **Room 342, BCC**

Organizers: **Amir Moradifam**, University of California Riverside
Alexandru Tamasan, University of Central Florida

8:00AM (2413) *A Regularisation of the Robin Problem for Functions of The Weighted Least Gradient.*
Alex Timonov, University of South Carolina Upstate (1145-35-827)

8:30AM (2414) *Limited angle acousto-electric tomography with complete wave modelling.*
Bjørn Christian Skov Jensen, **Adrian Kirkeby** and **Kim Knudsen***, Technical University of Denmark (1145-65-1831)

9:00AM (2415) *On the inverse conductivity problem with a single internal measurement.*
Faouzi Triki*, Grenoble-Alpes University, France, and **Tao Yin**, Caltech (1145-35-2400)

9:30AM (2416) *Direct reconstruction method in Magneto acoustic tomography.*
Pierre Millien, CNRS / Institut Langevin (Paris) (1145-35-1942)

10:00AM (2417) *Reconstructing the optical properties of a medium from the coupled physics PAT/OCT system.*
Leonidas Mindrinos, Johann Radon Institute for Computational and Applied Mathematics (RICAM) (1145-78-401)

10:30AM (2418) *Electrical Networks with Prescribed Current.*
Christina Knox* and **Amir Moradifam**, University of California, Riverside (1145-49-1534)

11:00AM (2419) *Reconstruction of anisotropic conductivites from power densities in three dimensions.*
Francois S Monard, Department of Mathematics, University of California Santa Cruz, and **Donsub Rim***, Department of Applied Physics and Applied Mathematics, Columbia University (1145-35-1240)

11:30AM (2420) *Non-zero constraints in quantitative coupled physics imaging.*
Giovanni S. Alberti, University of Genoa (1145-35-310)

Project NExT Workshop

8:30 AM – 9:45 AM **Room 308, BCC**

Building Interdisciplinary Bridges

Organizers: **Kelsey Houston-Edwards**, Olin College of Engineering
Allison Lewis, Lafayette College
Chase Russell, Pennsylvania State University, Erie - The Behrend Colleg
Lucas Waddell, Bucknell University

AMS Invited Address

9:00 AM – 9:50 AM **Ballrooms I & II, 400 Level, BCC**

(2421) *On torsion subgroups in class groups of number fields.*
Lillian B. Pierce, Duke University (1145-00-1797)

ASL Invited Address

9:00 AM – 9:50 AM **Room 315, BCC**

► (2422) *Computable aspects of homogeneous structures.*
Douglas Cenzer, Department of Mathematics, University of Florida (1145-03-1248)

MAA Minicourse #8: Part B

9:00 AM – 11:00 AM **Holiday Ballroom 5, 2nd Floor, Hilton**

Dance and Mathematics

Presenter: **Karl Schaffer**, De Anza College

MAA Minicourse #5: Part B

9:00 AM – 11:00 AM **Holiday Ballroom 1, 2nd Floor, Hilton**

IBL SIGMAA Minicourse: Introduction to Inquiry-Based Learning

Presenters: **Susan Crook**, Loras University
Eric Kahn, Bloomsberg University
Brian Katz, Augustana College
Victor Piercey, Ferris State University
Candice Price, University of San Diego
Xiao Xiao, Utica College

MAA Contributed Paper Session on Formative and Summative Assessment of Mathematical Communication and Conceptual Understanding, II

9:00 AM – 11:15 AM **Room 306, BCC**

Organizers: **Jessica OShaughnessy**, Shenandoah University
Jana Talley, Jackson State University

► 9:00AM (2423) *Assessment and transparency in a partially flipped intro to proofs classroom.* Preliminary report. **Phillip Andreae**, Meredith College (1145-H1-2973)

► 9:20AM (2424) *Cumulative Assignments.* **Jonathan E Beagley*** and **Mindy Capaldi**, Valparaiso University (1145-H1-2476)

► 9:40AM (2425) *Using Mindmaps to Uncover Conceptual Understanding of Vectors.* **Monica VanDieren***, Robert Morris University, and **Deborah Moore-Russo**, The University of Oklahoma (1145-H1-1765)

► 10:00AM (2426) *Student Applications of Logic to Everyday Life.* Preliminary report. **Whitney George**, University of Wisconsin - La Crosse (1145-H1-954)

► 10:20AM (2427) *Gaming Formative Assessment: Telestrations in the Mathematics Classroom.* **Kayla K. Blyman**, United States Military Academy - West Point, and **Marie Meyer***, Lewis University (1145-H1-2266)

10:40AM (2428) *A Formative Assessment of Formative Assessment: Exit Slips Over the Years.* **Cristina Runnalls**, California State Polytechnic University, Pomona (1145-H1-1433)

► 11:00AM (2429) *Results from Assessment of Mathematics Majors at Stetson University involving Mathematical Communication and Conceptual Understanding.* Preliminary report. **Lisa O. Coulter*** and **William W Miles**, Stetson University (1145-H1-766)

MAA Panel

9:00 AM – 10:20 AM **Room 349, BCC**

Calculus Before the Senior Year of High School: Issues and Options

Organizer: **David Bressoud**, Macalester College

Panelists: **Colin Adams**, Williams College
Stephanie Ogden, College Board
Alison Reddy, University of Illinois, Urbana-Champaign
Dan Teague, North Carolina School of Science and Mathematics

NAM Panel Discussion

9:00 AM – 9:50 AM **Room 316, BCC**

NAM 2019-2069: Where Do We Go from Here?

Moderator: **Duane Cooper**, Morehouse College

Panelists: **Robert Bozeman**, Morehouse College
Shea Burns, North Carolina A&T State University
Robin Wilson, California State Polytechnic University, Pomona
Shelby Wilson, Morehouse College

Exhibits and Book Sales

9:00 AM – NOON **Exhibit Hall F, 100 Level, BCC**

MAA Workshop

9:45 AM – 10:55 AM **Room 324, BCC**

Calculus: Near-Numbers

Presenter: **Frank Swenton**, Middlebury College

MAA Invited Address

10:00 AM – 10:50 AM **Ballrooms I & II, 400 Level, BCC**

(2430) *The Inclusion Principle: the importance of community in mathematics.*
Deanna Haunsperger, Carleton College
(1145-A0-19)

MAA Interactive Lecture for Students and Teachers

10:00 AM – 10:50 AM **Room 309/310, BCC**

10:00AM ► (2431) *Tic-Tac-Toe (or, What is Mathematics?).*
Ben Orlin, Math with Bad Drawings
(1145-A0-139)

ASL Invited Address

10:00 AM – 10:50 AM **Room 315, BCC**

(2432) *A forcing axiom for a non-special Aronszajn tree.*
John Krueger, University of North Texas
(1145-03-661)

AMS Special Session on Counting Methods in Number Theory, II

10:00 AM – 11:50 AM **Room 344, BCC**

Organizers: **Lillian Pierce**, Duke University
Arindam Roy, Rice University
Jiuya Wang, University of Wisconsin

10:00AM (2433) *Moments of unramified 2-group extensions of quadratic fields.*
Jack Klys, University of Calgary
(1145-11-1705)

10:30AM ► (2434) *Indivisibility and divisibility of class numbers of imaginary quadratic fields.*
Olivia Beckwith, University of Bristol
(1145-11-2026)

11:00AM (2435) *2^k-class groups of imaginary quadratic fields.*
Alexander Smith, Harvard University
(1145-11-1943)

11:30AM (2436) *Secondary terms in asymptotics for the number of zeros of quadratic forms over number fields.*
Jayce Robert Getz, Duke University
(1145-11-596)

NAM Business Meeting

10:00 AM – 10:50 AM **Room 316, BCC**

MAA Panel

10:30 AM – 11:50 AM **Room 349, BCC**

Listening and Responding to Students' Thinking, from Elementary to Undergraduate Mathematics

Organizers: **Brad Ballinger**, Humboldt State University
Christina Eubanks-Turner, Loyola Marymount University
Yvonne Lai, University of Nebraska - Lincoln
Cody L. Patterson, University of Texas at San Antonio
Priya V. Prasad, University of Texas at San Antonio
April Strom, Scottsdale Community College

Panelists: **Gail Burrill**, Michigan State University
Ted Coe, Achieve
Brian Katz, Augustana College

SIGMAA on Math Circles for Students and Teachers

10:30 AM – NOON **Room 322, BCC**

Math Wrangle

Organizers: **Ed Keppelmann**, University of Nevada Reno
Phil Yasskin, Texas A & M University

Mathemati-Con Presents: Showtime!

11:00 AM – NOON **Room 309/310, BCC**

Interview with the 2019 JPBM Communications Award Winner, Hidden Figures author Margot Lee Shetterly, followed by a meet-and-greet and autograph signing at noon.

AMS Business Meeting

12:15 PM – 12:45 PM **Ballrooms I & II, 400 Level, BCC**

NAM Claytor-Woodard Lecture

1:00 PM – 1:50 PM **Room 316, BCC**

(2437) *On Mathematical Problems in Geometric Optics.*
Henok Mawi, Howard University
(1145-35-1458)

ASL Invited Address

1:00 PM – 1:50 PM **Room 315, BCC**

(2438) *Fifty years in the model theory of theory of differential fields.*
David Marker, University of Illinois Chicago (1145-03-658)

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

1:00 PM – 5:50 PM **Room 343, BCC**

Organizers: **Darren A. Narayan**, Rochester Institute of Technology
Khang Tran, California State University, Fresno
Mark David Ward, Purdue University
John Wierman, The Johns Hopkins University

1:00PM ► (2439) *Tower-type bounds for Roth's theorem with popular differences.*
Huy Tuan Pham, Stanford University (1145-05-1735)

1:30PM (2440) *Crepant resolutions of $\mathbb{Q}$-factorial threefolds with compound Du Val singularities.*
Ravi Jagadeesan, Harvard Business School; and Department of Economics, Harvard University (1145-14-1159)

2:00PM ► (2441) *Invariants of Colored Knots.* Preliminary report.
Ramlah Ahmad, **Mai Dao*** and **Tommi Gans**, Smith College (1145-57-1860)

2:30PM ► (2442) *A project in statistics.* Preliminary report.
Tiffany Christian, Smith College (1145-62-2974)

3:00PM ► (2443) *Generalizing the Three Gap Theorem.*
Alexis Suki Dasher* and **Arianne Hermida**, Smith College (1145-11-2910)

3:30PM ► (2444) *The variety of interleavings.* Preliminary report.
Ojaswi Acharya, **Chen Li**, **David C Meyer** and **Jasmine Noory***, Smith College (1145-55-2046)

4:00PM ► (2445) *Further results in generalized splines.* Preliminary report.
Olga Blyum, **Dayln Gillentine**, **Alex Perry***, **Taylor Stefovic** and **Nancy Yun**, Smith College (1145-05-2923)

4:30PM ► (2446) *Combinatorial Identities in Graph Theory.*
Seungho Lee, Montville Township High School (1145-05-2013)

5:00PM ► (2447) *An Adaptive, Highly Accurate and Efficient, Parker-Sochacki Algorithm for Numerical Solution to Large Scale Dynamical Systems.* Preliminary report.
Jenna C. Guenther* and **Morgan A. Wolf**, James Madison University (1145-65-578)

5:30PM ► (2448) *Graphs of Gonality Three.*
Julie Yuan*, University of Minnesota, **Teresa Yu**, **Frances Dean**, Williams College, and **Ivan Aidun**, Oberlin College (1145-05-1917)

AMS Special Session on Advances and Applications in Integral and Differential Equations, II

1:00 PM – 3:50 PM **Room 331, BCC**

Organizers: **Jeffrey T. Neugebauer**, Eastern Kentucky University
Min Wang, Kennesaw State University

1:00PM ► (2449) *Asymptotic behavior of solutions of a forced third order integro-differential equation with δ-Laplacian.*
John R. Graef*, University of Tennessee at Chattanooga, and **Said R. Grace**, Cairo University, Egypt (1145-45-1073)

1:30PM (2450) *Comparison of Green's functions for a family of boundary value problems for fractional difference equations.*
Paul W Eloe, **Catherine M Kublik***, University of Dayton, and **Jeffrey T Neugebauer**, University of Eastern Kentucky (1145-39-1415)

2:00PM (2451) *Sequential Nabla Fractional Differences.*
Ariel Setniker, University of Nebraska-Lincoln (1145-39-1641)

2:30PM (2452) *Two Point Fractional Boundary Value Problems with a Fractional Boundary Conditions.*
Jeffrey W Lyons*, University of Hawaii at Manoa, and **Jeffrey T Neugebauer**, Eastern Kentucky University (1145-34-2006)

3:00PM ► (2453) *A Juvenile-Adult Model for an Amphibian Population with Distributed Birth and Metamorphosis Rates.* Preliminary report.
Baoling Ma*, Millersville University of Pennsylvania, and **Qihua Huang**, Southwest University (1145-35-1100)

3:30PM (2454) *Some new integral inequalities on time scales.*
Feifei Du, Sun Yat-Sen University, **Wei Hu***, **Lynn Erbe** and **Allan Peterson**, University of Nebraska-Lincoln (1145-39-2605)

AMS Special Session on Advances by Early Career Women in Discrete Mathematics, II

1:00 PM – 5:50 PM **Room 338, BCC**

Organizers: **Jessalyn Bolkema**, State University of New York at Oswego
Jessica De Silva, California State University, Stanislaus

1:00PM ► (2455) *Polyhedral cones generated by cycles of a graph.*
Anastasia Chavez*, **Jesús A. De Loera**, University of California, Davis, **Ana Paulina Figueroa**, Instituto Tecnológico Autónomo de México, **Yuanbo Li**, University of California, Davis, **Edgar Possani**, Instituto Tecnológico Autónomo de México, and **Lingyun Ye**, University of California, Davis (1145-05-1953)

1:30PM ► (2456) *Local Dimension of a Poset.* Preliminary report.
Jinha Kim, Seoul National University, **Ryan M. Martin**, Iowa State University, **Tomas Masarik**, Charles University, **Warren Shull**, Emory University, **Heather C Smith***, Davidson College, **Andrew Uzzell**, Grinnell College, and **Zhiyu Wang**, University of South Carolina (1145-05-1920)

2:00PM (2457) *Generalized Turán problems for graphs and hypergraphs.*
Ruth Luo*, University of Illinois at Urbana-Champaign, **Zoltan Furedi**, Renyi Institute of Mathematics, and **Alexandr Kostochka**, University of Illinois at Urbana-Champaign (1145-00-2481)

2:30PM (2458) *Many cliques with few edges.* Preliminary report.
Rachel Kirsch, London School of Economics (1145-05-1728)

3:00PM ► (2459) *A Collection of Extremal Problems for Counting Parameters of Graphs.*
Lauren Keough, Grand Valley State University (1145-05-2238)

3:30PM (2460) *Bounding the tripartite-circle crossing number of complete tripartite graphs.* Preliminary report.
Charles Camacho, Oregon State University, **Silvia Fernández-Merchant**, California State University, Northridge, **Marija Jelic**, University of Belgrade, **Rachel Kirsch**, London School of Economics, **Linda Kleist**, Technische Universität Berlin, **Elizabeth Bailey Matson**, Alfred University, and **Jennifer White***, Saint Vincent College (1145-05-2165)

4:00PM (2461) *DP-coloring of planar graphs without 4-,9-cycles and two cycles from* $\{5, 6, 7, 8\}$.
Runrun Liu, Central China Normal University, **Sarah Loeb***, Hampden-Sydney College, **Martin Rolek**, The College of William and Mary, **Yuxue Yin**, Central China Normal University, and **Gexin Yu**, The College of William and Mary (1145-05-1958)

4:30PM ► (2462) *Steinberg's Conjecture is almost true?*
Addie E. R. Armstrong, Norwich University (1145-05-1908)

5:00PM ► (2463) *Rainbow Spanning Trees in Edge-Colored Complete Graphs.*
Katherine Perry, University of Denver (1145-05-1621)

5:30PM (2464) *Rainbow spanning trees in general graphs.*
Lauren M. Nelsen* and **Paul Horn**, University of Denver (1145-05-983)

AMS Special Session on Advances in Quantum Walks, Quantum Simulations, and Related Quantum Theory, II

1:00 PM – 3:20 PM **Room 337, BCC**

Organizers: **Radhakrishnan Balu**, US Army Research Lab
Chaobin Liu, Bowie State University
Takuya Machida, Nihon University, Japan

1:00PM (2465) *From open quantum walks to unitary quantum walks.* Preliminary report.
Chaobin Liu, Bowie State University (1145-81-557)

1:30PM ► (2466) *Quantum Annealing-Based Algorithms, Quantum Machine Learning and Quantum Walks.*
Salvador Elias Venegas-Andraca, Atizapan de Zaragoza (1145-81-24)

2:00PM ► (2467) *A concise review of digital simulation software platforms of quantum algorithms.*
Juan Arturo Silva-Ordaz*, Tecnologico de Monterrey and Quantum Works, and **Salvador E Venegas-Andraca**, Tecnologico de Monterrey, Escuela de Ingenieria y Ciencias, Mexico. (1145-81-167)

2:30PM (2468) *Dynamical Entropy of Quantum Walks.* Preliminary report.
George Androulakis and **Duncan Wright***, University of South Carolina (1145-81-2492)

3:00PM (2469) *Adiabatic Quantum Computing and Graph Theory.*
Jake Farinholt* and **Samuel Mendelson**, Naval Surface Warfare Center, Dahlgren Division (1145-81-486)

AMS Special Session on Algebraic, Discrete, Topological and Stochastic Approaches to Modeling in Mathematical Biology, II

1:00 PM – 5:50 PM **Room 347, BCC**

Organizers: **Olcay Akman**, Illinois State University
Timothy D. Comar, Benedictine University
Daniel Hrozencik, Chicago State University
Raina Robeva, Sweet Briar College

1:00PM (2470) *Deducing dynamical rules via machine learning and topology.*
Angelika Manhart, Imperial College, **Dhananjay Bhaskar**, Brown University, **Jesse Milzman**, University of Maryland, **John Nardini***, North Carolina State University, **Chad Topaz**, Williams College, **Kathleen Storey**, University of Michigan, and **Lori Ziegelmeier**, Macalester College (1145-37-1511)

1:30PM (2471) *Analysis of an Agent-Based Model for Integrated Pest Management with Periodic Control Strategies.*
Timothy D Comar, Benedictine University (1145-92-1615)

2:00PM ► (2472) *The evolution of cooperation in mobile populations with costly movement on evolving multiplayer networks.*
Igor Erovenko*, UNC Greensboro, and **Mark Broom**, City, University of London (1145-91-88)

2:30PM (2473) *Coexistence in chase-escape.*
Rick Durrett, **Matthew Junge***, Duke University, and **Si Tang**, Lehigh University (1145-60-2749)

3:00PM (2474) *Network modeling through multistate canalization.*
Elena S Dimitrova, Clemson University (1145-92-1853)

3:30PM (2475) *Inheritance of bistability in mass action reaction networks.*
Casian Pantea*, West Virginia University, and **Murad Banaji**, Middlesex University London (1145-92-2985)

4:00PM ► (2476) *Not Just Either/Or: Discrete and Continuous Models Play Nicely Together in a Model of Hospital Infection.*
Lester Caudill* and **Barry Lawson**, University of Richmond (1145-92-2482)

4:30PM (2477) *Toric dynamical systems in population genetics.*
Jesse Drendel, Colorado State University (1145-37-2096)

5:00PM ► (2478) *Revising estimates of glutamate transporter density in astrocytes: a geometric computation.*
Cassandra L Williams*, SUNY New Paltz, **Anca Radulescu**, State University of New York at New Paltz, and **Annalisa Scimemi**, University at Albany (1145-92-1151)

5:30PM (2479) *Stochastic approximations of Fredholm Volterra Integro-differential equation arising in mathematical neuroscience.* Preliminary report.
M. Rahman, Department of Mathematics & Statistics, University of North Florida (1145-45-2725)

AMS Special Session on Counting Methods in Number Theory, III

1:00 PM – 5:50 PM **Room 344, BCC**

Organizers: **Lillian Pierce**, Duke University
Arindam Roy, Rice University
Jiuya Wang, University of Wisconsin

1:00PM (2480) *What is the height of two points in the plane?* Preliminary report.
Jesse Kass and **Frank Thorne***, University of South Carolina, Columbia, SC (1145-11-1764)

1:30PM (2481) *Number fields and arithmetic.* Preliminary report.
Robert J Lemke Oliver, Tufts University (1145-11-2908)

2:00PM (2482) *The shape of cubic and quartic number fields.*
Robert D Hough, SUNY Stony Brook (1145-11-45)

2:30PM (2483) *Efficient congruencing in ellipsephic sets.*
Kirsti Biggs, University of Bristol, UK (1145-11-1964)

3:00PM (2484) *Low-lying geodesics in a hyperbolic 3-manifold.*
Katie Lynn McKeon, Center for Communications Research (1145-11-2048)

3:30PM (2485) *Gowers uniformity of primes in arithmetic progressions and in short intervals.*
Xuancheng Shao, University of Kentucky (1145-11-1168)

4:00PM (2486) *Primes represented by positive definite binary quadratic forms.*
Asif Ali Zaman, Stanford University (1145-11-1030)

4:30PM (2487) *n-level density of the low lying zeros of primitive Dirichlet L-functions.*
Vorrapan Chandee*, Kansas State University, and **Yoonbok Lee**, Incheon National University (1145-11-1319)

5:00PM (2488) *Bounds for sets without polynomial progressions.*
Sarah Peluse, Stanford University (1145-11-1529)

5:30PM ► (2489) *The average number of rational points on genus two curves is bounded.*
Levent Hasan Ali Alpöge, Princeton University (1145-11-2082)

AMS Special Session on Enumerative Combinatorics, II

1:00 PM – 5:50 PM **Room 318, BCC**

Organizers: **Miklos Bona**, University of Florida
Cheyne Homberger, University of Maryland, Baltimore County

1:00PM (2490) *Probabilistic aspects of pattern avoiding permutations.*
Christopher Hoffman, University of Washington, **Douglas Rizzolo***, University of Delaware, and **Erik Slivken**, University of Paris, Diderot (1145-05-2188)

1:30PM (2491) ► *A Nonparametric Multivariate Two-Sample Test Using Cumulative Counts of Ranked Edges.* Preliminary report.
David M. Ruth* and **Michael J. Wallace**, US Naval Academy (1145-62-2306)

2:00PM (2492) *Counting partitions inside a rectangle.*
Stephen Melczer, **Greta Panova** and **Robin Pemantle***, University of Pennsylvania (1145-05-62)

2:30PM (2493) *Asymptotic bounds on the tails of the limiting QuickSort density.*
James Allen Fill* and **Wei-Chun Hung**, The Johns Hopkins University, Department of Applied Mathematics and Statistics (1145-68-1183)

3:00PM (2494) ► *Top-down or bottom-up: A tale of correspondences.*
Laura Eslava*, Georgia Institute of Technology, and **Louigi Addario-Berry**, McGill University (1145-05-1861)

3:30PM (2495) ► *Negative evaluations of the chromatic polynomial and its derivatives.*
Olivier Bernardi*, Brandeis University, and **Philippe Nadeau**, CNRS, Universite Lyon 1 (1145-05-1683)

4:00PM (2496) *Asymptotic regime change for multivariate generating functions.*
Stephen Melczer, University of Pennsylvania (1145-05-188)

4:30PM (2497) *Asymptotic analysis of combinatorial schemas of polylogarithms.*
Ricardo Gómez*, Institute of Mathematics of the National Autonomous University of México (UNAM), and **Mark Daniel Ward**, Purdue University (1145-05-1711)

5:00PM (2498) *Quota Trees.* Preliminary report.
Tad White, IDA Center for Computing Sciences (1145-05-1197)

5:30PM (2499) ► *Rational parking functions.* Preliminary report.
Yue Cai* and **Catherine H. Yan**, Texas A&M University (1145-05-1284)

AMS Special Session on Group Representation Theory and Character Theory, II

1:00 PM – 5:20 PM **Room 330, BCC**

Organizers: **Mohammad Reza Darafsheh**, University of Tehran, Iran
Manouchehr Misaghian, Prairie View A&M University

1:00PM (2500) *Character codegrees of p-groups.*
Preliminary report.
Sarah Croome* and **Mark L. Lewis**, Kent State University (1145-20-265)

1:30PM (2501) *A Database of Finite Groups with the Same Character Tables.*
William Cocke*, **Steve Goldstein** and **Michael Stemper**, University of Wisconsin-Madison (1145-20-435)

2:00PM (2502) *Minimal representations of Lie algebras with non-trivial Levi decomposition.* Preliminary report.
Manoj Lamichhane, University of Wisconsin Milwaukee at Waukesha (1145-22-1916)

2:30PM (2503) *Constructing Basic Algebras.*
Angela Kraft, University of Arizona (1145-20-2945)

3:00PM (2504) *Some Plancherel-type formulas for Lie groups.*
Ehssan Khanmohammadi, Union College (1145-22-2919)

3:30PM (2505) *Finite W-algebra invariants.* Preliminary report.
Jonathan Scott Brown, SUNY Oneonta (1145-20-1008)

4:00PM (2506) ► *Swarms and Group Theory.* Preliminary report.
Isabella Diaz, St. Thomas Aquinas College (1145-20-2813)

4:30PM (2507) *Graded multiplicity in harmonic polynomials from the Vinberg setting.*
Alexander Heaton, University of Wisconsin-Milwaukee (1145-20-545)

5:00PM (2508) *On Schubert varieties.*
Paramasamy Karuppuchamy, University of Toledo (1145-22-2724)

AMS Special Session on Latinx in Math, II

1:00 PM – 5:50 PM **Room 327, BCC**

Organizers: **Alexander Diaz-Lopez**, Villanova University
Laura Escobar, University of Illinois
Juanita Pinzón-Caicedo, North Carolina State University

1:00PM (2509) ► *Symmetric functions and the symmetric group.*
Rosa C Orellana*, Dartmouth College, and **Mike Zabrocki**, York University (1145-05-1113)

2:00PM (2510) *A combinatorial model for computing volumes of flow polytopes.*
Carolina Benedetti, Universidad de los Andes, **Rafael González D'León**, Universidad Sergio Arboleda, **Christopher R. H. Hanusa**, Queens College (CUNY), **Pamela E. Harris**, Williams College, **Apoorva Khare**, Indian Institute of Science, **Alejandro H. Morales***, University of Massachusetts, Amherst, and **Martha Yip**, University of Kentucky (1145-05-2844)

2:30PM (2511) ► *Broadcast Domination of Triangular Matchstick Graphs and the Triangular Lattice.*
Pamela E. Harris*, **Dalia K. Luque**, Williams College, **Claudia Reyes Flores**, New Mexico State University, and **Nohemi Sepulveda**, Williams College (1145-05-535)

3:00PM Break

3:30PM (2512) ► *Modifying DNA topology through packing and enzymatic reactions.*
Mariel Vazquez, Departments of Mathematics and of Microbiology & Molecular Genetics, University of California, Davis (1145-92-2489)

4:30PM (2513) *On the Hodge theory of stratified spaces.*
Pierre Albin, University of Illinois at Urbana-Champaign (1145-58-839)

5:00PM (2514) *Recent developments in the thin obstacle problem.*
Nicola Garofalo, Universita di Padova, **Arshak Petrosyan**, Purdue University, and **Mariana Smit Vega Garcia***, Western Washington University (1145-35-1578)

5:30PM Discussion

AMS Special Session on Localization and Delocalization for Disordered Quantum Systems, II

1:00 PM – 5:50 PM **Room 326, BCC**

Organizers: **Peter D. Hislop**, University of Kentucky
Christoph A. Marx, Oberlin College
Jeffery Schenker, Michigan State University

1:00PM (2515) *Dynamical Entanglement of disordered harmonic oscillators.* Preliminary report.
Houssam Abdul-Rahman, University of Arizona (1145-82-1540)

1:30PM (2516) *Low Energy Localization Properties of Disordered Harmonic Oscillators.*
Robert Sims*, **Houssam Abdul-Rahman**, University of Arizona, and **Gunter Stolz**, University of Alabama at Birmingham (1145-82-2384)

2:00PM (2517) *How fast can entanglement be generated in quantum systems?*
Anna Vershynina, University of Houston (1145-81-680)

2:30PM (2518) *Level spacing and Poisson statistics for continuum random Schrödinger operators.*
Adrian Dietlein, LMU Munich, and **Alexander Elgart***, Virginia Tech (1145-60-1189)

3:00PM (2519) *Eigenvalue separation in disordered quantum systems.*
John Z. Imbrie, University of Virginia (1145-81-2812)

3:30PM (2520) *Dynamical and spectral properties of random Schrodinger operators with strongly correlated potentials.* Preliminary report.
Rajinder Singh Mavi*, Ripon College, **Rodrigo Matos** and **Jeffrey Schenker**, Michigan State University (1145-82-2184)

4:00PM (2521) *Long-range Schrödinger Dynamics.*
Kay Kirkpatrick, University of Illinois at Urbana-Champaign (1145-35-1945)

4:30PM (2522) *Localization and delocalization for interacting quasiperiodic particles.* Preliminary report.
Jean Bourgain, Institute for Advanced Study, Princeton, **Svetlana Jitomirskaya**, University of California, Irvine, and **Ilya Kachkovskiy***, Michigan State University (1145-81-1955)

5:00PM (2523) *Ballistic motion for limit-periodic Schrödinger operators.*
Jake Fillman, Virginia Tech (1145-47-549)

5:30PM (2524) *Diffusion in the Mean for a Periodic Schrödinger Equation Perturbed by a Fluctuating Potential.*
Jeffrey Schenker, **F Zak Tilocco** and **Shiwen Zhang***, Michigan State University (1145-35-1141)

AMS Special Session on Mathematicians at Sea (in the Sky, or on Land): Defense Applications of Mathematics, II

1:00 PM – 5:50 PM **Room 332, BCC**

Organizers: **Tegan Emerson**, Naval Research Laboratory
Timothy Doster, Naval Research Laboratory
George Stantchev, Naval Research Laboratory

1:00PM ► (2525) *Dealing with Cluster Synchronization in undirected networks.*
Louis M Pecora*, Naval Research Laboratory, **Francesco Sorrentino**, University of New Mexico, **Aaron Hagerstrom**, NIST, Boulder, CO, **Abu Siddique**, University of New Mexico, **Joseph Hart**, **Rajarshi Roy** and **Thomas Murphy**, University of Maryland (1145-37-89)

2:00PM ► (2526) *How Your Data Will Lie to You.* Preliminary report.
A. K. Criner, Air Force Research Laboratory (1145-62-2414)

2:30PM ► (2527) *Geolocation via polynomial systems.* Preliminary report.
Dan Bates, US Naval Academy (1145-14-1696)

3:00PM (2528) *Semantics of Dynamical Systems.*
Jared Culbertson*, **Paul Gustafson**, Air Force Research Laboratory, **Daniel E Koditschek**, University of Pennsylvania, and **Peter F Stiller**, Texas A&M University (1145-18-1403)

4:00PM ► (2529) *Machine Learning for Data Assimilation in Dynamic Physical Processes.* Preliminary report.
James Kerce, Georgia Tech Research Institute, Georgia Institute of Technology (1145-62-2608)

4:30PM ► (2530) *Functional Analysis of Deep Learning Classifiers.* Preliminary report.
Katie Rainey, Space and Naval Warfare Systems Center Pacific (1145-68-1820)

5:00PM (2531) *A high-order shock-capturing limiter for discontinuous Galerkin methods with applicability to Cartesian, curvilinear, and unstructured meshes.* Preliminary report.
Scott A Moe, Advanced Micro Devices, **James A Rossmanith**, Iowa State University, and **David C Seal***, United States Naval Academy (1145-65-2498)

5:30PM Discussion: Current Trends in DoD Funding for Mathematics.

AMS Special Session on Mathematics of Coding Theory and Applications, II

1:00 PM – 5:50 PM **Room 319, BCC**

Organizers: **Hiram Lopez-Valdez**, Clemson University
Felice Manganiello, Clemson University
Gretchen L. Matthews, Virginia Tech

1:00PM (2532) *Constructions of codes for some models of distributed storage.*
Alexander Barg* and **Zitan Chen**, University of Maryland (1145-94-2122)

► 1:30PM (2533) *Additive codes associated to Laplacian simplices.*
Marie Meyer, Lewis University, and **Tefjol Pllaha***, University of Kentucky (1145-05-678)

2:00PM (2534) *Fast and Efficient Distributed Matrix-Vector Multiplication Using Rateless Fountain Codes.*
Ankur Mallick*, Carnegie Mellon University, **Malhar Chaudhari**, Oracle Inc., and **Gauri D Joshi**, Carnegie Mellon University (1145-94-553)

2:30PM (2535) *Sum-Rank Codes and Linearized Reed-Solomon Codes.*
Umberto Martinez-Penas* and **Frank R. Kschischang**, University of Toronto (1145-94-610)

3:00PM (2536) *Asymptotic Enumeration and Coding Theory.*
Alberto Ravagnani* and **Eimear Byrne**, University College Dublin (1145-00-787)

3:30PM (2537) *The second generalized hamming weight of some evaluation codes arising from a projective torus.*
Eliseo Sarmiento*, **Eduardo Camps**, Instituto Politécnico Nacional, **Rafael Villarreal**, Centro de Investigación y Estudios Avanzados del IPN, and **Manuel Gonzalez**, Instituto Politécnico Nacional (1145-13-2314)

4:00PM (2538) *Generalized Hamming weights of projective Reed-Muller codes.*
Sudhir R Ghorpade, Indian Institute of Technology Bombay, India (1145-94-1629)

4:30PM (2539) *Generalized Minimum Distance Functions.*
Manuel González-Sarabia*, INSTITUTO POLITECNICO NACIONAL-UPIITA, **José Martínez-Bernal**, **Rafael H. Villarreal** and **Carlos E. Vivares**, CINVESTAV-IPN (1145-13-422)

5:00PM (2540) *On the maximum number of $\mathbb{F}_q$-zeroes of polynomials with a given Newton polytope.* Preliminary report.
Kyle Meyer, The University of California, San Diego, **Ivan Soprunov***, Cleveland State University, and **Jenya Soprunova**, Kent State University (1145-52-1117)

5:30PM (2541) *Locally Recoverable Codes with Many Recovery Sets from Fiber Products of Curves.*
Kathryn Haymaker, Villanova University, **Beth Malmskog***, Colorado College, and **Gretchen Matthews**, Virginia Tech (1145-11-1986)

AMS Special Session on Network Science, II

1:00 PM – 5:50 PM **Room 320, BCC**

Organizers: **David Burstein**, Swarthmore College
Franklin Kenter, United States Naval Academy
Feng 'Bill' Shi, University of North Carolina

► 1:00PM (2542) *Hypergraph Kronecker models for Networks.*
Nicole Eikmeier* and **David F. Gleich**, Purdue University (1145-68-353)

1:30PM (2543) *Gromov-Wasserstein distances: Fast network comparison via entropy regularized optimal transport.*
Samir Chowdhury* and **Facundo Mémoli**, The Ohio State University (1145-49-2302)

2:00PM (2544) *Topological measures of network dynamics.* Preliminary report.
Chad Giusti, University of Delaware (1145-55-1522)

3:00PM (2545) *Meaningful Voids: Applying Algebraic Topology to Network Neuroscience.*
Ann E. Sizemore* and **Danielle S. Bassett**, University of Pennsylvania (1145-55-2366)

3:30PM (2546) *The Role of Sparsity in Inverse Problems for Networks with Nonlinear Dynamics.*
Victor James Barranca*, Swarthmore College, and **Douglas Zhou**, Shanghai Jiao Tong University (1145-92-1339)

4:00PM (2547) *Estimation in Popularity Adjusted Stochastic Block Model.*
Ramchandra Rimal* and **Marianna Pensky**, University of Central Florida, Department of Mathematics (1145-62-918)

4:30PM (2548) *Optimizing Geometric Requirements for Redistricting.*
John Asplund* and **Tom Gonzalez**, Dalton State College (1145-90-499)

5:00PM ► (2549) *Inverse Problems of Mixed Random Graph Models.* Preliminary report. **Samuel Baker***, United States Naval Academy, and **Franklin H. J. Kenter**, United States Navel Academy (1145-94-1336)

5:30PM ► (2550) *Random Spanning Trees on Homogeneous Graphs.* Preliminary report. **Anna Melikyan**, Kansas State University (1145-94-1253)

AMS Special Session on Not KNerds: A Community for Knot Theory, II

1:00 PM – 5:50 PM **Room 329, BCC**

Organizers: **Moshe Cohen**, Vassar College
Elizabeth Denne, Washington and Lee University
Adam Lowrance, Vassar College

1:00PM ► (2551) *The curious universe of virtual knots.* **Allison K Henrich**, Seattle University (1145-57-728)

2:00PM ► (2552) *Restrictions on Homflypt and Kauffman Polynomials Arising from Local Moves.* Preliminary report. **Sandy Ganzell**, St. Mary's College of Maryland, **Mercedes Gonzalez***, Southwestern University, **Chloe' Marcum**, Marshall University, **Nina Ryalls**, University of Dallas, and **Mariel Santos**, St. Mary's College of Maryland (1145-57-2249)

2:30PM ► (2553) *Hyperbolicity and Turaev Hyperbolicity of Knots and Virtual Knots.* **Colin C. Adams**, Williams College, **Or Eisenberg**, Harvard University, **Jonah Greenberg***, Williams College, **Kabir Kapoor**, Cornell University, **Kate O'Connor**, The College of New Jersey, **Natalia Pacheco-Tallaj**, Harvard University, **Zhen Liang**, University of Southern California, and **Yi Wang**, Columbia University (1145-57-1847)

3:00PM (2554) *Machine Learning Revelations from the Color Jones Polynomial.* Preliminary report. **Mustafa Hajij**, Ohio State University, **Jesse S F Levitt***, University of Southern California, and **Radmila Sazdanovic**, North Carolina State University (1145-54-1911)

3:30PM ► (2555) *Ineffective sets and region crossing change.* Preliminary report. **Miles Clikeman**, **Rachel Morris** and **Heather M. Russell***, University of Richmond (1145-57-1757)

4:00PM (2556) *Realizing knots by physical ropes.* **Yuanan Diao**, Department of Mathematics and Statistics, University of North Carolina Charlotte (1145-57-594)

5:00PM (2557) *Knot types of generalized Kirchhoff rods.* **Tom Needham**, The Ohio State University (1145-53-1779)

5:30PM ► (2558) *Folded ribbon knots in the plane.* Preliminary report. **Elizabeth Denne**, Washington & Lee University (1145-57-1214)

AMS Special Session on Number Theory, Arithmetic Geometry, and Computation, II

1:00 PM – 5:50 PM **Room 325, BCC**

Organizers: **Brendan Hassett**, Brown University
Drew Sutherland, Massachusetts Institute of Technology
John Voight, Dartmouth College

1:00PM (2559) *Upper bounds for the endomorphism algebra of an abelian variety.* **Edgar Costa**, Massachusetts Institute of Technology (1145-11-2867)

1:30PM (2560) *Shioda's fourfold and CM Mumford's fourfold.* **Yuwei Zhu**, Brown University (1145-14-1348)

2:00PM (2561) *Odd order obstructions to rational points on general K3 surfaces.* **Jennifer Berg*** and **Anthony Várilly-Alvarado**, Rice University (1145-11-2288)

2:30PM (2562) *Computing hyperelliptic modular invariants from period matrices.* Preliminary report. **Christelle Vincent**, University of Vermont (1145-11-1123)

3:00PM (2563) *Galois actions associated to hyperelliptic curves over local fields.* **Jeffrey Yelton**, University of Milan (1145-11-889)

3:30PM (2564) *Conductors and minimal discriminants of hyperelliptic curves in odd residue characteristic.* Preliminary report. **Padmavathi Srinivasan***, Georgia Institute of Technology, and **Andrew Obus**, Baruch College (CUNY) (1145-11-520)

4:00PM (2565) *Computing Zeta Functions of Superelliptic Curves in Large Characteristic.* **Vishal Arul**, MIT, **Alex Best**, Boston University, **Edgar Costa**, MIT, **Richard Magner**, Boston University, and **Nicholas Triantafillou***, MIT (1145-11-276)

4:30PM (2566) *Torsion Subgroups of Elliptic Curves over Function Fields.* **Robert J.S. McDonald**, University of Connecticut (1145-11-2418)

5:00PM (2567) *The geometric average size of Selmer groups over function fields.* **Aaron Landesman**, Stanford University (1145-11-1572)

5:30PM (2568) *The Sato-Tate conjecture and Nagao's conjecture.*
Seoyoung Kim, Brown University (1145-11-1363)

AMS Special Session on Partition Theory and Related Topics, II

1:00 PM – 5:50 PM **Room 321, BCC**

Organizers: **Dennis Eichhorn**, University of California, Irvine
Tim Huber, University of Texas, Rio Grande Valley
Amita Malik, Rutgers University

1:00PM (2569) *Identities for Third Order Mock Theta Functions from Ramanujan's Lost Notebook.*
Bruce C Berndt*, University of Illinois at Urbana-Champaign, **George E Andrews**, Pennsylvania State University, **Song Heng Chan**, Nanyang Technological University, **Sun Kim**, University of Cologne, and **Amita Malik**, Rutgers University (1145-11-1041)

► 1:30PM (2570) *The Borwein Conjecture: An exercise in utilizing the saddle point method.* Preliminary report.
Chen Wang, University of Vienna (1145-05-1877)

► 2:00PM (2571) *An experimental mathematics approach to Parking Functions.*
Yukun Yao, Rutgers University, and **Doron Zeilberger***, Rutgers University (NB) (1145-05-867)

2:30PM (2572) *Hyperbolicity of the partition Jensen polynomials.*
Hannah Larson, Stanford University, and **Ian Wagner***, Emory University (1145-11-1606)

3:00PM (2573) *CM Evaluations of the Goswami-Sun Series.*
Madeline Locus Dawsey* and **Ken Ono**, Emory University (1145-11-364)

► 3:30PM (2574) *Ramanujan's modular equations and colored partition identities.*
Sun Kim, University of Cologne (1145-11-559)

4:00PM (2575) *A Generalization of Partition Identities for First Differences of Partitions of n Into at most m Parts.*
Acadia Larsen, University Of Texas: Rio Grande Valley (1145-05-170)

4:30PM (2576) *Euler's partition theorem for all moduli and a generalization of the lecture hall partition theorem.* Preliminary report.
Ae Ja Yee, Penn State University (1145-05-2195)

► 5:00PM (2577) *Iterated differences in Gaussian coefficients.*
William J. Keith, Michigan Technological University (1145-05-607)

5:30PM (2578) *Integer partitions and the exponential distribution analog of the Grubbs–Weaver method.*
Andrew V Sills* and **Charles W Champ**, Georgia Southern University (1145-62-944)

AMS Special Session on Statistical, Variational, and Learning Techniques in Image Analysis and their Applications to Biomedical, Hyperspectral, and Other Imaging, II

1:00 PM – 4:50 PM **Room 346, BCC**

Organizers: **Justin Marks**, Gonzaga University
Laramie Paxton, Washington State University
Viktoria Taroudaki, Eastern Washington University

1:00PM (2579) *Fast Detection of Inter-Group Differences in Images.*
Alex Cloninger, University of California, San Diego (1145-62-780)

► 1:30PM (2580) *An entropy-based algorithm for texture image inpainting.* Preliminary report.
Prashant Athavale*, Clarkson University, Potsdam, NY, **Sheetal Dharmatti** and **Aiswarya Sara Matthew**, Indian Institute of Science Education and Research Thiruvananthapuram (1145-65-2172)

2:00PM (2581) *Anisotropic diffuse interface functionals based on multiscale multidirectional representations.*
Julia A Dobrosotskaya, Case Western Reserve University, Department of Math., Appl. Math. and Statistics (1145-65-1948)

2:30PM (2582) *Truncation and Recycling Methods for Lanczos Bidiagonalization and Hybrid Regularization.*
Jiahua Jiang*, **Julianne Chung** and **Eric de Sturler**, Virginia Tech (1145-65-489)

► 3:00PM (2583) *Diffeomorphic registration of discrete varifolds.* Preliminary report.
Nicolas Charon* and **Hsi-Wei Hsieh**, Department of Applied Mathematics and Statistics, Johns Hopkins University (1145-49-1650)

► 3:30PM (2584) *Electrical Impedance Tomography: Two Direct Image Reconstruction Methods.*
Peter A Muller, Rowan University (1145-78-1804)

4:00PM (2585) *Feature-Based Image Registration with Applications to Remote Sensing and Medical Imaging.*
Azubuike M. Okorie, **Taposh Biswas**, **Samuel K. Awidi** and **Sokratis Makrogiannis***, Delaware State University (1145-68-2676)

4:30PM (2586) *Application of Stochastic Algorithms for Multiple Measurement Vectors to the Hyperspectral Diffuse Optical Tomography Problem.* Preliminary report. **Rachel Grotheer***, Goucher College, **Natalie Durgin**, Spiceworks, **Chenxi Huang**, Yale University, **Shuang Li**, Colorado School of Mines, **Anna Ma**, University of California, San Diego, **Deanna Needell**, University of California, Los Angeles, and **Jing Qin**, Montana State University (1145-94-2444)

AMS Special Session on Topological Data Analysis: Theory and Applications, II

1:00 PM – 5:50 PM **Room 345, BCC**

Organizers: **Justin Curry**, University at Albany, State University of New York
Mikael Vejdemo-Johansson, College of Staten Island, City University of New York
Sara Kalisnik Verovsek, Wesleyan University

1:00PM (2587) *Rational cochains on the space of persistence vineyards.* Preliminary report. **Chad Giusti**, University of Delaware (1145-55-1526)

► 1:30PM (2588) *Sheaf theory on universal persistent homology spaces.* **Jānis Lazovskis**, University of Illinois at Chicago (1145-55-955)

2:00PM (2589) *Cauchy Sequences in Categories with an Interleaving.* **Joshua Cruz**, Duke University (1145-55-796)

2:30PM (2590) *Directed complexes, sequence dimension and inverting a neural network.* **Vladimir Itskov*** and **Alexandra Yarosh**, The Pennsylvania State University (1145-55-2620)

3:00PM (2591) *Metric reconstruction via optimal transport.* **Michal Adamaszek**, MOSEK, **Henry Adams***, Colorado State University, and **Florian Frick**, Carnegie Mellon University (1145-51-259)

3:30PM (2592) *The Persistent Homology of Random Geometric Complexes on Fractals.* **Benjamin D Schweinhart**, Ohio State University (1145-60-622)

4:00PM (2593) *Homology theories for (finite) metric spaces.* **Nina Otter**, UCLA and MPI MIS (1145-55-2251)

4:30PM (2594) *Approximating length spaces with metric graphs of bounded first Betti number.* **Facundo Memoli** and **Osman Berat Okutan***, The Ohio State University, Department of Mathematics (1145-51-138)

5:00PM ► (2595) *Learning metric for persistence diagrams.* Preliminary report. **Yusu Wang*** and **Qi Zhao**, The Ohio State University (1145-68-1462)

5:30PM (2596) *Learning with Nerve Complexes.* **Jose A. Perea**, Michigan State University (1145-55-581)

AMS Special Session on Using Modeling to Motivate the Study of Differential Equations, II

1:00 PM – 3:50 PM **Room 336, BCC**

Organizers: **Robert Kennedy**, Centennial High School, Ellicott City MD
Audrey Malagon, Virginia Wesleyan University
Brian Winkel, SIMIODE, Cornwall NY
Dina Yagodich, Frederick Community College

► 1:00PM (2597) *Using Differential Equations to Model Predator-Prey Relations as Part of SCUDEM Modeling Competition.* Preliminary report. **Anthony Dean Stefan***, **Zachary David Fralish** and **Thomas Bernard Tyson**, Florida Southern College (1145-34-1000)

► 1:30PM (2598) *Opportunities for Community in Using Modeling to Teach Differential Equations at SIMIODE.* **Brian J Winkel**, SIMIODE, Cornwall NY USA (1145-97-1884)

► 2:00PM (2599) *Cancer modeling using agent-based models.* Preliminary report. **Sarah El Jamous**, Arizona State University (1145-34-2634)

► 2:30PM (2600) *Motivating Students with Dynamic Modeling.* **S. Lin**, Savannah State University (1145-97-1767)

► 3:00PM (2601) *Fast solvers for Biot model using a multiphysics reformulation.* **David Evans*** and **Mingchao Cai**, Morgan State University (1145-35-1894)

► 3:30PM (2602) *Mathematical modeling and optimal control of Tick Fever.* **Blessing Emerenini**, Oregon State University, (1145-34-2998)

MAA Invited Paper Session on Mathematics and Policy

1:00 PM – 3:50 PM **Room 317, BCC**

Organizers: **Rick Klima**, Appalachian State University
Eric Marland, Appalachian State University

► 1:00PM (2603) *In defense of democracy: mathematical tools for fighting gerrymandering.* **Mira Bernstein**, Cambridge, MA (1145-AH-3024)

1:30PM ► (2604) *Mathematical arguments in Dudum v. Arntz.* Preliminary report.
Jonathan K Hodge, Grand Valley State University (1145-AH-1063)

2:00PM ► (2605) *Partnerships and Pathways to Inform Policy.*
Catherine Paolucci, Worcester Polytechnic Institute (1145-AH-2012)

2:30PM ► (2606) *Stakeholder Engagement and Analysis of CMS Data Products in Decision Making and Policy Frameworks.*
Vanessa Escobar, NASA Goddard Space Flight Center (1145-AH-3018)

3:00PM ► (2607) *Disciplinary Societies and Federal Policy for Support of Research and Education.*
J Michael Pearson, Mathematical Association of America (1145-AH-3003)

3:30PM ► (2608) *Modeling to Engage Students in Policy Issues.*
Karen M. Bliss, Virginia Military Institute (1145-AH-2442)

AMS-MAA-ICHM Special Session on History of Mathematics, III

1:00 PM – 4:50 PM **Room 314, BCC**

Organizers: **Sloan Despeaux**, Western Carolina University
Jemma Lorenat, Pitzer College
Daniel E. Otero, Xavier University
Adrian Rice, Randolph-Macon College

1:00PM ► (2609) *De Morgan on Barrett and Tetens: a British-Continental analogy in the history of statistic thinking?* Preliminary report.
Anna-Sophie Heinemann, University of Paderborn, Germany (1145-01-1729)

1:30PM ► (2610) *Understanding the differential in the unpublished work of Mary Somerville (1780-1872).*
Brigitte Stenhouse, The Open University, UK (1145-01-1017)

2:00PM ► (2611) *A Cambridge correspondence class in arithmetic for women.* Preliminary report.
J J Tattersall, Providence College (1145-01-844)

2:30PM ► (2612) *My Computing Device – A Mathematical Perspective.*
Peggy Aldrich Kidwell, National Museum of American History, Smithsonian Institution (1145-01-1623)

3:00PM ► (2613) *Magnificent Mathematicians in their Flying Machines.*
Tony Royle, The Open University, UK. (1145-01-1495)

3:30PM Discussion

4:00PM ► (2614) *The Nautical Almanac Office harbors mathematical editors, 1849-1866.* Preliminary report.
Deborah Kent, Drake University (1145-01-1965)

4:30PM ► (2615) *Aiming for High Standards: Solomon Lefschetz as Editor of the Annals of Mathematics.* Preliminary report.
Della Dumbaugh, University of Richmond (1145-01-1898)

MAA Minicourse #12: Part B

1:00 PM – 3:00 PM **Holiday Ballroom 3, 2nd Floor, Hilton**

Keep Teaching Statistics using R and RStudio

Presenters: **Shonda Kuiper**, Grinnell College
Randall Pruim, Calvin College

MAA Minicourse #10: Part B

1:00 PM – 3:00 PM **Holiday Ballroom 1, 2nd Floor, Hilton**

Object Based Learning and the Smithsonian Learning Lab

Presenter: **Amy Shell-Gellasch**, Eastern Michigan University

MAA Minicourse #6: Part B

1:00 PM – 3:00 PM **Holiday Ballroom 2, 2nd Floor, Hilton**

Visualizing Multivariable Calculus & Differential Equations using CalcPlot3D

Presenters: **Paul E. Seeburger**, Monroe Community College
Monica VanDieren, Robert Morris University

AMS Contributed Paper Session on Combinatorics and Graph Theory, IV

1:00 PM – 5:25 PM **Room 313, BCC**

1:00PM (2616) *Combinatorial curve neighborhoods of the affine flag variety of type* A_n^1.
Songul Aslan, Virginia Tech (1145-05-1951)

1:15PM (2617) *Minuscule Kac-Moody settings unified by new poset coloring properties.*
Michael C. Strayer, University of North Carolina at Chapel Hill (1145-05-1794)

1:30PM ► (2618) *Upper and Lower Bounds on Zero-Sum Generalized Schur Numbers.*
Erik A Metz, University of Maryland (1145-05-1502)

1:45PM Break

2:00PM ► (2619) *Counting Simultaneous Core Partitions with d-Distinct Parts.*
Noah Kravitz, Yale University (1145-05-747)

2:15PM ► (2620) *Cyclic Descents for General Skew Tableaux.*
Brice Huang, Massachuseetts Institute of Technology (1145-05-876)

2:30PM (2621) *Weight distribution of quasi-quadratic residue codes.*
Nigel Boston, University of Wisconsin - Madison, and **Jing Hao***, University of Wisconson - Madison (1145-05-2499)

► 2:45PM (2622) *Anti-power j-fixes of the Thue-Morse word.*
Marisa Gaetz, Massachusetts Institute of Technology (1145-05-1561)

► 3:00PM (2623) *Sudoku Pair Latin Squares.*
Braxton Carrigan, **David Diaz**, Southern Connecticut State University, and **James M Hammer***, Cedar Crest College (1145-05-2830)

► 3:15PM (2624) *Embedding Partial Latin Cubes.* Preliminary report.
Amin Bahmanian, Illinois State University (1145-05-103)

► 3:30PM (2625) *The Intersection Problem for Latin Rectangles.*
Bin Yeh*, Virginia Commonwealth University, and **Chris Rodger**, Auburn University (1145-05-2041)

3:45PM (2626) *Adjusting p,q-analogues of m-level Rook Placements.*
Kenneth Barrese, Alma College (1145-05-2030)

► 4:00PM (2627) *Strip Tilings on Square Chessboards.* Preliminary report.
Arthur L Gershon, Case Western Reserve University (1145-05-2673)

4:15PM (2628) *Permutations with equal orders.*
Charles Burnette*, Saint Louis University, **Eric Schmutz** and **James Thomas**, Drexel University (1145-05-2869)

► 4:30PM (2629) *Improving the $\frac{1}{3} - \frac{2}{3}$ Conjecture for Width Two Posets.*
Ashwin Sah, Massachusetts Institute of Technology (1145-05-695)

► 4:45PM (2630) *Investigating Allowed Patterns in Dynamical Systems Using Commuter Functions.*
Scott M LaLonde* and **Kassie Archer**, University of Texas at Tyler (1145-05-2894)

5:00PM (2631) *On Gessel super Catalan Polynomials.*
Irina Gheorghiciuc* and **Emily Allen**, Carnegie Mellon University (1145-05-2824)

► 5:15PM (2632) *Snakes: Legal, Illegal and Dodecahedral.*
Therese Aglialoro and **Robert Hochberg***, University of Dallas (1145-05-2357)

AMS Contributed Paper Session on Commutative Algebra

1:00 PM – 5:25 PM **Room 311, BCC**

1:00PM (2633) *Slenderness program.*
Radoslav Dimitric, New York City, NY (1145-13-922)

1:15PM (2634) *Some properties of ladder determinantal rings.* Preliminary report.
Sean Sather-Wagstaff, Clemson University, **Tony Se*** and **Sandra Spiroff**, University of Mississippi (1145-13-958)

► 1:30PM (2635) *Unstacking Tortoise Shells with Math: Factoring Multivariate Polynomials in the Tropical Semiring.* Preliminary report.
Davis Deaton* and **Jordan Sawdy**, Belmont University (1145-13-2887)

1:45PM (2636) *Atoms in Quasilocal Integral Domains.*
Kevin Bombardier* and **D. D. Anderson**, University of Iowa (1145-13-357)

► 2:00PM (2637) *Noetherian Rings with Unusual Prime Ideal Structures.* Preliminary report.
Anya Michaelsen, Williams College (1145-13-497)

2:15PM (2638) *The group of t-invertible t-ideals of Prüfer v multiplication domains.* Preliminary report.
Lokendra P Paudel, University of Akron (1145-13-585)

2:30PM (2639) *A study of m-canonical ideals.*
Simplice Tchamna, Georgia College (1145-13-1517)

► 2:45PM (2640) *Infinite-Dimensional Algebras Without Simple Bases.* Preliminary report.
Rebin A. Muhammad*, Ohio Univeristy, **Sergio Lopez-Permouth**, Ohio University, and **Pinar Aydogdu**, Hacettepe University (1145-13-690)

► 3:00PM (2641) *A generalization of the Newton Girard formula to the monomial symmetric polynomials.*
Samuel H Chamberlin*, Park University, and **Azadeh Rafizadeh**, William Jewell College (1145-13-1145)

► 3:15PM (2642) *Gröbner bases with respect to several monomial orderings and computation of Hilbert-type dimension polynomials.*
Matthew F Menture, The Catholic University of America (1145-13-938)

► 3:30PM (2643) *Triangular Bases for Modules of Generalized Splines on Arbitrary Graphs.*
Lauren Rose*, Bard College, and **Jeff Suzuki**, Brooklyn College (1145-11-2112)

3:45PM (2644) *Unique Decomposition of Direct Sums of Ideals.*
Akeel Omairi* and **Lee Klingler**, Florida Atlantic University (1145-13-868)

4:00PM (2645) *Jacobson and Hilbert Module Equivalence.* Preliminary report.
Tim C McEldowney, University of California, Riverside (1145-13-1482)

4:15PM (2646) *Gröbner bases and equations of the multi-Rees algebras.*
Babak Jabbar Nezhad, University of Arkansas, Fayetteville (1145-13-1525)

4:30PM (2647) *Numerical Maculification in Arbitrary Codimension.*
Erin Bela, Juniata College (1145-13-2214)

4:45PM ► (2648) *Virtual Complete Intersections in $\mathbb{P}^1 \times \mathbb{P}^1$.* **Amal Mattoo***, Harvard College, **Jiyang Gao**, Massachusetts Institute of Technology, **Yutong Li**, Haverford College, and **Michael C. Loper**, University of Minnesota, Twin Cities (1145-13-2142)

5:00PM ► (2649) *Matrix Square Roots of Polynomials.* **Trung Vu*** and **Kosmas Diveris**, St. Olaf College (1145-13-25)

5:15PM (2650) *Summary statistics for persistent homology.* **Ashleigh Thomas**, Duke University (1145-13-2607)

AMS Contributed Paper Session on Mathematics in the Life Sciences, Ecology, and Related Fields, III

1:00 PM – 5:55 PM **Room 312, BCC**

1:00PM ► (2651) *Improving Statistical Binning Techniques for Species Tree Reconstruction.* **Joseph P Rusinko**, Hobart and William Smith Colleges, **Jennifer Vandenbussche***, Kennesaw State University, and **Qingyi Lu**, Hobart and William Smith Colleges (1145-92-1317)

1:15PM (2652) *Discrete Conformal Invariants on Triangle Meshes of Brain Data.* **Carolyn M Eady**, Florida State University (1145-92-2107)

1:30PM ► (2653) *Averaging for molecular motors with switching behavior.* **Joe John Klobusicky***, **Peter Kramer**, Rensselaer Polytechnic Institute, and **John Fricks**, Arizona State University (1145-92-2404)

1:45PM (2654) *The Replicator Dynamics for Multilevel Selection in Evolutionary Games.* **Daniel B Cooney**, Princeton University (1145-92-175)

2:00PM (2655) *Dynamic Observers for Unknown Populations.* **Nathan A Poppelreiter**, University of Nebraska Lincoln (1145-92-1468)

2:15PM ► (2656) *A Harmonic Oscillator Analogy to Mathematical Biology Systems.* Preliminary report. **Sergiy Koshkin**, University of Houston-Downtown, and **Isaiah G. Meyers***, University of Texas at Austin (1145-92-1924)

2:30PM (2657) *Explicit probability of fixation formula for mutual competitors in a stochastic population model under competitive trade-offs.* Preliminary report. **Glenn S Young*** and **Andrew Belmonte**, Penn State University (1145-92-1071)

2:45PM ► (2658) *Modeling factors that regulate cell cooperativity in the zebrafish posterior lateral line primordium.* **Leif Zinn-Bjorkman***, UCLA, and **Frederick R Adler**, University of Utah (1145-92-2047)

3:00PM ► (2659) *Analyzing the Dynamics of an Inflammatory Response to a Bacterial Infection in Rats.* **Allison Torsey***, SUNY College at Buffalo, **Amy Carpenter**, Lee Unviersity, and **Julia Arciero**, Indiana University- Purdue University Indianapolis (1145-92-604)

3:15PM (2660) *How receptor diffusion and cell rotations increase association rates with extracellular reactants.* Preliminary report. **Christopher E Miles***, Courant Institute of Mathematical Sciences, New York University, and **Sean D Lawley**, Department of Mathematics, University of Utah (1145-92-2631)

3:30PM ► (2661) *Behavioral Synchrony and Functional EEG Networks.* Preliminary report. **David Damiano**, **Sarah McGuire*** and **Richard Schmidt**, College of the Holy Cross (1145-00-1912)

3:45PM (2662) *A model-based analysis of autonomic nervous function in response to the Valsalva maneuver.* **E Benjamin Randall***, North Carolina State University, **Jesper Mehlsen**, Coordinating Research Centre, Frederiksberg Hospital, Frederiksberg, Denmark, and **Mette Olufsen**, North Carolina State University (1145-92-770)

4:00PM ► (2663) *A Model to Explore the Origin of Heart Rate Variability.* **Lindsey Fox**, University of Tennessee (1145-92-2761)

4:15PM ► (2664) *Understanding the Role of Macrophages in Lung Inflammation Through Mathematical Modeling.* **Sarah B Minucci***, **Rebecca L Heise**, **Michael S Valentine**, **Franck J Kamga Gninzeko** and **Angela M Reynolds**, Virginia Commonwealth University (1145-92-1919)

4:30PM ► (2665) *Parameter estimation and predictive modeling in a model of peritonitis focusing on the sequential immune cell response.* **Marcella M Torres***, **Angela Reynolds**, **Rebecca Segal** and **Shobha Ghosh**, Virginia Commonwealth University (1145-92-121)

4:45PM ► (2666) *A Mathematical Model of Translation Regulation by the Integrated Stress Response: the ISR as an Analog-Digital Mechanism Tuned by eIF2B.* **Laura F Strube***, Virginia Tech, and **Frederick R Adler**, University of Utah (1145-92-2954)

5:00PM ► (2667) *Effects of observation function selection in nonlinear filtering for epidemic models.* Preliminary report. **Leah M Mitchell*** and **Andrea Arnold**, Worcester Polytechnic Institute (1145-92-840)

5:15PM ► (2668) *Investigating Cellular-Level Effects of Neurostimulation Therapies with a Partial Differential Equation Based Mathematical Model.* Preliminary report.
Kaia R. Lindberg* and **Edward T. Dougherty**, Roger Williams University (1145-92-1461)

5:30PM ► (2669) *A Computational Approach for Constructing an Intracellular Signaling Pathway Mathematical Model with Application to Parkinson's Disease.* Preliminary report.
Elizabeth M. Gilchrist*, **Abigail T. Small** and **Edward T. Dougherty**, Roger Williams University (1145-92-1473)

5:45PM ► (2670) *The signalling game between plants and pollinators.*
Jan Rychtar*, UNC Greensboro, **Shan Sun**, Lanzhou University, and **Michael Leshowitz**, UNC Greensboro (1145-91-898)

AMS Contributed Paper Session on Ordinary Differential Equations

1:00 PM – 5:25 PM **Room 333, BCC**

1:00PM (2671) *Effect of Delays in Mathematical Models of Cancer Chemotherapy.*
Ismail Abdulrashid*, Auburn University, **Tomas Caraballo**, Universidad de Sevilla, and **Xiaoying Han**, Auburn University (1145-34-530)

1:15PM ► (2672) *Fitting Classical Mathematical Models to Small Data Sets from Lewis Lung and Human Breast Carcinomas.* Preliminary report.
Maria Teresa Hernandez*, California State University, Monterey Bay, and **Judith E. Canner**, California State University, Montery Bay (1145-34-2543)

1:30PM (2673) *Dynamics of a Producer-Grazer Model Incorporating the Effects of Phosphorus Loading on Grazer's Growth.*
Lale Asik* and **Angela Peace**, Department of Mathematics and Statistics,Texas Tech University (1145-34-712)

1:45PM ► (2674) *Mathematical Model of Honeybee Colonies Infested with Diseases.*
Vardayani Ratti*, Dartmouth College, **Peter Kevan** and **Hermann Eberl**, University of Guelph, Canada (1145-34-3016)

2:00PM ► (2675) *Effects of Multiple Transmission Pathways on Zika Dynamics.*
Omomayowa Olawoyin* and **Christopher Kribs**, University of Texas at Arlington (1145-34-946)

2:15PM (2676) *Global Stability: Vector Feeding Preference in Vector Borne Diseases.*
Rocio Marilyn Caja Rivera, University of Notre Dame, and **Alfredo Villanueva***, University of Saint Francis (1145-34-260)

2:30PM ► (2677) *Modeling the Effects of Wolbachia Transinfection and the Importance of Temperature in Dengue Epidemics.* Preliminary report.
Vinodh kumar Chellamuthu* and **Jisun Otterson**, Dixie State University, St. George, Utah (1145-34-2149)

2:45PM ► (2678) *Mathematical Model of Dengue Fever with Vertical Transmission in an Age-Structured Population.* Preliminary report.
Quynh Nguyen*, University of Cincinnati, and **Nguyenho Ho**, Bridgewater State University (1145-34-2245)

3:00PM ► (2679) *Approximate analytical solutions for a nonlinear fourth-order differential equation with nonlinear boundary conditions.* Preliminary report.
Saurabh Tomar* and **R. K. Pandey**, Indian Institute of Technology Kharagpur- India (1145-34-1722)

3:15PM ► (2680) *Numerical Solution of Beam Equation with Free Boundaries.* Preliminary report.
Hella M. Quinnett* and **Narayan Thapa**, Cameron University (1145-34-1289)

3:30PM (2681) *Optimal semi-analytical method to solve coupled nonlinear differential equations arising in epidemiology.*
Mangalagama Dewasurendra*, **Kuppalapalle Vajravelu** and **Ying Zhang**, University of Central Florida (1145-34-836)

3:45PM ► (2682) *The Adaptive Parker-Sochacki Pade' Method For Robust Numerical Simulation.* Preliminary report.
Paul G Warne* and **Debra A Warne**, James Madison University (1145-34-808)

4:00PM ► (2683) *Numerical Results for Sequential Caputo Fractional Differential Equations with Laplace Transform Methods.* Preliminary report.
Bhuvaneswari Sambandham*, Dixie State University, **Aghalaya S Vatsala**, University of Louisiana at Lafayette, and **Vinodh Kumar Chellamuthu**, Dixie State University (1145-34-2317)

4:15PM (2684) *Mathematical Theory of Excange-driven Growth: Fundamentals and Asymptotic Behavior.*
Emre Esenturk, University of Warwick (1145-34-1554)

4:30PM (2685) *An Isospectral Flow on Banded Matrices.*
Krishna P Pokharel, Young Harris College, Young Harris, GA (1145-34-1725)

4:45PM (2686) *Power asymptotics of orbits of a Kolmogorov type polynomial vector field with a fixed Newton polyhendron.* Preliminary report.
Ateq Alsaadi*, Department of Mathematics, Howard University, Washington, DC 20059, USA, and **Faina Berezovskaya**, Department of Mathematics, Howard University (1145-34-2623)

5:00PM ► (2687) *A Necessary Condition for Exponential Matrix Solutions of Differential Equations.*
James H Liu, **Alexander R McAllister*** and **Alfred Williams**, James Madison University (1145-34-2582)

5:15PM (2688) *Some Asymptotic Properties of Ordinary Differential Equations.*
Zhivko S. Athanassov, Institute of Mathematics, Bulgarian Academy of Sciences (1145-34-316)

MAA Contributed Paper Session on Meaningful Modeling in the First Two Years of College

1:00 PM – 2:35 PM **Room 306, BCC**

Organizers: **William C. Bauldry**, Appalachian State University
Mary R. Parker, Austin Community College

1:00PM ► (2689) *Engaging Modeling Students through Epidemiology.* Preliminary report.
Suzanne Sumner, University of Mary Washington (1145-R5-1739)

1:20PM ► (2690) *Assessing Modeling Meaningfully in a Freshmen-Level Mathematical Modeling Course through Discovery Learning Assessments.*
Kayla K. Blyman, **Kristin M. Arney** and **Scott D. Warnke***, United States Military Academy - West Point (1145-R5-2674)

1:40PM (2691) *Findings from One Year of Implementation of the Modeling Practices in Calculus Curriculum.* Preliminary report.
Adam J. Castillo*, Florida International University, STEM Transformation Institute, **Charity Watson**, **Eddie Fuller**, **Geoff Potvin** and **Laird Kramer**, Florida International University (1145-R5-2950)

2:00PM ► (2692) *Integrating Science and Technology to motivate the learning of Trigonometry in a Precalculus course.* Preliminary report.
Ahlam Tannouri, Morgan State University (1145-R5-2976)

2:20PM (2693) *Let the Model Drive the Bus: A model-motivated approach to first-year calculus.*
Andrew M. Baxter*, **Amine Benkiran**, **Eric Simring**, **Russell deForest** and **Matthew Willyard**, Penn State University, University Park (1145-R5-2270)

MAA General Contributed Paper Session on Graph Theory, III

1:00 PM – 4:10 PM **Room 341, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

1:00PM ► (2694) *Independence Number of Maximal Planar Graphs.*
Allan E Bickle, Penn State Altoona (1145-VP-2888)

1:15PM (2695) *An Extension of Hansel's Theorem to Hypergraphs.*
Gregory Churchill, State University of New York at Oswego (1145-VP-2891)

1:30PM ► (2696) *Decomposing Rings of Generalized Graph Splines.*
Katie Anders, University of Texas at Tyler, **Alissa Crans**, Loyola Marymount University, **Briana Foster-Greenwood***, Cal Poly Pomona, **Blake Mellor**, Loyola Marymount University, and **Julianna Tymoczko**, Smith College (1145-VP-2906)

1:45PM ► (2697) *The Randić Index and Average Path Length.*
Billy M Duckworth, Creighton University (1145-VP-2921)

2:00PM ► (2698) *Non-Crossing Matchings on Words with Restricted Bonding Conditions.*
Mitch Phillipson, St. Edward's University (1145-VP-2250)

2:15PM ► (2699) *Reconfiguration graphs under constraints and variations.* Preliminary report.
Janet Fierson* and **Yitbarek Demesie**, La Salle University (1145-VP-2960)

2:30PM ► (2700) *Kolakoski sequences and Chvatals sequence of graphs.* Preliminary report.
Bernd Sing, University of the West Indies (1145-VP-2984)

2:45PM ► (2701) *Optimal cluster detection of a certain directed edge-weighted bipartite graph.* Preliminary report.
Peng Zhao* and **Cheng Zhao**, Indiana State University (1145-VP-3009)

3:00PM ► (2702) *The Current State of Best Monotone Theorems in Graph Theory.*
Michael R Yatauro, Penn State University - Brandywine (1145-VP-866)

3:15PM ► (2703) *Cycles in algebraically defined bipartite graphs.*
Allison Ganger, University of Nebraska-Lincoln, **Shannon Golden**, Colorado State University, **Brian Kronenthal***, Kutztown University, **Felix Lazebnik**, University of Delaware, **Carter Lyons**, Nebraska Wesleyan University, and **Jason Williford**, University of Wyoming (1145-VP-552)

3:30PM ► (2704) *Bounding the Cop Number in the Game of Cops and Robbers on Graphs.* Preliminary report.
Shannon Dillman* and **Franklin Kenter**, United States Naval Academy (1145-VP-462)

3:45PM ► (2705) *Pressing Sequences in Genome Graphs.*
Hays W. Whitlatch* and **Joshua N. Cooper**, University of South Carolina (1145-VP-478)

4:00PM ► (2706) *Constructing Arbitrarily Large Ordered Graceful Labelings.*
Desmond Cummins*, Wells College, and **Jocelyn Bell**, Hobart and William Smith Colleges (1145-VP-894)

MAA General Contributed Paper Session on Probablity and Statistics, II

1:00 PM – 5:40 PM **Room 348, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

1:00PM (2707) *A new regularization and variable selection technique - HRLR.* Preliminary report.
Hasthika S. Rupasinghe Arachchige Don* and **Lasanthi C Pelawa Watagoda**, Appalachian State University (1145-VT-2253)

1:15PM (2708) *Are P-value Still Reliable? Discussing Statistical Significance.*
Davidson Barr* and **Salvatore P Giunta**, Columbia Teachers College (1145-VT-2257)

1:30PM (2709) *Bootstrapping Multiple Linear Regression After Variable Selection.*
Lasanthi C Pelawa Watagoda*, Appalachian State University, Boone, NC, and **David J Olive**, Southern Illinois University, Carbondale, IL (1145-VT-2260)

1:45PM ► (2710) *Gumbel-Burr XII Distribution; Inference and Application.*
Raid M Al-Aqtash*, **A Mallick**, Marshall University, and **G G Hamedani**, Marquette University (1145-VT-2275)

2:00PM (2711) *A fast mixing Markov chain on the symmetric group.*
Alperen Ozdemir, University of Southern California (1145-VT-2353)

2:15PM ► (2712) *A stochastic comparison study of series and parallel systems having Kumaraswamy's and Fréchet distributed components.*
Madhurima Datta* and **Nitin Gupta**, Department of Mathematics, Indian Institute of Technology Kharagpur (1145-VT-2457)

2:30PM ► (2713) *Data Smoothing via Minimum Fisher Information.* Preliminary report.
Robert L Bassett, Naval Postgraduate School (1145-VT-2497)

2:45PM ► (2714) *Benford distributions in Music.* Preliminary report.
Azar Khosravani, Columbia College Chicago (1145-VT-2583)

3:00PM ► (2715) *On Families of Generalized Pareto Distributions: Properties and Applications.* Preliminary report.
Duha Hamed*, Winthrop University, **Felix Famoye** and **Carl Lee**, Central Michigan University (1145-VT-261)

3:15PM ► (2716) *A new Lindley family of continuous distribution.* Preliminary report.
Ahmad Alzaghal, State University of New York FSC (1145-VT-2700)

3:30PM ► (2717) *The Frog Model on Trees with Drift.*
Erin Beckman*, Duke University, **Natalie Frank**, New York University, **Yufeng Jiang**, **Matthew Junge**, Duke University, and **Si Tang**, Lehigh University (1145-VT-2815)

3:45PM ► (2718) *Sampling Prudently using Inversion Spheres on the Simplex.*
Sharang Chaudhry*, **Daniel Lautzenheiser** and **Kaushik Ghosh**, University of Nevada, Las Vegas (1145-VT-2997)

4:00PM (2719) *Unit Roots Test: Spatial Model With Long Memory Errors.*
Nathaniel Adjei Adu, University of Central Florida, Orlando Florida. (1145-VT-448)

4:15PM ► (2720) *Pairing between Zeros and Critical Points of Polynomials with Random Roots.*
Noah N. Williams* and **Sean O'Rourke**, University of Colorado Boulder (1145-VT-730)

4:30PM ► (2721) *Mirror Model on the Square Lattice.*
Yan Dai, University of Arizona (1145-VT-784)

4:45PM ► (2722) *Measuring Statistical Evidence Using Relative Belief.*
Jenkin Tsui, Yale University (1145-VT-834)

5:00PM (2723) *Series Representation of Jointly $S\alpha S$ Distributions via Generalized Covariations.*
Yujia Ding* and **Qidi Peng**, Claremont Graduate University (1145-VT-872)

5:15PM (2724) *Asymptotic Results on the k-th Subword Complexity of Strings.*
Lida Ahmadi, Purdue University (1145-VT-935)

5:30PM ► (2725) *Analyzing Voter Behavior in the Lehigh Valley Through Semi-Parametric Regression and Geostatistical Techniques.*
Benjamin S Lieberman, Muhlenberg College (1145-VT-2070)

MAA General Contributed Paper Session on Teaching and Learning Calculus, II

1:00 PM – 4:55 PM **Room 339, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

1:00PM ► (2726) *Linking the understanding of derivatives of inverse functions to the teaching of inverse functions in high school mathematics for preservice secondary mathematics teachers in first-semester calculus.*
Andrew Kercher* and **James A. Mendoza Álvarez**, The University of Texas at Arlington (1145-VJ-2355)

1:15PM ► (2727) *A first approach to undergraduate learning assistants.* Preliminary report.
Cassie Williams, James Madison University (1145-VJ-2356)

1:30PM (2728) *Learning Assistants in the first-year biocalculus sequence at Penn State University.* Preliminary report.
Amine Benkiran, **Eric Simring**, **Andrew M Baxter**, **Russ deForest** and **Matthew Willyard***, Penn State University, University Park (1145-VJ-2374)

1:45PM ► (2729) *The PVAMU Mathematics Summer Bridge Program: Examining Student Attitudes Toward the Establishment of a Learning Community.* Preliminary report.
Cody Kearse* and **James R Valles, Jr.**, Prairie View A&M University (1145-VJ-2381)

2:00PM ► (2730) *Standards-based grading in Calculus with Precalculus.* Preliminary report.
Jacquelyn L Rische, Marymount University (1145-VJ-2604)

2:15PM ► (2731) *Facilitating Calculus I for Diverse Students.* Preliminary report.
Mary A Nelson* and **Stephen Liddle**, George Mason University (1145-VJ-266)

2:30PM ► (2732) *Practical Applications in Data Analysis for College Algebra.*
Diane C Lussier* and **Mary Minke**, Pima Community College (1145-VJ-1498)

2:45PM (2733) *Team-Based Learning Calculus.* Preliminary report.
Anna Aboud*, **Heather Bolles** and **Amanda Baker**, Iowa State University (1145-VJ-2821)

3:00PM ► (2734) *Calculus without Limit Theory.*
Zengxiang Tong*, Department of Mathematical Sciences, Otterbein University, Westerville, OH 43081, **Jingzhong Zhang**, School of Computer Science and Educational Software, Guangzhou University, Guangzhou 510006, China, and **Hongguang Fu**, University of Electronic Science and Technology of China (1145-VJ-679)

3:15PM (2735) *Homogeneous Discussion Sections for New Start Calculus Students.* Preliminary report.
Katherine Walsh Hall* and **Amit Savkar**, University of Connecticut (1145-VJ-2840)

3:30PM ► (2736) *Reimagining the Curriculum: Making Radical Changes to Improve Learning in First-Year College Calculus.*
Jan Cannizzo, Stevens Institute of Technology (1145-VJ-2852)

3:45PM ► (2737) *MYMA Calculus: An Active and Interactive Approach to Learning and Doing Calculus.*
Douglas B Meade*, University of South Carolina, and **Philip B Yasskin**, Texas A&M University (1145-VJ-2977)

4:00PM ► (2738) *Striving for Gains: Implementing Growth Mindset in a Calculus Classroom.*
William Corson* and **Andrew F. Plucker**, United States Military Academy at West Point (1145-VJ-300)

4:15PM ► (2739) *Implementing Mastery Grading in Coordinated Calculus.* Preliminary report.
Mark Bly, Coastal Carolina University (1145-VJ-550)

4:30PM ► (2740) *Partially Flipping Calc 1: Using Instructor-Created Videos to Introduce, Inspire, and Motivate.* Preliminary report.
Benjamin V.C. Collins, University of Wisconsin-Platteville (1145-VJ-613)

4:45PM ► (2741) *Extending physical Manipulatives to Visualize Multivariable Calculus Topics into Virtual Reality.*
Daniel L McGee, Kentucky Center for Mathematics (1145-VJ-663)

SIAM Minisymposium on Flow-induced (In)Stability of Elastic Structures

1:00 PM – 5:30 PM **Room 342, BCC**

Organizers: **Justin Webster**, University of Maryland, Baltimore County
Scott Hansen, Iowa State University

1:00PM (2742) *An Eulerian method for mixed soft and rigid body interactions in fluids.*
Xiaolin Wang*, **Chris H Rycroft**, Harvard University, and **Ken Kamrin**, MIT (1145-76-1776)

1:30PM (2743) *Nonlinear Response of an Inextensible, Cantilevered Beam/Plate Subjected to a Nonconservative Force.*
Earl H Dowell*, **Kevin McHugh** and **Maxim Freydin**, Duke University (1145-35-710)

2:00PM ► (2744) *Dynamics of the Inextensible Inverted Flag with Piston-Theoretic Forcing Term.*
Jason S Howell*, **Varun Gudibanda**, Carnegie Mellon University, and **Justin T Webster**, University of Maryland, Baltimore County (1145-35-1658)

2:30PM (2745) *Controllability of a Cochlea with Localized Control on the Basilar Membrane.*
Scott Hansen, Iowa State University (1145-93-2207)

3:00PM Break.

3:30PM (2746) *Asymptotics of the eigenfrequencies of the Euler-Bernoulli beam with fully non-dissipative boundary feedback.*
Laszlo P. Kindrat* and **Marianna Shubov**, University of New Hampshire (1145-35-788)

4:00PM (2747) ► *Feedback stabilization of a 2D fluid-structure interaction model.* **Yongjin Lu**, Virginia State University (1145-35-1691)

4:30PM (2748) *Rational Decay rates for a PDE Fluid-Structure Interaction.* **George Avalos**, University of Nebraska-Lincoln (1145-35-1490)

5:00PM (2749) *Weak solution and long time behavior of a fluid-plate interaction model.* **Jing Zhang***, Virginia State University, and **Roberto Triggiani**, University of Memphis (1145-35-560)

AMS Special Presentation

1:00 PM – 2:45 PM **Room 309/310, BCC**

Who Wants to Be a Mathematician—Championship Contest.

SIGMAA on Math Circles for Students and Teachers (SIGMAA MCST) Special Presentation

1:00 PM – 2:30 PM **Room 322, BCC**

Math Circle Demonstration

Organizers: **Sarah Bryant**, Dickinson College

Lance Bryant, Shippensburg University

AMS Contributed Paper Session on Probability Theory and Stochastic Processes

1:15 PM – 5:10 PM **Room 334, BCC**

1:15PM (2750) *Favorite sites of a persistent random walk on* $\mathbb{Z}$*.* **Arka Ghosh**, Iowa State University, **Steven Noren***, Lake Superior State University, and **Alexander Roitershtein**, Texas A & M University (1145-60-811)

1:30PM (2751) ► *Non-Hermitian Anderson Operators and their Spectral Properties.* **Mira Gordin**, Brown University (1145-60-465)

1:45PM (2752) *Intermittence and space-time fractional stochastic partial differential equations.* **Jebessa B Mijena***, Georgia College & State University, and **Erkan Nane**, Auburn University (1145-60-2903)

2:00PM (2753) ► *Joint exit time and place distribution for Brownian motion on Riemannian manifolds.* Preliminary report. **Upul H Rupassara**, Southern Illinois University (1145-60-614)

2:15PM (2754) *A weak rectangular method for a class of stochastic differential equations and mean square stability analysis.* **Ram Sharan Adhikari**, Rogers State University (1145-60-1279)

2:30PM (2755) ► *Load balancing for queues using delayed information.* **David Lipshutz*** and **Rami Atar**, Technion (1145-60-2278)

2:45PM (2756) *When does the competitive exclusion principle hold in stochastic environments?* **Alexandru Hening***, Tufts University, and **Dang Hai Nguyen**, University of Alabama (1145-60-650)

3:00PM (2757) *Probability, Final Size, and Duration of an Outbreak in Stochastic Multigroup Models.* **Aadrita Nandi*** and **Linda J.S. Allen**, Texas Tech University (1145-60-1170)

3:15PM (2758) ► *Influence of Receptor Recharge on the Statistics of Captured Particles.* **Gregory Handy***, **Sean D Lawley** and **Alla Borisyuk**, University of Utah (1145-60-1590)

3:30PM (2759) ► *Curing Cancer Faster: Optimizing Drug Scheduling Protocols with a Fokker-Plank Model.* **Julia L Pelesko***, Departments of Translational Hematology and Oncology Research and Radiation Oncology, Cleveland Clinic, Cleveland, OH, **Michael Hinczewski**, Department of Physics, Case Western Reserve University, Cleveland, OH, USA, and **Jacob Scott**, Departments of Translational Hematology and Oncology Research and Radiation Oncology, Cleveland Clinic, Cleveland, OH (1145-60-2995)

3:45PM (2760) ► *Obstructions to LWE-based Homomorphic Encryption with Uniform Error.* Preliminary report. **Alice Chudnovsky**, University of Illinois at Urbana-Champaign, **Jake Januzelli***, Cornell University, and **Jacob Brazeal**, Bob Jones University (1145-06-2948)

4:00PM (2761) *Association and other forms of positive dependence for Feller evolution systems.* **Eddie B. Tu**, Dickinson College (1145-60-2125)

4:15PM (2762) *Systems of Competing Brownian Particles.* **Andrey Sarantsev**, University of Nevada, Reno (1145-60-2510)

4:30PM (2763) *Linear Univariate GARCH(p,q) and Pink Noise.* **Fatemeh Norouzi***, **Isabelle Kemajou-Brown**, Morgan State University, and **Rachel Kuske**, Georgia Institute of Technology, School of Mathematics (1145-60-2796)

4:45PM (2764) *Portfolio optimization for small time horizons.* **Rohini Kumar**, Wayne State University, and **Hussein Nasralah***, Worcester Polytechnic Institute (1145-60-2455)

5:00PM (2765) ► *Stochastic Deflator for an Economic Scenario Generator with Five Factors.* **Po-Keng Cheng***, Chaire Data Analytics & Models for Insurance, Laboratoire SAF, Université Claude Bernard Lyon 1, and **Frédéric Planchet**, ISFA, Laboratoire SAF, Université Claude Bernard Lyon 1; Prim'Act (1145-60-137)

MAA General Contributed Paper Session on Other Topics

1:15 PM – 5:25 PM **Room 340, BCC**

Organizers: **Emelie Kenney**, Siena College
Kim Roth, Juniata College
Melvin Royer, Indiana Wesleyan University

1:15PM (2766) *Mathematics Teacher as Learner: What I Learned from Participating in the NOAA Teacher at Sea Program.*
Emily Cilli-Turner, University of La Verne (1145-VV-1082)

► 1:30PM (2767) *Equilibrium patterns in the candy-sharing circle.* Preliminary report.
Madison Lydic* and **Ryan Higginbottom**, Washington & Jefferson College (1145-VV-1362)

1:45PM (2768) *Relations in doubly laced crystal graphs via discrete Morse theory.*
Molly Lynch, North Carolina State University (1145-VV-1868)

► 2:00PM (2769) *Periodic Solutions and Bifurcations of the Bernoulli Dynamic Equation on a Certain Class of Time Scales.* Preliminary report.
Chris Ahrendt, University of Wisconsin-Eau Claire (1145-VV-2261)

2:15PM (2770) *Sequences and PTPMs.* Preliminary report.
Lisa Schneider* and **Jathan Austin**, Salisbury University (1145-VV-2665)

► 2:30PM (2771) *Odd Items from the Complex History of the Real Numbers; i^i.*
John Robert Botzum*, Kutztown University, Kutztown Pennsylvania, and **Andrew Martin**, Kentucky State University (1145-VV-2684)

2:45PM (2772) *Compressive Sensing with the Non-Convex Quantized Particle Swarm Optimization.*
Abd Al Rahman R Al Momani, Clarkson University, and **Ahmad R Almomani***, SUNY Geneseo (1145-VV-2762)

► 3:00PM (2773) *Prince Rupert's Cube in Higher Dimensions.* Preliminary report.
Chaogui Zhang, Clayton State University (1145-VV-2848)

► 3:15PM (2774) *Searching for Complex Cellular Automata.*
Clifford A Reiter, Lafayette College (1145-VV-307)

3:30PM (2775) *Stirling Numbers in Braid Matroid Kazhdan-Lusztig Polynomials.*
Trevor K Karn*, Pennsylvania State University, and **Max D Wakefield**, United States Naval Academy (1145-VV-380)

► 3:45PM (2776) *A probabilistic chip-collecting game.*
Wing Hong Tony Wong*, Kutztown University of Pennsylvania, and **Jiao Xu**, West Virginia University (1145-VV-684)

► 4:00PM (2777) *Symmetry Algebras of the Canonical Lie Group Geodesic Equations in Dimension Five.* Preliminary report.
Hassan Almusawa, Virginia Commonwealth University, Richmond, Virginia (1145-VV-891)

► 4:15PM (2778) *Some Criteria for Permutation Binomials over Finite Fields.*
Laura Mora-Mercado, University of Puerto Rico-Mayaguez (1145-VV-893)

4:30PM (2779) *A Category Theoretic Framework for Classical Mechanics.*
John Baez, **David Weisbart** and **Adam Yassine***, University of California, Riverside (1145-VV-1922)

► 4:45PM (2780) *Structure and a duality of binary operations on monoids and groups.*
Masayoshi Kaneda, American University of Kuwait (1145-VV-1824)

► 5:00PM (2781) *How To: Create a Community for Undergraduate Mathematicians.*
Alice Chudnovsky* and **Anna Chlopecki**, University of Illinois at Urbana-Champaign (1145-VV-2970)

► 5:15PM (2782) *Accessibility Features for Advanced Mathematics in the new MathJax Version 3.*
Volker Sorge*, MathJax Consortium & Birmingham University, UK, and **Davide P Cervone**, MathJax Consortium & Union College, NY (1145-VV-2584)

Project NExT Workshop on Flipped Classroom

1:15 PM – 2:30 PM **Room 308, BCC**

Maximizing Student Outcomes in Flipped Classrooms

Organizers: **Ranthony A.C. Edmonds**, The Ohio State University
Forest Mannan, Colorado School of Mines
Caleb Moxely, Birmingham-Southern College
Diana Schepens, Whitworth University

AMS Special Session on Geometry of Representation Spaces, II

1:30 PM – 5:45 PM **Room 328, BCC**

Organizers: **Sean Lawton**, George Mason University
Chris Manon, University of Kentucky
Daniel Ramras, Indiana University-Purdue University Indianapolis

1:30PM (2783) *Higher Teichmuller components for SO(p,q).*
Brian Collier, University of Maryland (1145-14-603)

2:00PM (2784) *On type-preserving representations of thrice punctured projective plane group.* **Sara Maloni***, University of Virginia, **Frederic Palesi**, Institut de Mathematiques de Marseille, and **Tian Yang**, Texas A&M University (1145-57-1148)

3:00PM (2785) *Bad subgroups in complex reductive groups.* **Clément Jacques Etienne Guérin**, University of Luxembourg (1145-20-886)

3:30PM (2786) *Topology and Arithmetic of $GL(n,\mathbb{C})$-Character Varieties.* Preliminary report. **Carlos A. Florentino**, University of Lisbon, Portugal (1145-14-1829)

4:30PM (2787) *The topology, geometry and arithmetic of representation varieties.* Preliminary report. **Maxime Bergeron**, University of Chicago (1145-57-2014)

5:00PM (2788) *Shape and Ptolemy coordinates for higher dimensional manifolds.* Preliminary report. **Christian K Zickert**, University of Maryland, College Park (1145-57-1067)

ASL Contributed Paper Session

2:00 PM – 4:50 PM **Room 315, BCC**

2:00PM (2789) *The First Measurable is a Lower Bound for the Hanf Number for Joint Embedding.* **Will Boney**, Harvard University, and **Ioannis Souldatos***, University of Detroit Mercy (1145-03-726)

2:30PM (2790) *Model companions of theories of valued differential fields.* Preliminary report. **Nigel Pynn-Coates**, University of Illinois at Urbana–Champaign (1145-03-914)

3:00PM (2791) *Baldwin-Shi hypergraphs in infinite languages.* **Danul K Gunatilleka**, University of Maryland at College Park (1145-03-1879)

3:30PM (2792) *Relevance and the perfect sequents of classical logic.* **Ethan Brauer**, Department of Philosophy, The Ohio State University (1145-03-1238)

4:00PM (2793) *On the Utility of Partial Evasions of the Second Incompleteness Theorem in the Modern Digital Era.* **Dan E. Willard**, University at Albany (1145-03-1011)

► 4:30PM (2794) *On the Induction Problem.* Preliminary report. **Joachim Mueller-Theys**, Independent Researcher (1145-03-2823)

AWM Workshop:WinCompTop: Applied and computational topology, II

2:00 PM – 4:50 PM **Room 307, BCC**

Organizers: **Radmila Sazdanovic**, North Carolina State University
Yusu Wang, The Ohio State University

2:00PM (2795) *Graph rules for inhibitory network dynamics.* **Carina Curto**, Penn State (1145-92-1928)

► 3:00PM (2796) *Using Topology to Measure Dynamics of Time-Varying Systems.* Preliminary report. **Lori Ziegelmeier***, Macalester College, **Henry Adams**, Colorado State University, **Chad Topaz**, Williams College, and **Lu Xian**, Macalester College (1145-55-1377)

3:30PM (2797) *Topological Techniques for Characterization of Pattern Forming Systems.* **Rachel A. Neville**, The University of Arizona (1145-55-1493)

► 4:00PM (2798) *Local Persistent Homology-Based Distances between Nonplanar Road Networks.* Preliminary report. **Brittany Terese Fasy***, School of Computing and Dept. of Mathematical Sciences, Montana State University, **Ahmed Abdelkader**, University of Maryland, College Park, **Geoff Boeing**, Northeastern University, and **David L. Millman**, Montana State University (1145-55-2592)

► 4:30PM (2799) *Burning the Medial Axis.* **Erin Wolf Chambers**, Saint Louis University (1145-55-709)

MAA Business Meeting

2:00 PM – 2:45 PM **Room 316, BCC**

Organizers: **Deanna Haunsperger**, Carleton College
James Sellers, Pennsylvania State University

MAA-AMS-SIAM Gerald and Judith Porter Public Lecture

3:00 PM – 3:50 PM **Ballrooms I & II, 400 Level, BCC**

(2800) *Big data, inequality, and democracy.* **Cathy O'Neil**, ORCAA (1145-A0-20)

2019 AMS "Until Next Time" Social

7:00 PM – 9:30 PM **Maryland Science Center, 601 Light Street, Baltimore**

Steven H. Weintraub
AMS Associate Secretary
Bethlehem, Pennsylvania

Hortensia Soto
MAA Associate Secretary
Greeley, Colorado