Program of the Sessions

Denver, Colorado, January 15–18, 2020

Monday, January 13

AMS Short Course on Mean Field Games: Agent Based Models to Nash Equilibria

9:00 AM – 6:00 PM Capitol Ballroom 1,2,3, 4th Floor, Hyatt Regency Denver

Organizer: François Delarue, University of Nice

9:00 AM Registration

9:45 AM Introduction

10:00 AM (1) The Nash certainty equivalence and applications.
Roland P. Malhame, Polytechnique Montréal

11:30 AM Break

11:30 AM (2) The Nash certainty equivalence and applications: Exercise Session.
Christy V. Graves, Princeton University

NOON Lunch

2:00 PM (3) The Master Equation.
F. Delarue, Université Côte d’Azur, France

3:15 PM Discussion and Break

4:00 PM (4) Applications of Mean Field Games in Economic Theory.
Rene Carmona, Princeton University

5:00 PM Reception

AMS Short Course Reception

5:00 PM – 6:00 PM Capitol Ballroom 1,2,3, 4th Floor, Hyatt Regency Denver

Tuesday, January 14

AWM Moving Towards Action Workshop

8:00 AM – 5:00 PM Denver 1,2, Hilton Denver City Center

Organizers: Maeve McCarthy, Murray State University
Elizabeth Donovan, Murray State University
Vrushali Bokil, Oregon State University
Ami Radunskaya, Pomona College

Moderator: Karoline Pershell, Association for Women in Mathematics

AMS Department Chairs Workshop

8:00 AM – 6:30 PM Capitol Ballroom 4, 4th Floor, Hyatt Regency Denver

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 41, 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.
AMS Short Course on Mean Field Games: Agent Based Models to Nash Equilibria

9:00 AM – 3:00 PM Capitol Ballroom 1,2,3, 4th Floor, Hyatt Regency Denver

Organizer: François Delarue, University of Nice

9:00 AM The convergence problem.
Daniel Lacker, Columbia University

10:15 AM Break

10:45 AM Deviations and fluctuations for mean field games.
Kavita Ramanan, Brown University

NOON Lunch

2:00 PM Numerical methods.
Mathieu Lauriere, ORFE, Princeton University

AMS Council

1:30 PM – 8:00 PM Mineral Hall D, E, F, G, 3rd Floor, Hyatt Regency Denver

Joint Meetings Registration

3:00 PM – 7:00 PM Lobby C, Meeting Room Level, Colorado Convention Center

Advanced registration will remain open until 7:30 pm.

Email Center

3:00 PM – 7:30 PM Lobby C, Meeting Room Level, Colorado Convention Center

Wednesday, January 15

Joint Meetings Registration

7:00 AM – 6:00 PM Lobby C, Meeting Room Level, Colorado Convention Center

Email Center

7:00 AM – 9:20 PM Lobby C, Meeting Room Level, Colorado Convention Center

MAA Minority Chairs Meeting

7:00 AM – 8:45 AM Mineral Hall A, 3rd Floor, Hyatt Regency Denver

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 210/212, Meeting Room Level, Colorado Convention Center

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

8:00 AM Eigenvalue Distributions of Random Iterated Block Matrices.
Keller L Blackwell*, University of South Florida, Neelima Borade, University of Illinois, Chicago, Charles P Devlin VI, University of Michigan, Ann Arbor, Renyuan Ma, Williamstown, Massachusetts, Steven J Miller, Williams College, and Wanqiao Xu, University of Michigan, Ann Arbor (1154-15-105)

8:30 AM Solvability of Multiple Unicast Networks Over Finite Fields.
Paque G. Beidelman*, University of Mary Washington, Kimberly Nicole Hancock, Bowdoin College, Kaiwen Lu, University of Michigan, Ann Arbor, Pedro D Morales Vega, University of Maryland, College Park, and Nathan J Akerhielm, Haverford College (1154-13-1991)

9:00 AM Online Approaches for Allocating Products to Users. Preliminary report.
Andrea Boskovic*, Amherst College, Qinyi Chen, University of California, Los Angeles, Dominik Kufel, University College London, and Zijie Zhou, Purdue University (1154-90-471)

Tingting Ou* and Michelle Shu, Johns Hopkins University (1154-05-1055)

10:00 AM Efficient and Non-efficient Domination of Z-stacked Archimedean Lattices. Preliminary report.
Nathan Vallapurreddy* and Lyle Paskowitz, Johns Hopkins University (1154-05-1202)

10:30 AM Most Reliable Two-Terminal Graphs With Node Failures.
Isaac Brown*, Washington State University, Brendan Miller, University of Saint Francis, Tyler Russell and Christina Graves, University of Texas at Tyler (1154-05-1735)

AMS-ASL Special Session on Choiceless Set Theory and Related Areas, I

8:00 AM – 10:50 AM Room 404, Meeting Room Level, Colorado Convention Center

Organizers: Paul Larson, Miami University

Jindrich Zapletal, University of Florida

8:00 AM Choice from finite sets — a topos view. Preliminary report.
Andreas Blass, University of Michigan (1154-03-317)
<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
<th>Institution(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30AM</td>
<td>Ground model definability in ZF.</td>
<td>Victoria Gitman</td>
<td>CUNY Graduate Center</td>
</tr>
<tr>
<td>9:00AM</td>
<td>Friedman-Stanley jumps and Kinna-Wagner principles.</td>
<td>Assaf Shani</td>
<td>CMU, Harvard</td>
</tr>
<tr>
<td>9:30AM</td>
<td>What does a choiceless model theory look like?</td>
<td>Rehana Patel</td>
<td>African Institute for Mathematical Sciences-Senegal</td>
</tr>
<tr>
<td>10:00AM</td>
<td>Polish groupoids and $\mathcal{L}_{\omega_1\omega}$-theories.</td>
<td>Ruiyuan Chen</td>
<td>University of Illinois at Urbana-Champaign</td>
</tr>
<tr>
<td>9:00AM</td>
<td>Friedman-Stanley jumps and Kinna-Wagner principles.</td>
<td>Assaf Shani</td>
<td>CMU, Harvard</td>
</tr>
<tr>
<td>9:30AM</td>
<td>What does a choiceless model theory look like?</td>
<td>Rehana Patel</td>
<td>African Institute for Mathematical Sciences-Senegal</td>
</tr>
<tr>
<td>10:00AM</td>
<td>Polish groupoids and $\mathcal{L}_{\omega_1\omega}$-theories.</td>
<td>Ruiyuan Chen</td>
<td>University of Illinois at Urbana-Champaign</td>
</tr>
<tr>
<td>10:00AM</td>
<td>Agent-based multi-scale modeling enhances understanding of the immune response to M. tuberculosis infection. Preliminary report.</td>
<td>Caitlin S. Hult, Jennifer J. Linderman and Denise E. Kirschner</td>
<td>University of Michigan</td>
</tr>
<tr>
<td>10:30AM</td>
<td>Multiscale modeling of epidermal-dermal interactions during skin wound healing.</td>
<td>Huijing Du</td>
<td>University of Nebraska-Lincoln</td>
</tr>
<tr>
<td>10:00AM</td>
<td>Agent-based multi-scale modeling enhances understanding of the immune response to M. tuberculosis infection. Preliminary report.</td>
<td>Caitlin S. Hult, Jennifer J. Linderman and Denise E. Kirschner</td>
<td>University of Michigan</td>
</tr>
<tr>
<td>10:30AM</td>
<td>Multiscale modeling of epidermal-dermal interactions during skin wound healing.</td>
<td>Huijing Du</td>
<td>University of Nebraska-Lincoln</td>
</tr>
</tbody>
</table>

AMS-AWM Special Session on Women in Symplectic and Contact Geometry, I

8:00 AM – 10:50 AM  Room 105, Meeting Room Level, Colorado Convention Center

Organizers: Morgan Weiler, Rice University

Catherine Cannizzo, Simons Center for Geometry and Physics

Melissa Zhang, University of Georgia

8:00AM | Symplectic embedding problems. Preliminary report. | Dusa McDuff, Barnard College | (1154-53-767)

9:00AM | Legendrian Invariants. Preliminary report. | Ziva Myer, Duke University | (1154-53-2287)

9:30AM | Homological mirror symmetry for the Hopf surface. | Abigail R. Ward, Stanford University | (1154-51-1296)

10:00AM | Symplectic Cohomology of Affine Varieties. Preliminary report. | Dahye Cho, Stony Brook University | (1154-51-707)

10:30AM | Augmentations and exact Lagrangian surfaces. | Yu Pan, MIT | (1154-57-41)

AMS-AWM Special Session on Women in Topology, I

8:00 AM – 10:50 AM  Room 405, Meeting Room Level, Colorado Convention Center

Organizers: Jocelyn Bell, Hobart and William Smith Colleges

Rocky Flint, Columbia University Teachers College

Candice Price, Smith College

Arunima Ray, Max Planck Institute for Mathematics
8:00AM     Distortion and the bridge distance of knots.
           Marion Campisi*, San Jose State University, Ryan Blair, California State University Long Beach, Maggy Tomova, Iowa State University, and Scott Taylor, Colby College (1154-57-175)

8:30AM     Micro-homogeneity.
           Lynne Yengualp, Wake Forest University (1154-54-525)

9:00AM     All the augmentations come from immersed Lagrangian fillings.
           Yu Pan*, MIT, and Dan Rutherford, Ball State University (1154-57-40)

9:30AM     The embedded contact homology of Seifert fiber spaces.
           Jo Nelson and Morgan Weiler*, Rice University (1154-53-669)

10:00AM    Computational grid Floer homology: explorations of crossing change and knot genus.
           Margaret I Doig, Creighton University (1154-54-1727)

10:30AM    k-matching sequences of simplicial complexes.
           Julianne Vega, University of Kentucky (1154-05-638)

AMS Special Session on Advances in Multivariable Operator Theory: Connections with Algebraic Geometry, Free Analysis, and Free Probability, I

8:00 AM – 10:50 AM     Room 109, Meeting Room Level, Colorado Convention Center
Organizers: Joseph A. Ball, Virginia Tech
           Paul S. Muhly, University of Iowa

8:00AM     W*-Categories: the Womb of Noncommutative Function Theory.
           Paul S. Muhly, Department of Mathematics, University of Iowa (1154-47-1095)

9:00AM     Jordan decomposition for free noncommutative kernels. Preliminary report.
           Joseph A. Ball*, Gregory Marx, Virginia Tech, and Victor Vinnikov, Ben-Gurion University of the Negev (1154-47-1626)

10:00AM    Blaschke-Singular-Outer factorization of non-commutative functions. Preliminary report.
           Robert T.W. Martin*, Department of Mathematics, University of Manitoba, and Eli Shamovich, Department of Mathematics, Ben-Gurion University of the Negev (1154-47-535)

10:30AM    Discussion

AMS Special Session on Algebras and Algorithms, I

8:00 AM – 10:50 AM     Room 103, Meeting Room Level, Colorado Convention Center
Organizers: Keith A. Kearnes, University of Colorado, Boulder
           Peter Mayr, University of Colorado, Boulder
           Agnes Szendrei, University of Colorado, Boulder

8:00AM     Inverse-free reducts of lattice-ordered groups.
           Nick Galatos*, University of Denver, George Metcalfe and Almudena Colacito, University of Bern (1154-06-1386)

8:30AM     The structure of idempotent involutive residuated lattices and weakening relation algebras.
           Nikolaos Galatos, University of Denver, Peter Jipsen*, Chapman University, Olim Tuyt, University of Bern, and Diego Valota, University of Milan (1154-06-2013)

9:00AM     A class of modular lattices embedded into congruence lattices of algebras in almost all varieties.
           Ralph S Freese, University of Hawaii (1154-08-718)

           Clifford Bergman*, Iowa State University, T. Penza and A. B. Romanowska, Warsaw University of Technology (1154-08-1128)

10:00AM    What I would still like to know about equational logic. Preliminary report.
           George F McNulty, University of South Carolina (1154-08-1375)

10:30AM    Supernilpotence Need Not Imply Nilpotence.
           Matthew Moore*, University of Kansas, and Andrew Moorhead, Charles University, Czech Republic (1154-08-2473)

AMS Special Session on Coding Theory and Applications, I

8:00 AM – 10:50 AM     Room 402, Meeting Room Level, Colorado Convention Center
Organizers: Allison Beemer, New Jersey Institute of Technology
           Ian F. Blake, University of British Columbia
           Christine A. Kelley, University of Nebraska-Lincoln
           Felice Manganiello, Clemson University

8:00AM     Fountain codes and their applications.
### AMS Special Session on Cohomological Field Theories and Wall Crossing, I

**8:00 AM – 10:30 AM**

**Room 106, Meeting Room Level, Colorado Convention Center**

**Organizers:** Yefeng Shen, University of Oregon
Mark Shoemaker, Colorado State University

#### 8:00 AM

**Virtual Cycle on the Moduli Space of Maps to a Complete Intersection.**

Rachel Webb*, University of Michigan, Felix Janda, Institute for Advanced Study, and Qile Chen, Boston College (1154-14-1531)

#### 8:30 AM

**Mirror Symmetry for nonabelian Landau-Ginzburg models.**

Nathan Priddis, Brigham Young University (1154-14-1953)

#### 9:00 AM

**Gopakumar-Vafa invariants and the P=W conjecture.**

Junliang Shen, MIT (1154-14-560)

#### 9:30 AM

**The stability manifold of local orbifold elliptic quotients.**

Franco Rota, Rutgers University (1154-14-1429)

#### 10:00 AM

**On factorization and vector bundles of conformal blocks from vertex algebras.**

Preliminary report.
C Damilolini, Princeton, A. Gibney*, Rutgers University, New Brunswick, and N. Tarasca, Virginia Commonwealth University (1154-14-1392)

---

### AMS Special Session on Frames, Designs, and Optimal Spherical Configurations, I

**8:00 AM – 10:50 AM**

**Room 712, Meeting Room Level, Colorado Convention Center**

**Organizers:** Xuemei Chen, New Mexico State University
Alexey Glazybin, University of Texas Rio Grande Valley
Kasso Okoudjou, University of Maryland, College Park
Oleksandr Vlasiuk, Florida State University

#### 8:00 AM

**Universal optimality and its failure.**

Henry Cohn, Microsoft Research New England (1154-52-2681)

#### 9:00 AM

**Discreteness of minimizing measures.**

Dmitriy Bilyk, University of Minnesota (1154-28-1219)

#### 9:30 AM

**Optimal packings in real projective spaces.**

Dustin G. Mixon and Hans Parshall*, The Ohio State University (1154-52-1644)

#### 10:00 AM

**Stable phase retrieval from magnitude of point evaluation for infinite dimensional subspaces of L2(R).**

Robert Calderbank, Ingrid Daubechies, Duke University, Daniel Freeman*, St Louis University, and Nikki Freeman, University of North Carolina, Chapel Hill (1154-46-1572)

#### 10:30 AM

**Supports of solutions to the minimal log-energy problem with constraints.**

Preliminary report.
Alexander Reznikov*, Florida State University, Brian Simanek, Baylor University, and Oleksandr Vlasiuk, Florida State University (1154-31-2263)

---

### AMS Special Session on Group Actions in Harmonic Analysis, I

**8:00 AM – 10:50 AM**

**Room 304, Meeting Room Level, Colorado Convention Center**

**Organizers:** Keri Kornelson, University of Oklahoma
Emily J. King, University of Bremen

#### 8:00 AM

**Introduction to Group Actions in Harmonic Analysis.**

Emily J King, Colorado State University (1154-43-1813)

#### 8:30 AM

**Wasserstein ISOMAP for Image Manifold Learning.**

Preliminary report.
Keaton Ham*, and Nick Henscheid, University of Arizona (1154-68-803)
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 401, Meeting Room Level, Colorado Convention Center
Organizers: David Goldberg, Purdue University
Phil Kutzko, University of Iowa

8:00AM Mathematical Modeling of a Network of Neurons Regarding G1D Transport Deficiency Epilepsy Seizures. Ariel N Leslie* and Jianzhong Su, University of Texas at Arlington (1154-34-264)

8:30AM Coding Properties of Firing Rate Models with Low-Rank Synaptic Weight Matrices. Steven Collazos*, University of Minnesota, Morris, and Duane Nykamp, University of Minnesota, Twin Cities (1154-37-2430)

9:00AM Non-Local Blockwise Implementation Method with Selective Features for Speckle Image Denoising. Chartese Darnel Jones, Mississippi State University (1154-65-2149)

9:30AM Dynamics of a childhood disease model with isolation. Joan Ponce*, Purdue University, and Zhilan Feng, Purdue University/National Science Foundation (1154-92-1454)

10:00AM Use of Computer Software to Do Mathematics and the Mathematics Achievement of Students in Puerto Rico Using Restricted 2015 NAEP Data. Ricela Feliciano-Semidei, Northern Illinois University (1154-97-397)

10:30AM Probability of Consensus in Spatial Opinion Models with Confidence Threshold. Mela Hardin* and Nicolas Lanchier, Arizona State University (1154-60-689)

AMS Special Session on Interactions Among Partitions, Basic Hypergeometric Series, and Modular Forms, I

8:00 AM – 10:50 AM Room 104, Meeting Room Level, Colorado Convention Center
Organizers: Chris Jennings-Shaffer, University of Denver
Frank Garvan, University of Florida

8:00AM Ramanujan congruences for a class of eta-quotients. Preliminary report. Shashika Nuwan Chamara Petta Mestrige, Baton Rouge (1154-11-1407)

---

AMS Special Session on Hamiltonian Systems, I

8:00 AM – 10:50 AM Room 406, Meeting Room Level, Colorado Convention Center
Organizers: Sean Gasiorek, University of Sydney
Gabriel Martins, California State University Sacramento
Andres Perico, University of California Santa Cruz

8:00AM Finite-dimensional reductions of infinite-dimensional Lie-Poisson brackets. Philip J Morrison, The University of Texas at Austin (1154-37-1825)

8:30AM Classical integrable Hamiltonian systems, Poisson structures and some generalizations. Anthony M Bloch*, University of Michigan, Francois Gay-Balmaz, Ecole Normale Superieure, and Tudor S Ratiu, Shanghai Jiao Tong University (1154-34-1081)

9:00AM Lie point symmetries of the planar Kepler problem. Connor Jackman, CIMAT (1154-70-605)


10:00AM Collective Heavy Top Dynamics. Tomoki Ohsawa, University of Texas at Dallas (1154-37-448)

10:30AM Discussion
8:30AM Incongruences for modular forms and applications to partition functions.
Marie Jameson*, University of Tennessee, Knoxville, and Sharon Garthwaite, Bucknell University (1154-11-1491)

9:00AM Verifying Partition Congruences with Symbolic Computation. Preliminary report.
Nicolas Allen Smoot* and Cristian-Silviu Radu, Research Institute for Symbolic Computation, Linz (1154-11-1089)

9:30AM Parity considerations in Rogers–Ramanujan–Gordon type overpartitions.
Ae Ja Yee, Penn State University (1154-11-1418)

10:00AM The method of weighted words re-revisited. Preliminary report.
Ali K Uncu, Austrian Academy of Sciences OEAW RICAM / Johannes Kepler University RISC (1154-05-1343)

10:30AM The smallest parts function.
Scott Ahlgren*, University of Illinois, and Byungchan Kim, Seoul University of Science and Technology (1154-11-1549)

AMS Special Session on Interactions of Inverse Problems, Computational Harmonic Analysis, and Imaging, I

8:00 AM – 10:50 AM Room 107, Meeting Room Level, Colorado Convention Center
Organizers: M. Zuhair Nashed, University of Central Florida
Willi Freeden, University of Kaiserslautern
Otmar Scherzer, University of Vienna

8:00AM Some Inverse Problems in Graph Signal Processing. Preliminary report.
Qiyu Sun, University of Central Florida (1154-94-1074)

8:30AM Inverse Magnetization Problems and Potential Field Separation.
Christian Gerhards, TU Bergakademie Freiberg (1154-49-1349)

9:00AM Hierarchical convex optimization by the hybrid steepest descent method with proximal splitting operators.
Isao Yamada* and Masao Yamagishi, Tokyo Institute of Technology (1154-65-1321)

9:30AM Semiclassical Sampling and Discretization of Linear Inverse Problems.
Plamen Stefanov, Purdue University (1154-35-1052)

10:00AM A Fourier approach to the inverse source problem in an absorbing and scattering medium with applications to Optical Molecular Imaging.
Kamran Sadiq, Johann Radon Institute of Computational and Applied Mathematics (RICAM) (1154-35-826)

AMS Special Session on Iterative Methods for Large-Scale Data Analysis, I

8:00 AM – 10:50 AM Room 407, Meeting Room Level, Colorado Convention Center
Organizers: Jamie Haddock, University of California Los Angeles
Anna Ma, University of California San Diego

8:00AM A New Constrained Mixture Models for Drug Discovery Data with Innovative Iterative Algorithms.
Xu (Sunny) Wang*, Wilfrid Laurier University, and Hugh Chipman, Acadia University (1154-62-1616)

8:30AM Monte Carlo approximation certificates for k-means clustering.
Soledad Villar, New York University (1154-90-1259)

9:00AM On the minimum ℓp-norm of random matrices. Preliminary report.
Josiah Park, Georgia Tech (1154-60-2762)

9:30AM Stochastic Methods for Low-Rank Tensor Recovery.
Rachel Grotheer*, Goucher College, Shuang Li, Colorado School of Mines, Anna Ma, University of California Irvine, Deanna Needell, University of California Los Angeles, and Jing Qin, University of Kentucky (1154-15-1025)

10:00AM Simultaneous Blind Deconvolution and Phase Retrieval with Tensor Iterative Hard Thresholding.
Shuang Li*, Colorado School of Mines, Golden, CO, Gongguo Tang and Michael B. Wakin, Colorado School of Mines (1154-15-595)

10:30AM Non-negative tensor decompositions for dynamic topic modeling. Preliminary report.
Kathryn E Leonard, Occidental College (1154-41-1842)

AMS Special Session on Noncommutative Geometry and Applications, I

8:00 AM – 10:50 AM Room 110, Meeting Room Level, Colorado Convention Center
Organizer: Frederic Latremoliere, University of Denver

8:00AM Localization in Hochschild Homology and Applications.
Markus Pflaum, University of Colorado (1154-18-732)
Program of the Sessions – Wednesday, January 15 (cont’d.)

8:00 AM – 10:50 AM Room 113, Meeting Room Level, Colorado Convention Center

Organizers: Valeria Barra, University of Colorado Boulder
Oana Marin, Argonne National Laboratory

8:00 AM Are PDEs still relevant? Scientific Computing in the Age of Big Data and Extreme Computing.
Jeffrey Alan Furst Hittinger, Lawrence Livermore National Laboratory (1154-65-2237)

9:00 AM Numerical simulations of macroscopic quantities for stochastic differential equations with α-stable processes.
Xiaofan Li, Illinois Institute of Technology (1154-65-584)

9:30 AM Optimal distribution of dielectrics via boundary integral constrained optimization.
Oana Marin, Marieme Ngom* and Barry Smith, Argonne National Laboratory (1154-35-1213)

10:00 AM New results for the EMAC formulation of the Navier-Stokes equations. Preliminary report.
Leo Rebholz, Clemson University (1154-65-1432)

10:30 AM An efficient and high order accurate direct solution technique for variable coefficient elliptic partial differential equations.
Adrianna Gillman, University of Colorado, Boulder (1154-35-563)

AMS Special Session on Recent Developments in Numerical Methods for PDEs, I

AMS Special Session on Research in Graph Theory and Combinatorics by Research Experience for Undergraduate Faculty (REUF) Alumni and Their Students, I

8:00 AM – 10:50 AM Room 303, Meeting Room Level, Colorado Convention Center

Organizers: Katie Anders, University of Texas at Tyler
Kassie Archer, University of Texas at Tyler
Briana Foster-Greenwood, California State Polytechnic University-Pomona

8:00 AM Dimensions of generalized spline spaces.
Laetitia Huang, Valeri Jean-Pierre*, Karen Reed and Isabella Zhu, Smith College (1154-05-2769)

8:30 AM A Tale of Two Graph Theory Projects: From Graceful Trees to Domino Tilings. Preliminary report.
Rachelle Bouchat*, Patrick Cone and William Rizer, Indiana University of Pennsylvania (1154-05-2491)

9:00 AM On (t, r) broadcast domination of certain grid graphs.
Natasha Crepeau*, Harvey Mudd College, Pamela E. Harris, Williams College, Sean Hays, University of South Florida, Marissa Loving, Joseph Rennie, University of Illinois at Urbana-Champaign, Gordon Rojas Kirby, University of California Santa Barbara, and Alexandro Vasquez, Manhattan College (1154-05-69)

9:30 AM Arithmetical structures on graphs.
Joel Louwsma, Niagara University (1154-05-1221)

10:00 AM Graph Splines and the Universal Difference Property. Preliminary report.
Katie Anders*, University of Texas at Tyler, Daniel Arreola, California State University, Long Beach, Luisa Asencio, St. Edward’s University, Chloe Ireland, Carnegie Mellon University, and Luke Smith, University of Texas at Tyler (1154-05-451)

10:30 AM Failed zero forcing on oriented and directed graphs: results, applications, and open questions.
Alyssa N Adams, Youngstown State University, and Bonnie C Jacob*, National Technical Institute for the Deaf at Rochester Institute of Technology (1154-05-969)

AMS Special Session on Sequences, Words, and Automata, I

8:00 AM – 10:50 AM Room 403, Meeting Room Level, Colorado Convention Center

Organizers: Eric Rowland, Hofstra University

8:00 AM Gapped boundary theories in three dimensions. Preliminary report.
Daniel S Freed, University of Texas at Austin (1154-81-1261)

10:00 AM Quantum metrics on the tensor product of a commutative C*-algebra and an AF C*-algebra.
Konrad Aguilar, University of Southern Denmark (1154-47-585)

10:30 AM Geodesics in the Banach-Mazur distance.
Alvaro Arias* and Vladimir Kovalchuk, University of Denver (1154-46-665)
AMS Special Session on Spectral and Transport Properties of Disordered Systems, I

8:00 AM – 10:50 AM  Room 102, Meeting Room
Level, Colorado Convention Center

Organizers:  Peter D. Hislop, University of Kentucky  
Jeffrey Schenker, Michigan State University

8:00 AM  Ballistic transport for one-frequency
Schrödinger operators. Preliminary report.  
Ilya Kachkovskiy, Michigan State University (1154-47-2000)

8:30 AM  Diffusion in the mean for a periodic
Schrödinger equation perturbed by a fluctuating potential.  
J Schenker, F Z Tiloco*, Michigan State University, and S Zhang, University of Minnesota (1154-47-2272)

9:00 AM  An energy-dependent Lieb-Robinson bound for quantum rotors. Preliminary report.  
Alvin Moon, UC Davis (1154-81-1504)

9:30 AM  A gapped family of two-dimensional AKLT models.  
Houssam Abdul-Rahman, University of Arizona, Marius Lemm, Harvard University, Angelo Lucia, CalTech,  
Bruno Nachtergaele, UC Davis, and Amanda Young*, Technical University of Munich/MCST (1154-82-1414)

10:00 AM  On the Regime of Localized Excitations for Disordered Oscillator Systems.  
Robert Sims*, Houssam Abdul-Rahman, University of Arizona, and Gunter Stolz, University of Alabama at Birmingham (1154-81-1376)

10:30 AM  Localization at the bottom of the spectrum of a disordered XXZ spin chain. Preliminary report.  
Alexander Elgart*, Virginia Tech, and Abél Klein, UC Irvine (1154-81-1833)

AMS Special Session on Symbolic Dynamics, I

8:00 AM – 10:50 AM  Room 111, Meeting Room
Level, Colorado Convention Center

Organizers:  Ronnie Pavlov, University of Denver  
Scott Schmieding, Northwestern University

8:00 AM  Properties of low complexity symbolic systems and applications.  
Van Cyr*, Bucknell University, and Bryna Kra, Northwestern University (1154-37-2418)

8:30 AM  Mapping class groups of zero-entropy subshifts.  
Kitty Yang, Northwestern University (1154-37-2165)
9:00AM | The number of minimal subsystems of a transitive subshift of linear complexity.
Andrew Dykstra*, Hamilton College, Nic Ormes and Ronnie Pavlov, University of Denver (1154-37-796)

Van Cyr, Bucknell University, Aimee Johnson, Swarthmore College, Bryna Kra, Northwestern University, and Ayşe Şahin*, Wright State University (1154-37-2406)

10:00AM | Determining when a Bratteli-Vershik system is expansive.
Sarah Bailey Frick, Furman University (1154-37-2198)

10:30AM | Characteristic Measures of Symbolic Dynamical Systems.
Joshua Frisch, California Institute of Technology (1154-37-2341)

AMS Contributed Paper Session on Functional Analysis, Operator Theory and Operator Algebras, I

8:00 AM – 9:55 AM | Room 204, Meeting Room Level, Colorado Convention Center

8:00AM | Module bundles and module amenability.
Terje Høim*, Wilkes Honors College, Florida Atlantic University, and D. A. Robbins, Tucson, AZ (1154-46-282)

8:15AM | On critical value of the coupling constant in exterior elliptic problems.
Rajan Puri*, Wake Forest University, and Boris Vainberg, University of North Carolina at Charlotte (1154-46-472)

8:30AM | Sobolev Orthogonal Polynomials on the Sierpinski Gasket. Preliminary report.
Shashank Sule*, Amherst College, Sreeram Venkat, North Carolina State University, and Tian Lan, Chinese University of Hong Kong (1154-46-1712)

8:45AM | Unitary topological free entropy. Preliminary report.
Weihua Li, Columbia College Chicago (1154-46-1846)

9:00AM | Equivalent definitions of real locally C*-algebras.
Oleg Friedman*, Lander College for Men / Touro, NY, USA, and Alexander A Katz, St. John’s University, NY, USA (1154-46-2338)

Sofya S Masharipova*, University of Pittsburgh at Johnstown, and Shukhrat Musmanov, Concord University (1154-46-1957)

9:30AM | Index Theory on Contact Manifolds with a Groupoid Action. Preliminary report.
Zachary J. Garvey, Dartmouth College (1154-19-2530)

AMS Contributed Paper Session on Partial Differential Equations and Applications, I

8:00 AM – 10:25 AM | Room 202, Meeting Room Level, Colorado Convention Center

8:00AM | Global existence of a two-dimensional chemotaxis-haptotaxis model with remodeling of non-diffusible attractant.
Peter Y Pang, National University of Singapore (1154-35-19)
Wednesday, January 15 – Program of the Sessions

8:15 AM  
**Sinc and Solitary Wave Solutions to the Generalized Benjamin-Bona-Mahony-Burgers Equations.**
Kamel M. Al-Khaleed, Jordan University of Science and Technology (1154-35-63)

8:30 AM  
**PI Finite Element Methods for Elliptic Optimal Control Problems.**
Susanne Brenner, Louisiana State University, Lina Ma, Trinity College, Minah Oh*, James Madison University, Li-yeng Sung, Louisiana State University, and Kening Wang, University of North Florida (1154-65-1126)

8:45 AM  
**Radiation dynamics in fast soliton collisions in the presence of nonlinear dissipation.**
Aver Peleg*, Jerusalem, Israel, and Debananda Chakraborty, Department of Mathematics, New Jersey City University, Jersey City, New Jersey 07305, USA (1154-35-291)

9:00 AM  
Break

9:15 AM  
**Microproteron traveling waves in diatomic Fermi-Pasta-Ulam-Tsingou lattices under the equal mass limit.**
Timothy E. Faver* and Herman Jan Hupkes, Leiden University (1154-35-493)

9:30 AM  
**Generalized Two-phase Mass Flow Model.**
Preliminary report.
Sayonita Ghosh Hajra, California State University, Sacramento (1154-35-576)

9:45 AM  
**Finite Difference Schemes for a Structured Population Equation in the Space of Measures.**
Azmy S. Ackleh, Rainey Lyons*, University of Louisiana at Lafayette, and Nicolas Saintier, Universidad de Buenos Aires (1154-35-683)

10:00 AM  
**Neural partial differential equation solver with fractional gradient descent.**
Mostafa Rezapour*, Adebowale Sijuade and Thomas J. Asaki, Washington State University (1154-35-714)

10:15 AM  
**An Anisotropic Cahn-Hilliard Equation with Variable Mobility and Gravity Potential.**
Zachary J. Hilliard*, Lynn Schreyer and Nikolaos Voulgarakis, Washington State University (1154-35-1040)

MAA Contributed Paper Session on Best Practices and Considerations in Designing and Developing Online Math Courses

8:00 AM – 10:15 AM  
Room 505, Meeting Room Level, Colorado Convention Center

Organizers: Sharon M. Mosgrove, Western Governors University  
Doug Scheib, Western Governors University

8:00 AM  
**Online Exercises for a Proofs Course.**
Susanna S Epp, DePaul University (1154-B1-1871)

8:20 AM  
**An Online IBL Geometry Class.**
Nathaniel Miller, University of Northern Colorado (1154-B1-977)

8:40 AM  
**Hands-On-Online Real Life Data Collection.**
Kirsten K Meymaris* and Michael Heeren, Purdue University Global (1154-B1-2633)

9:00 AM  
**Addressing Mindset, Pacing, Comprehension, and Persistence in Online Self-Paced Mathematics Classes.**
Preliminary report.

9:20 AM  
**Addressing Mindset and Math Anxiety with Online Math Students.**
Preliminary report.
Neil Starr*, Hilda Black, Heather Rosenblatt and Erika Wittenborn, Western Governors University (1154-B1-2253)

9:40 AM  
**Tools, tips, and techniques: Lessons learned from a decade of teaching statistics online.**
Kate McGivney, Shippensburg University (1154-B1-1172)

10:00 AM  
**Designing and Developing an Online Math Course – Creating a student-centered model.**
Sharmila Sivalingam, Maryville University of St.Louis (1154-B1-2608)

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

8:00 AM – 10:55 AM  
Room 507, Meeting Room Level, Colorado Convention Center

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

9:20 AM  
**Using tools like Mathematica and Wolframalpha to develop exercise problems with solutions in a Discrete Math Course.**
Mohamed Jamalodeen, Georgia Gwinnett College (1154-D1-1369)

9:40 AM  
**Discrete Math and Pseudocode: a pedagogical endeavor to improve persistence and achievement of non-Math majors.**
Filippo Posta, Estrella Mountain Community College (1154-D1-211)
Program of the Sessions – Wednesday, January 15 (cont’d.)

8:00 AM – 10:55 AM Room 501, Meeting Room Level, Colorado Convention Center

Organizers: Brian Katz, Augustana College  
Carl Mummert, Marshall University  
Victor I. Piercey, Ferris State University  

Benjamin Purkis, Oxford College of Emory University (1154-H5-2355)

8:20 AM Creating A Flipped Geometry Course with Room for Inquiry.  
John D Ross, Western University (1154-H5-2280)

8:40 AM Collaborative Writing as Assessment in an Abstract Algebra Course.  
Aviva Halani, Phillips Exeter Academy (1154-H5-2439)

9:00 AM The Number Line: A Guided Inquiry into Real Analysis.  
David Clark, SUNY New Paltz, and Xiao Xiao*, Utica College (1154-H5-369)

9:20 AM Break

Megan Wawro*, Virginia Tech, Michelle Zandieh, Arizona State University, Christine Andrews-Larson, Florida State University, and David Ploasco, Clayton State University (1154-H5-2600)

10:00 AM Who gets an A? Preliminary report.  
Jonas D’Andrea, Westminster College (1154-H5-2793)

Mami T Wentworth* and Mel Henriksen, Wentworth Institute of Technology (1154-H5-2108)

Sarah A. Nelson, Lenoir-Rhyne University (1154-H5-2342)

MAA Contributed Paper Session on Mathematics and the Arts: in the Classroom and Beyond, I

8:00 AM – 10:55 AM Room 504, Meeting Room Level, Colorado Convention Center

Organizer: Douglas Norton, Villanova University

8:00 AM Color Swaps in Mosaic Knitting.  
(180) Susan Goldstine*, St. Mary’s College of Maryland, and Carolyn Yackel, Mercer University (1154-K1-2374)

8:20 AM Orbifolds Attainable through Itajime Shibori. Preliminary report.  
Carolyn Yackel, Mercer University (1154-K1-2050)

8:40 AM Mathematics in Persian Art.  
(182) Samaneh G. Hamidi, Rider University (1154-K1-2559)

9:00 AM Curve stitching variations in 2D and 3D.  
(183) John Nicholson, Austin Peay State University (1154-K1-2533)

Anduriel Widmark, Denver, Colorado (1154-K1-122)

9:40 AM Mapping Cubic Lace Drawings.  
(185) Susan Happertsz, Artist (1154-K1-445)

10:00 AM A retrospective of creating five years of cover art for Mathematics Magazine.  
(186) David A. Reimann, Albion College (1154-K1-2743)

Douglas McKenna, Mathemaesthetics, Inc., Boulder, CO (1154-K1-1300)

10:40 AM Collaborative sculptural art installation using textile and other media to illustrate mathematical creativity. Preliminary report.  
Ingrid Daubechies*, Duke University, and Dominique Ehrmann, independent textile artist (1154-K1-777)

MAA Contributed Paper Session on Modeling-First Inquiry-Based Course Activities

8:00 AM – 10:55 AM Room 502, Meeting Room Level, Colorado Convention Center

Organizers: Ben Galluzzo, Clarkson University  
Brian Winkel, SIMIODE  
Corban Harwood, George Fox University
8:00AM Using Modeling in Introductory Differential Equations to Motivate Relevance, Positive Attitudes Toward Mathematics and the Transfer of Knowledge to Other Courses. Preliminary report.
Bonnie S Moon*, Brigham Young University-Idaho, and Paul Cox, Brigham Young University-Idaho (1154-L5-1843)

8:20AM What does he X? Thinking about statistics, not just hearing about statistics: Getting students to engage in the process of learning and doing statistics. Preliminary report.
John Z. Hossler, Seattle Pacific University (1154-L5-1374)

8:40AM Two Inquiry Based Learning Modeling Activities: The Warming of Cold Water in a Bottle and Using Phase Models to Describing Oscillating Populations. Eli E Goldwyn, University of Portland (1154-L5-2021)

9:00AM SIR and Beyond: An Inquiry Based Approach to Modeling the Spread of Disease in an Introductory Differential Equations Course. Jennifer L. Garbett, Lenoir-Rhyne University (1154-L5-2735)


9:40AM Stability of random Perturbed Logistic Model. Reza R Ahangar, Texas A&M University - Kingsville, Texas 78363 (1154-L5-2502)

10:00AM Teaching Differential Equations with Modeling First. Arati Nanda Pati, University of St. Thomas (1154-L5-1684)

10:20AM Comparing Symmetrical, Asymmetrical, and Parallel Modeling Projects. Corban Harwood, George Fox University (1154-L5-1281)


MAA Contributed Paper Session on Teaching Mathematics with Humor or Pop Culture

8:00AM – 9:35 AM Room 506, Meeting Room Level, Colorado Convention Center
Organizers: Sarah J. Greenwald, Appalachian State University
Semra Kilic-Bahi, Colby-Sawyer College
Cesar Martinez-Garza, Pennsylvania State University at Berks

8:00AM Vector Calculus Imagery in Science Fiction and Fantasy. Cesar Martinez-Garza, Penn State - Berks (1154-Q5-2739)

8:40AM From Star Wars Lightsabers to the Broadway Stage Door: Infusing Pop Culture in Statistics, Pre-Calculus and Beyond. Adrienne Chu, Suffolk County Community College (1154-Q5-939)

9:00AM Stories and Jokes that Worked At Least Once. Susan B. Crook, Loras College (1154-Q5-2729)


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

8:00 AM – 10:55 AM Room 503, Meeting Room Level, Colorado Convention Center
Organizers: Tom Banchoff, Brown University
Curtis Bennett, California State University Long Beach
Jacqueline Dewar, Loyola Marymount University
Edwin Herman, University of Wisconsin-Stevens Point
Lew Ludwig, Denison University

8:00AM Preliminary Analysis of the Impact of Active Learning in General Education Mathematics Courses. Preliminary report.
Marie Meyer*, Amanda Harsy, Michael Smith and Brittany Stephenson, Lewis University (1154-OS-1037)

8:20AM Utilizing Exam Wrappers to Improve Student Metacognitive Skills in College Algebra. Preliminary report.
Ashley D. Cherry, Lubbock Christian University (1154-OS-1695)

8:40AM Retrieving, Interleaving, and Intervention in Calculus. Daniel L Kern* and Menaka Navaratna, Florida Gulf Coast University (1154-OS-2441)

9:00AM What kinds of homework more effective for Calculus I students? Preliminary report.
Kristin A. Camenga, Juniata College (1154-OS-1910)

9:20AM The Impact of Frequent Student-Faculty Interactions on Repeater Students. Preliminary report.
Shanda R Hood* and Joshua Girshner, University of Arkansas (1154-OS-78)
Program of the Sessions – Wednesday, January 15 (cont’d.)

8:00 AM – 10:25 AM Room 707, Meeting Room Level, Colorado Convention Center

Organizers: Cathy Erbes, Hiram College
Holley Friedlander, Dickinson College
Steven McKay, Brigham Young University

8:00 AM A New Method to Find Relations Between Invariants of Representations.
Alison E Becker*, University of Wisconsin-Milwaukee (1154-VL-1877)

Preliminary report.
Ann E. Rogers, DePaul University, Chicago, IL (1154-VL-2567)

8:30 AM Optimality of an Improved Bound on Polya's Positivity Theorem (Univariate Case).
Preliminary report.
Brittany Riggs* and Hoon Hong, North Carolina State University (1154-VL-2288)

8:45 AM Independence Complexes of Finite Groups.
Casey M. Pinckney, Colorado State University (1154-VL-907)

9:00 AM Check digit schemes and the Dihedral group.
Cheryl Lynn Fergusson* and Roman Wong, Washington & Jefferson College (1154-VL-1159)

Haydee M Lindo, Williams College (1154-VL-2485)

8:00 AM – 10:40 AM Room 710, Meeting Room Level, Colorado Convention Center

Organizers: Cathy Erbes, Hiram College
Holley Friedlander, Dickinson College
Steven McKay, Brigham Young University

8:30 AM Explicit Pieri Inclusions. Preliminary report.
John A Miller*, Markus Hunziker and Mark Sepanski, Baylor University (1154-VL-644)

9:45 AM A Note on a Class of Generalized Nilpotent Groups Introduced by Bechtell and Doerk. Preliminary report.
Joseph Kirtland, Marist College (1154-VL-481)

10:00 AM Groups of Units Modulo f(x).
Karlee Westrem, University of Minnesota Duluth (1154-VL-1088)

10:15 AM Hilbert Series of Modules of Covariants and Branching. Preliminary report.
Matthew D. Jaynes* and Markus Hunziker, Baylor University (1154-VL-2573)

MAA General Contributed Paper Session on Graph Theory, I

8:00 AM – 10:40 AM Room 710, Meeting Room Level, Colorado Convention Center

Organizers: Cathy Erbes, Hiram College
Holley Friedlander, Dickinson College
Steven McKay, Brigham Young University

8:30 AM Classification of three-dimensional real algebraically defined monomial graphs by girth.
Alex Kodess, Farmingdale State College, Brian Kronenthal, Diego Manzano-Ruiz and Ethan Noe*, Kutztown University of Pennsylvania (1154-VP-1809)

8:45 AM Some Recent Advances in Group Coloring of Graphs. Preliminary report.
Lucian Mazza, West Virginia University (1154-VP-1570)

9:00 AM On weighted modulo orientation of graphs.
Jian-Bing Liu*, Hong-Jian Lai, West Virginia University, Ping Li, Beijing Jiaotong University, Jiaao Li, Nankai University, and Miaomiao Han, Tianjin Normal University (1154-VP-713)

Kevin Iga, Pepperdine University and Brown University (1154-VP-2427)

9:30 AM Inequalities of Kazhdan Constants on Isomorphic Graph Pairs. Preliminary report.
Manuel A Davila, California State University of Los Angeles (1154-VL-2570)

9:45 AM Seymour’s Second Neighborhood Conjecture from a Different Perspective.
Farid Bouya* and Bogdan Oporowski, Louisiana State University (1154-VP-1829)
10:00 AM  ▶ (227) Inflection Points and Comparability of Reliability Polynomials. Preliminary report.
Tyler Russell*, UT Tyler, Isaac Brown, Washington State University, and Brendan Miller, Saint Francis University (1154-VP-1815)

10:15 AM  ▶ (228) Planar Graphs with Girth 20 are Additively 3-choosable.
Alex Brandt, Northern Kentucky University, Nathan Tempas, Vanderbilt University, and Carl Yerger*, Davidson College (1154-VP-2143)

10:30 AM  ▶ (229) Enumerating Acyclic Orientations of Complete Multipartite Graphs.
Arvind Ayer, Indian Institute of Science, Daniel Hathcock* and Prasad Tetali, Georgia Institute of Technology (1154-VP-2291)

MAA General Contributed Paper Session on Mathematics and Technology, History, and Logic

8:00 AM - 10:55 AM Room 709, Meeting Room Level, Colorado Convention Center
Organizers: Cathy Erbes, Hiram College
Holley Friedlander, Dickinson College
Steven McKay, Brigham Young University

8:00 AM  ▶ (230) Incorporating Technology to make Calculus Interactive and Engaging in the Classroom. Preliminary report.
Dushanthi N Herath, Department of Mathematics, Maryville University (1154-VD-2424)

8:15 AM  ▶ (231) Using a Mathematical Software Package in a Class Exercise to Demonstrate Google’s Simple PageRank Algorithm. Preliminary report.
Gerald Kruse, Juniata College (1154-VD-2229)

Yevgeniy Galperin, East Stroudsburg University of PA (1154-VD-2236)

8:45 AM  ▶ (233) Using YouTube videos to promote learning inside and outside the classroom. Preliminary report.
Peyam Ryan Tabrizian, University of California - Irvine (1154-VD-2707)

9:00 AM  ▶ (234) A toolkit for breaking expensive textbook/homework bundles: Case studies on using a textbook-agnostic homework system to create affordable online homework to reach every student.
Bob Carmichael* and Sid Grover, Edfinity (1154-VD-2517)

Nilakantha Paudel, Gran Sasso Science Institute, and Ram C Neupane*, Texas A&M University-Texarkana (1154-VD-1475)

9:30 AM  ▶ (236) Mediating Victorian Geometry Anxiety Through Curve Stitching.
Brittany Anne Carlson, University of California, Riverside (1154-VD-330)

9:45 AM  ▶ (237) Conflicting Sines.
John Robert Botzum*, Kutztown University, and Andrew Martin, Kentucky State University (1154-VD-2362)

10:00 AM  ▶ (238) Existence of Measurable Cardinals and Modal Logic.
G. Bezhanishvili, New Mexico State University, N. Bezhanishvili, University of Amsterdam, J. Lucero-Bryan*, Khalifa University of Science and Technology, and J. van Mill, University of Amsterdam (1154-VD-1515)

10:15 AM  ▶ (239) Axiomatic Systems.
Janine E. Janoski, King’s College (1154-VD-2614)

Joshua Cole, University of Findlay (1154-VD-2770)

Timothy Trujillo, Sam Houston State University (1154-VD-2680)

SIAM Minisymposium on Recent Advances and New Trends in Modeling and Simulation of Systems with Multiple Scales, Coupled Phenomena and Interfaces

8:00 AM - 10:55 AM Room 301, Meeting Room Level, Colorado Convention Center
Organizer: Yekaterina Epshteyn, University of Utah

8:00 AM  ▶ (242) Grain Structure, Grain Growth and Evolution of the Grain Boundary Network. Yekaterina Epshteyn, The University of Utah (1154-65-516)

8:30 AM  ▶ (243) High order accurate versions of threshold dynamics.
Alexander Zaitzeff, Selim Esedoglu*, Department of Mathematics, University of Michigan, and Krishna Garikipati, Department of Mechanical Engineering, University of Michigan (1154-65-2114)

9:00 AM  ▶ (244) Microstructural entropy and stored energy in modeling recrystallization and microstructure-property relationships in polycrystals.
Maria Emelianenko, George Mason University (1154-70-1631)
9:30AM Machine Learning from Polymer Self Consistent Field Theoretic Simulations to Accelerate Phase Discovery.
Hector D. Ceniceros, Department of Mathematics, University of California Santa Barbara (1154-65-465)

10:00AM Numerical analysis of a biofilm-nutrient model involving a variational inequality.
Malgorzata Peszynska*, Oregon State University, Mathematics Department, and Azhar Alhammali, Imam Abdulrahman Bin Faisal University, Saudi Arabia (1154-65-688)

10:30AM Explicit Partitioned Methods based on Monolithic Formulations of the Coupled Problem.
Pavel B Bochev*, Paul Kuberry and Kara Peterson, Sandia National Laboratories (1154-65-412)

Project NExT Workshop
8:00 AM – 6:00 PM Mile High Ballroom 4d-4f, Ballroom Level, Colorado Convention Center
Organizers: Matt DeLong, Marian University
Dave Kung, St. Mary’s College of Maryland
Alicia Prieto Langarica, Youngstown State University

Employment Center
8:00 AM – 5:30 PM Mile High Ballroom 1,2,3, Ballroom Level, Colorado Convention Center

MAA Minicourse #1: Part A
9:00 AM – 11:00 AM Room 704, Meeting Room Level, Colorado Convention Center
Using Automated Software to Learn and Teach Numerical Solution of Partial Differential Equations.
Presenter: L. Ridgeway Scott, University of Chicago

MAA-SIAM-AMS Hrabowski-Gates-Tapia-McBay Session: Lecture
9:00 AM – 9:45 AM Room 207, Meeting Room Level, Colorado Convention Center
Organizer: Carrie Diaz Eaton, Bates College
Speakers: Belin Tsinnajinnie, Santa Fe Community College

9:00 AM Moving from changing the faces of mathematics to changing who mathematics serves.
Belin Tsinnajinnie, Santa Fe Community College (1154-00-2855)

MAA Panel
9:00 AM – 10:20 AM Room 603, Meeting Room Level, Colorado Convention Center
Assessment for Accreditation: Lots of Little Fish Make a Large School
Organizers: Regina Aragon, Eastern New Mexico University
Mariah Birgen, Wartburg College
Panelists: Curtis Bennett, California State University, Long Beach
Bonnie Gold, Monmouth University
Stephanie Kolitsch, The University of Tennessee at Martin
Josephine Rodriguez, Western New England University
Murphy Waggoner, Simpson College

MAA Minicourse #2: Part A
9:00 AM – 11:00 AM Room 706, Meeting Room Level, Colorado Convention Center
Teaching Reproducible Statistics with R and R Studio.
Presenters: Ryan Botts, Point Loma Nazarene University
Judith E. Canner, California State University, Monterey Bay

MAA Workshop
9:00 AM – 10:20 AM Room 605, Meeting Room Level, Colorado Convention Center
Teaching Undergraduate Mathematics via Primary Source Projects.
Organizers: Janet H. Barnett, Colorado State University - Pueblo
Kathleen M. Clark, Florida State University
Dominic Klyve, Central Washington University
Wednesday, January 15 – Program of the Sessions

MAA Panel

9:00 AM – 10:20 AM  Room 601, Meeting Room Level, Colorado Convention Center
What Every Student Should Know about the JMM
Organizers: Peri Shereen, California State University, Monterey Bay
Violeta Vasilevska, Utah Valley University
Panelists: Joyati Debnath, Winona State University
Matt DeLong, Marian University
Stephanie Edwards, Hope College

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

9:50 AM – 10:30 AM  Room 207, Meeting Room Level, Colorado Convention Center
Organizer: Carrie Diaz Eaton, Bates College
Panelists: Emille Davie Lawrence, University of San Francisco
Belin Tsinnajinnie, Santa Fe Community College
William Yslas Vélez, University of Arizona

MAA Contributed Paper Session on Re-Envisioning the Calculus Sequence, I

10:00 AM – 10:55 AM  Room 506, Meeting Room Level, Colorado Convention Center
Organizers: Robin Cruz, College of Idaho
Tom Halverson, Macalester College
Joel Kilty, Centre College
Alison Marr, Southwestern University
Alex M. McAllister, Centre College
Chad Topaz, Williams College

AMS Invited Address

10:05 AM – 10:55 AM  Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center
The geometric disposition of Diophantine equations.
Anthony Várilly-Alvarado, Rice University (1154-11-1771)

Radical Dash Kickoff Meeting

10:20 AM – 10:50 AM  Room 702, Meeting Room Level, Colorado Convention Center
Organizers: Stacey Muir, University of Scranton
Janine Janoski, Kings College

AMS-MAA Invited Address

11:10 AM – NOON  Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center
Different problems, common threads: Computing the difficulty of mathematical problems.
Karen M. Lange, Wellesley College (1154-03-1732)

Exhibits and Book Sales

12:15 PM – 5:30 PM  Hall D, Exhibit Level, Colorado Convention Center
AMS Colloquium Lectures: Lecture I

1:00 PM – 1:50 PM  Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center

(254) Mathematical Frameworks for Signal and Image Analysis. Lecture I: Multiresolution analysis, wavelets and beyond.
Ingrid Daubechies, Duke University (1154-94-11)

MAA Invited Address

2:15 PM – 3:05 PM  Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center

(255) Mazes, riddles, zombies, and unicorns!
Scott Adamson, Chandler-Gilbert Community College (1154-A0-74)

AMS-ASL Special Session on Logic Facing Outward, I (Associated with Joint AMS-MAA Invited Address Karen Lange)

2:15 PM – 5:55 PM  Room 404, Meeting Room Level, Colorado Convention Center

Organizers: Karen Lange, Wellesley College
Russell Miller, Queens College & Graduate Center CUNY

2:15PM
The model theory of differential closures.
David Marker, University of Illinois at Chicago (1154-03-768)

3:15PM
What is the difference between sets of primes? Preliminary report.
Alexandra Shlapentokh, East Carolina University (1154-03-911)

4:15PM
A constructive solution to Tarski’s circle squaring problem.
Andrew Marks, UCLA (1154-03-1264)

5:15PM
Passing Hilbert’s Final Test.
Jack H. Lutz, Iowa State University (1154-03-2399)

AMS-AWM Special Session on Women in Mathematical Biology, II

2:15 PM – 6:05 PM  Room 112, Meeting Room Level, Colorado Convention Center

Organizers: Christina Edholm, University of Tennessee
Amanda Laubmeier, University of Nebraska-Lincoln
Katharine Gurski, Howard University
Heather Zinn Brooks, University of California Los Angeles

2:15PM
Stability, Bifurcation, and the Emergence of Synchronization and Clusters in Time Delayed Neural Networks.
Hwayeon Ryu*, Elon University, and Sue Ann Campbell, University of Waterloo (1154-92-1042)

2:45PM
The Effects of Excess Food Nutrient Content on the Coexistence of Competing Consumer Species.
Lale Asilk and Angela Peace, Texas Tech University (1154-34-690)

3:15PM
A stochastic discrete time population model with multiple independent environmental factors. Preliminary report.
Amy Veprauskas, University of Louisiana at Lafayette, and Tingting Tang*, San Diego State University Imperial Valley (1154-92-2782)

3:45PM
A vector-borne disease model with non-exponentially distributed infection and treatment stages.
Zhilan Feng, Purdue University, West Lafayette, IN, Katharine F. Gurski, Howard University, Washington, DC, Olivia Prosper, University of Tennessee, Knoxville, TN, Miranda Ijang Teboh-Ewungkem*, Lehigh University, and Margaret Grogan, University of Tennessee, Knoxville (1154-92-1610)

4:15PM
Non-exponentially distributed waiting times in a two-strain SITR vector-borne disease model. Preliminary report.
Margaret A. Grogan and Olivia Prosper, University of Tennessee, Knoxville (1154-92-1689)

4:45PM
Population Dynamic Model of Microbial Interactions and Traits Associated with Microbiome. Preliminary report.
Lihong Zhao, University of Idaho (1154-37-1960)

5:15PM
Iordanka Panayotova*, Christopher Newport University, and Nicole Rychagov, Harvard College (1154-92-1761)

5:45PM
Fluid Dynamics of Nematocyst Prey Capture.
Rebecca Segal*, Virginia Commonwealth University, Wanda Strychalski, Case Western Reserve University, Sarah Bryant, Dickinson College, Baasansuren Jadamba, Rochester Institute of Technology, Eirini Kilikian, University of Delaware, Xiulan Lai, Renmin University of China, Leili Shahriyari, University of Texas at Arlington, Ning Wei, Purdue University, and Laura Miller, University of North Carolina, Chapel Hill (1154-92-678)
AMS-AWM Special Session on Women in Symplectic and Contact Geometry, II  
2:15 PM – 6:05 PM  
Room 105, Meeting Room Level, Colorado Convention Center  
Organizers: Morgan Weiler, Rice University  
Catherine Cannizzo, Simons Center for Geometry and Physics  
Melissa Zhang, University of Georgia

2:15PM  
Right-veering and twist-left-veering open books.  
Keiko Kawamuro, University of Iowa (1154-57-730)

3:15PM  
Planarity in higher-dimensional contact manifolds.  
Bahar Acu, Northwestern University (1154-51-1267)

3:45PM  
Complements of toric divisors in toric 4 manifolds.  
Bahar Acu, Northwestern University, Orsola Capovilla-Searle, Duke University, Aleksandra Marinkovic, University of Belgrade, Emmy Murphy, Northwestern University, Laura Starkston, UC Davis, and Angela Wu, University College London (1154-51-1791)

4:15PM  
Non-Hamiltonian symplectic circle actions.  
Susan Tolman, University of Illinois at Urbana-Champaign (1154-53-781)

AMS Special Session on Coding Theory and Applications, II

AMS Special Session on Algebras and Algorithms, II

AMS Special Session on Women in Symplectic and Contact Geometry, II
3:15 PM - Families of quantum error-correcting codes from Reed-Muller codes. Preliminary report.
Jessalyn Bolkema*, Harvey Mudd College, Khodakhast Bibak, Miami University, Robert Calderbank, Duke University, Neville Fogarty, Christopher Newport University, and Felice Manganelli, Clemson University (1154-94-1777)

Ming Zhang*, University of British Columbia, and Yang Zhou, Center of Mathematical Sciences and Applications, Harvard University (1154-14-1772)

Levi Heath, Colorado State University (1154-14-1605)

5:45 PM - Linear Hyperelliptic Hodge Integrals.
Adam Afandi, Colorado State University (1154-14-639)

AMS Special Session on Combinatorial Structures and Integrable Systems

2:15 PM – 6:15 PM Room 407, Meeting Room Level, Colorado Convention Center
Organizers: Maxim Arnold, University of Texas at Dallas
Nathan Williams, University of Texas at Dallas

2:15PM - Lozenge tilings in Algebraic Combinatorics.
Greta Panova, University of Southern California (1154-05-2232)

3:15PM - Cyclic sieving for plane partitions and symmetry.
Samuel F Hopkins, University of Minnesota (1154-05-982)

3:45PM - Integrable Mappings from a Unified Perspective.
Tova Brown*, Wisconsin Lutheran College, and Nicholas M. Ercolani, University of Arizona (1154-05-790)

4:15PM - From Yang-Baxter equations to stochastic systems.
Leonid Petrov, University of Virginia (1154-60-529)

5:15PM - Vector-relation configurations and plabic graphs.
Niklas Affolter, Technische Universitat Berlin, Max* Glick, The Ohio State University, Pavlo Pylyavsky, University of Minnesota, and Sanjay Ramassamy, CNRS (1154-05-995)

5:45PM - Gröbner geometry of Schubert polynomials through ice. Preliminary report.
Zachary Hamaker, University of Florida, Oliver Pechenik* and Anna Weigandt, University of Michigan (1154-14-2238)
2:15 PM – 5:55 PM Room 304, Meeting Room Level, Colorado Convention Center

Organizers: Keri Kornelson, University of Oklahoma

Emily J. King, University of Bremen

AMS Special Session on Group Actions in Harmonic Analysis, II

2:15PM The Scattering Transform for Geometric Deep Learning.
Michael Perlmuter*, Michigan State University, Department of Computational Math., Science and Engineering, Feng Gao, Yale University, Department of Genetics, Guy Wolf, University of Montreal, Department of Mathematics and Statistics, and Matthew Hirn, Michigan State University, Department of Computational, Math., Science and Engineering, Dept. of Math. (1154-42-1677)

2:45PM CUR Decompositions and Perturbations.
▶ (312) Longxiu Huang*, University of California, Los Angeles, and Keaton Hamm, University of Arizona (1154-41-601)

Mark Blumstein*, Louis Scharf, Edwin Chong and Chris Peterson, Colorado State University (1154-22-2353)

3:45PM Hamiltonian Group Actions on Frame Spaces.
Tom Needham, Florida State University, and Clayton Shonkwiler*, Colorado State University (1154-42-1125)

4:15PM Doubly transitive lines: Symmetry implies optimality.
Joseph W. Iverson*, Iowa State University, and Dustin G. Mixon, The Ohio State University (1154-52-684)

4:45PM Complete translation invariant measurements.
Jameson Cahill, New Mexico State University (1154-42-218)

5:15PM Harmonic equiangular tight frames and their combinatorial generalizations.
John Jasper, South Dakota State University (1154-43-2555)

AMS Special Session on How to Discover and Train Gifted Students

2:15 PM – 5:55 PM Room 406, Meeting Room Level, Colorado Convention Center

Organizers: Scott Annin, California State University, Fullerton

Cezar Lupu, Texas Tech University

Shoo Seto, University of California, Irvine

Bogdan D. Suceava, California State University, Fullerton

2:15PM How to coordinate a problem at the International Mathematical Olympiad? Preliminary report.
Cezar Lupu, Texas Tech University (1154-97-1976)

2:45PM Psychological Drivers of Mathematically Gifted Students. Preliminary report.
Scott Jeremy Baldridge, Louisiana State University (1154-97-1875)
### AMS Special Session on Interactions Among Partitions, Basic Hypergeometric Series, and Modular Forms, II

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:15 PM – 6:05 PM</td>
<td><strong>Room 104, Meeting Room Level, Colorado Convention Center</strong></td>
</tr>
<tr>
<td>2:45 PM</td>
<td>Quotients of integers with restricted digit sets mod b. Simone Sisneros-Thiry, University of Illinois at Urbana-Champaign (1154-11-2315)</td>
</tr>
<tr>
<td>3:15 PM</td>
<td>Basis of an infinite-dimensional tensor product representation of osp(1</td>
</tr>
<tr>
<td>3:45 PM</td>
<td>On some local invariants of geometric Langlands parameters. Preliminary report. Andrei Alanz, Louisiana State University (1154-14-2694)</td>
</tr>
<tr>
<td>4:15 PM</td>
<td>Kernel-estimated Nonparametric Overlap-Based Syncytial Clustering. Israel A Almodovar-Rivera, University of Puerto Rico Medical Science Campus (1154-62-2472)</td>
</tr>
<tr>
<td>4:45 PM</td>
<td>On Complex-Valued Equivariant Neural Networks for Radio Frequency Fingerprinting. Camila Alexandra Ramirez, Expedition Technology (1154-68-1800)</td>
</tr>
<tr>
<td>5:15 PM</td>
<td>Bayesian compartmental models and reproductive numbers for an infection with multiple infectious sources and transmission modes. Marie V Ozanne, Mount Holyoke College (1154-62-1152)</td>
</tr>
<tr>
<td>5:45 PM</td>
<td>Overview of the Geometric Model of Propagating Strings in String Theory and Possible Generalizations. Lyda Pamela Urresta, University of Notre Dame (1154-81-2245)</td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:15 PM – 6:05 PM</td>
<td>Room 401, Meeting Room Level, Colorado Convention Center</td>
</tr>
<tr>
<td>2:15 PM</td>
<td>Identifying very strong high-school students + An early-college REU. sarah-marie belcastro, Mathematical Staircase, Inc. (1154-97-1309)</td>
</tr>
<tr>
<td>3:15 PM</td>
<td>A Comprehensive Model for Preparing Underrepresented Students for Graduate Programs in Mathematics. Scott Annin* and Anael Verdugo, California State University, Fullerton (1154-97-1153)</td>
</tr>
<tr>
<td>4:45 PM</td>
<td>UC Irvine Math CEO and After-School Math Programs. Preliminary report. Shoo Seto, University of California Irvine (1154-97-269)</td>
</tr>
<tr>
<td>5:15 PM</td>
<td>Developing interest and extraordinary ability in mathematics. Po-Shen Loh, Carnegie Mellon University (1154-97-2074)</td>
</tr>
</tbody>
</table>

---

**Organizers:**

- Chris Jennings-Shaffer, University of Denver
- Frank Garvan, University of Florida
- David Goldberg, Purdue University
- Phil Kutzko, University of Iowa
- Alexander J Dunn, University of Illinois
- Walter M. Bridges, Louisiana State University
- Karl Mahlburg*, Louisiana State University
- Kathrin Bringmann, University of Cologne, Chris Jennings-Shaffer, University of Denver, and Karl Mahlburg*, Louisiana State University
- Alexander J Dunn, University of Illinois
- Sarah-marie belcastro, University of Notre Dame
- A. Shashank Kanade, University of Denver, and Worthington Luis Saldivia, University College Dublin

---

**AMS Special Session on Interactions Among Partitions, Basic Hypergeometric Series, and Modular Forms, II**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:45 PM</td>
<td>On the refined q-trinomial coefficients. Alexander Berkovich, University of Florida (1154-11-550)</td>
</tr>
<tr>
<td>3:15 PM</td>
<td>The colored Jones polynomial of the odd double twist knots. Jeremy Lovejoy*, CNRS, Université Paris Diderot, and Robert Osburn, University College Dublin (1154-11-1650)</td>
</tr>
<tr>
<td>3:45 PM</td>
<td>Knot invariants and coefficient stability. Paul Beirne, University College Dublin (1154-57-637)</td>
</tr>
<tr>
<td>4:15 PM</td>
<td>Statistics for unimodal sequences of integers. Kathrin Bringmann, University of Cologne, Chris Jennings-Shaffer, University of Denver, and Karl Mahlburg*, Louisiana State University (1154-11-371)</td>
</tr>
<tr>
<td>4:45 PM</td>
<td>Limit Shapes for Unimodal Sequences. Walter M. Bridges, Louisiana State University (1154-05-1363)</td>
</tr>
<tr>
<td>5:15 PM</td>
<td>Maass forms and the mock theta function f(q). Alexander J Dunn, University of Illinois at Urbana Champaign (1154-11-168)</td>
</tr>
<tr>
<td>5:45 PM</td>
<td>On certain partition identities related to A_q^2. Preliminary report. Shashank Kanade*, University of Denver, and Matthew C Russell, Rutgers, The State University of New Jersey (1154-11-315)</td>
</tr>
</tbody>
</table>
### AMS Special Session on Interactions of Inverse Problems, Computational Harmonic Analysis, and Imaging, II

2:15 PM – 6:05 PM

Room 107, Meeting Room Level, Colorado Convention Center

Organizers: M. Zuhair Nashed, University of Central Florida
Willi Freeden, University of Kaiserslautern
Otmar Scherzer, University of Vienna

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Authors</th>
<th>Affiliations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:15PM</td>
<td>Orthogonal Fourier expansions for certain fractals.</td>
<td>Palle Jorgensen*, University of Iowa, and Steen Pedersen, Wright State University</td>
<td>(1154-42-154)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:45PM</td>
<td>Variational extrapolation.</td>
<td>Alexander Zaitzeff, Selim Esedoglu*, Department of Mathematics, University of Michigan, and Krishna Garikipati, Department of Mechanical Engineering, University of Michigan</td>
<td>(1154-65-2104)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:45PM</td>
<td>Multiscale regularization strategies for the tensorial satellite gravitational gradiometry (SGG) problem.</td>
<td>Willi Freeden, University of Kaiserslautern, Germany, Helga Nutz*, CBM – Gesellschaft für Consulting, Business und Management mbH, Bexbach, Germany, Rainer Rummel, University of Munich, Germany, and Michael Schreiner, University of Applied Sciences of Technology NTB, Buchs, Switzerland</td>
<td>(1154-41-1533)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:45PM</td>
<td>A data-driven iteratively regularized Landweber iteration.</td>
<td>Andrea Aspri, Johann Radon Institute for Computational and Applied Mathematics (RICAM)</td>
<td>(1154-65-433)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5:15PM</td>
<td>On the Reconstruction of a Class of Signals Bandlimited to a Disc in the Linear Canonical Transform Domain.</td>
<td>Ahmed I Zayed, DePaul University</td>
<td>(1154-42-1036)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5:45PM</td>
<td>On the range characterization of the Radon transform in two dimensions. Preliminary report.</td>
<td>Alexandru Tamasan*, University of Central Florida, and Kamran Sadiq, Radon Institute for Computational and Applied Mathematics</td>
<td>(1154-35-1697)</td>
</tr>
</tbody>
</table>

### AMS Special Session on Noncommutative Geometry and Applications, II

2:15 PM – 6:05 PM

Room 110, Meeting Room Level, Colorado Convention Center

Organizer: Frederic Latremoliere, University of Denver

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Authors</th>
<th>Affiliations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:15PM</td>
<td>From random spectral triples to spectral curves and topological recursion.</td>
<td>Masoud Khalkhali* and Shahab Azarfar, University of Western Ontario, Canada</td>
<td>(1154-46-237)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:15PM</td>
<td>Dirac operators for matrix algebras converging to coadjoint orbits. Preliminary report.</td>
<td>Marc A. Rieffel, University of California, Berkeley</td>
<td>(1154-46-613)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:15PM</td>
<td>An Introduction to Noncommutative Fractal Geometry.</td>
<td>Michel L Lapidus, University of California, Riverside</td>
<td>(1154-46-205)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:45PM</td>
<td>Convergence of Spectral Triples on the Sierpinski Gasket.</td>
<td>Therese Landry*, Michel L Lapidus, University of California, Riverside and Frederic Latremoliere, University of Denver</td>
<td>(1154-46-1106)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5:15PM</td>
<td>Tensor-product coaction functors.</td>
<td>S. Kaliszewski*, Arizona State University, Magnus B. Landstad, Norwegian University of Science and Technology, and John Quigg, Arizona State University</td>
<td>(1154-46-1857)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5:45PM</td>
<td>Exact Sequences in the Enchilada Category.</td>
<td>Menevse Eryuzlu*, John Quigg and Steven Kaliszewski, Arizona State University</td>
<td>(1154-47-1506)</td>
</tr>
</tbody>
</table>

### AMS Special Session on Outreach Strategies for Reaching Underrepresented Students at the Pre-College Level, I

2:15 PM – 6:05 PM

Room 210/212, Meeting Room Level, Colorado Convention Center

Organizers: Jacob Castaneda, The Art of Problem Solving/Bridge to Enter Advanced Mathematics (BEAM)
Cory Colbert, Washington & Lee University
Li-Mei Lim, Boston University/PROMYS
Max Warshauer, Texas State University at San Marcos
Daniel Zaharopol, The Art of Problem Solving Initiative/Bridge to Enter Advanced Mathematics (BEAM)
Program of the Sessions – Wednesday, January 15 (cont’d.)

2:15 PM Building and Supporting Gender Diversity at Canada/USA Mathcamp.
Marisa Debowsky, Canada/USA Mathcamp (1154-97-2528)

2:45 PM GirlsGetMath: Building and expanding a day program for high school students.
Katharine Ott, Bates College (1154-97-646)

3:15 PM Research about Math Outreach Programs.
Max Warshauer* and Hiroko K Warshauer, Texas State University (1154-97-1483)

3:45 PM Reaching inside before Reaching Out: Acknowledgement before attempting to provide access.
Aris Benjamin Winger, Georgia Gwinnett College (1154-97-1426)

4:15 PM Program design and student outcomes at MIT mathroots.
Vishal Arul and Gweneth McKinley*, Massachusetts Institute of Technology (1154-97-740)

4:45 PM Prepare and Inspire: Broadening participation in STEM through outreach programs for pre-college students at MIT.
Reimi Hicks*, Eboney Hearn and Kristin Kurianski, MIT (1154-97-2737)

5:15 PM Early Access to Advanced Mathematics for Underrepresented Students.
Jacob Castaneda, Bridge to Enter Advanced Mathematics/Art of Problem Solving Initiative, Inc (1154-97-2545)

5:45 PM Supporting math proficiency and motivation through afterschool math enrichment: A focus on program design.
Alessandra Pantano, University of California, Irvine (1154-00-1523)

AMS Special Session on Rational Points on Algebraic Varieties: Theory and Computation, I (Associated with AMS Invited Address Anthony Varilly-Alvarado)

2:15 PM – 6:05 PM Room 405, Meeting Room Level, Colorado Convention Center

Organizers: Brendan Hassett, Brown/ICERM and Andrew Sutherland, MIT

2:15 PM Quadratic points on quartic del Pezzo surfaces: Preliminary report.
Brendan Creutz, University of Canterbury, and Bianca Viray*, University of Washington (1154-11-1235)

2:45 PM Low degree points on curves.
Geoffrey Smith, Harvard University, and Isabel Vogt*, Stanford University (1154-11-1324)

3:15 PM Effective Sato-Tate conjecture for abelian varieties and applications.
Alina Bucur, UCSD, Francesc Fité*, MIT, and Kiran Kedlaya, UCSD (1154-11-1372)

3:45 PM Sato-Tate Groups of Trinomial Hyperelliptic Curves.
Heidi Goodson, Brooklyn College (CUNY) (1154-11-1197)

4:15 PM Complexity of strong approximation on the sphere.
Naser Talebizadeh Sardari, Postdoctoral fellow/Institute for Advanced Study (1154-11-794)

4:45 PM Kodaira dimension of moduli spaces of low degree special $K3^{[2]}$-fourfolds.
Jack Petok, Rice University (1154-14-1381)

5:15 PM Variation of the rank of the group of algebraic cycles under reduction.
Edgar Costa, MIT (1154-11-1498)

5:45 PM The arithmetic of intermediate Jacobians.
Jeff Achter*, Colorado State University, Sebastian Casalaina-Martin, University of Colorado, and Charles Vial, Universität Bielefeld (1154-14-1359)

AMS Special Session on Recent Developments in Numerical Methods for PDEs, II

2:15 PM – 6:05 PM Room 113, Meeting Room Level, Colorado Convention Center

Organizers: Valeria Barra, University of Colorado Boulder

Yue Cao and Shuwang Li*, Dept. of Applied Math, Illinois Institute of Technology, Chicago, IL (1154-65-494)

2:45 PM Preconditioning with BDDC and FDM for High Order Finite Elements with libCEED. Preliminary report.

3:15 PM Multirate Time Integration Methods and Their Deployment in the SUNDIALS Library.
Carol S. Woodward*, David J. Gardner, John Loffeld, Lawrence Livermore National Laboratory, and Daniel R. Reynolds, Southern Methodist University (1154-65-1798)
AMS Special Session on Research in Graph Theory and Combinatorics by Research Experience for Undergraduate Faculty (REUF) Alumni and Their Students, II

2:15 PM – 6:05 PM
Room 303, Meeting Room
Level, Colorado Convention Center

Organizers: Katie Anders, University of Texas at Tyler
Kassie Archer, University of Texas at Tyler
Briana Foster-Greenwood, California State Polytechnic University-Pomona

2:15PM Peg Solitaire in Multiple Colors on Graphs. Preliminary report.
Tara C Davis*, Alexxis De Lamere, Hawaii Pacific University, Gustavo Sopena and Roberto Soto, California State University, Fullerton (1154-05-195)

2:45PM Matchings and Springer fibers.
Talia Goldwasser*, Meera Nadeem and Garcia Sun, Smith College (1154-05-2759)

3:15PM The Quick Introduction to the Mathematics of Redistricting.
John Asplund, Dalton State College (1154-05-415)

3:45PM Using Graph Theoretical Designs of Self Assembling DNA to Motivate Undergraduate Research. Preliminary report.
Amanda M Harsy*, Lewis University, Cory Johnson, California State University, San Bernardino, Eric Redmon, Paul Buldak, James Sparks and Miles Mena, Lewis University (1154-05-545)

4:15PM The analysis of complex networks and the evaluation of their complexity.
Rainhana Mokhliassi*, Mohammed V University, Rabat, Morocco, and Joyati Debnath, Winona State University (1154-05-290)

4:45PM Vertex differentiation in reconfiguration graphs. Preliminary report.
Janet Fierson*, Tyler Knappenberger and Ricky Whitmoyer, La Salle University (1154-05-2787)

Mary K Flagg and Phyllicia Tran*, University of St. Thomas (1154-05-1113)

5:45PM Interlace Polynomials of Friendship Graphs.
Christina Eubanks-Turner, Loyola Marymount University, and Aihua Li*, Montclair State University (1154-05-431)

AMS Special Session on Sequences, Words, and Automata, II

2:15 PM – 6:05 PM
Room 403, Meeting Room
Level, Colorado Convention Center

Organizers: Eric Rowland, Hofstra University
Manon Stipulanti, Hofstra University

2:15PM Duluthian Developments in the Anti-Powerful Words World.
Colin Defant, Princeton University (1154-05-162)

2:45PM Increasing consecutive patterns in words.
Mingjia Yang* and Doron Zeilberger, Rutgers University (1154-05-1466)

3:15PM The abelian complexity of infinite words and the Frobenius problem.
Ian Kaye and Narad Rampersad*, University of Winnipeg (1154-68-201)

3:45PM Abelian subshifts.
Svetlana Puzynina, Saint Petersburg State University, Russia (1154-05-1299)

4:15PM On non-repetitive complexity of Arnoux-Rauzy words.
Kateřina Medková, Edita Pelantová, Department of Mathematics, FNSPE, Czech Technical University in Prague, Czech Republic, and Elise Vandomme*, Liège, Belgium (1154-05-1343)
AMS Special Session on Spectral and Transport Properties of Disordered Systems, II

2:15 PM - 6:05 PM  Room 102, Meeting Room
Level, Colorado Convention Center

Organizers: Peter D. Hislop, University of Kentucky

Jeffrey Schenker, Michigan State University

2:15PM  Constructions of asymptotically hyperbolic manifolds with singular continuous spectrum embedded into the essential spectrum of the Laplacian.
Svetlana Jitomirskaya, UC Irvine, and Wencai Liu*, Department of mathematics, Texas A&M University (1154-47-920)

2:45PM  Dynamical Contrast on Highly Correlated Anderson Models.
Rodrigo Matos, Michigan State University (1154-47-1502)

3:15PM  The landscape law for the integrated density of states. Preliminary report.
Svitlana Mayboroda*, University of Minnesota, Guy David, Universite Paris-Sud, and Marcel Filoche, Ecole Polytechnique (1154-35-2638)

Benjamin Brodie* and Peter Hislop, University of Kentucky (1154-82-2566)

4:15PM  Lifshitz tails for the fractional Anderson model. Preliminary report.
Martin Gebert*, University of California, Davis, and Constanza Rojas-Molina, Universite de Cergy-Pontoise, France (1154-47-1413)

4:45PM  A spectral shift type estimate and its applications to the density of states measure for random Schrödinger operators.
Chris A Marx*, Oberlin College, and Peter D Hislop, University of Kentucky (1154-81-791)

5:15PM  Positive Lyapunov Exponents and a Large Deviation Theorem for Continuum Anderson Models. Briefly.
Valmir Bucaj, West Point, David Damanik, Rice University, Jake Fillman, Texas State University, Vitalii Gerbuz, Rice University, Tom VandenBoom*, Yale University, Fengpeng Wang, Ocean University of China, and Zhenghe Zhang, UC Riverside (1154-35-1801)

5:45PM  Topological Equivalence of Continuum Models with Their Discrete Tight-Binding Limits in the IQHE.
Jacob Shapiro* and Michael I Weinstein, Columbia University (1154-81-1412)
AMS Special Session on Symbolic Dynamics, II

2:15 PM – 6:05 PM Room 111, Meeting Room Level, Colorado Convention Center
Organizers: Ronnie Pavlov, University of Denver
Scott Schmieding, Northwestern University

2:15PM (411) Minimal symbolic actions of amenable groups with prescribed entropy. Preliminary report. Dominik Kwietniak* and Marta Straszak, Jagiellonian University in Krakow (1154-37-2029)

2:45PM (412) Extender Entropy. Thomas French* and Ronnie Pavlov, University of Denver (1154-37-1704)

3:15PM (413) Markovian properties of continuous group actions: algebraic actions, entropy and the homoclinic group. Felipe García-Ramos*, CONACyT & Universidad Autónoma de San Luis Potosí, Sebastián Barbieri, Université de Bordeaux, and Hanfeng Li, SUNY at Buffalo (1154-37-1079)

3:45PM (414) Entropy conjugacy for Markov multi-maps of the interval. Kevin McGoff*, University of North Carolina at Charlotte, and James P. Kelly, Christopher Newport University (1154-37-1053)


4:45PM (416) Invariant Random Subgroups of Full Groups. Artem Dudko, IMPAN, and Kostya Medynets*, United States Naval Academy (1154-37-1471)

5:15PM (417) Strong Speedups of Minimal Cantor Systems and Strong Orbit Equivalence. Drew D Ash, Albion College (1154-37-1420)

5:45PM (418) The weak Bernoulli property for matrix Gibbs states. Mark Piraino, Northwestern University (1154-37-642)

MAA Invited Paper Session on Research in Undergraduate Mathematics Education: Highlights from the Annual SIGMAA on RUME

2:15 PM – 4:35 PM Room 610/612, Meeting Room Level, Colorado Convention Center
Organizers: Shiv Smith Karunakaran, Michigan State University
Megan Wawro, Virginia Tech

2:15PM (419) Variational Reasoning Used by Students While Discussing Differential Equations. George Kuster*, Christopher Newport University, and Steven Jones, Brigham Young University (1154-AB-556)

2:45PM (420) Monster-barring as a catalyst for connecting secondary algebra to abstract algebra. John Paul Cook, Oklahoma State University (1154-AB-467)

3:15PM (421) Responsiveness as a Disposition and Its Impact on Instruction. Jessica Gehrz, University of Georgia (1154-AB-2110)

3:45PM (422) The Role of Multiplicative Objects in a Formula. Irma E. Stevens, University of Michigan (1154-AB-1160)

4:15PM (423) Using a computational context to investigate student reasoning about whether “order matters” in counting problems. Elise Lockwood, Oregon State University (1154-AB-524)

MAA Minicourse #9: Part A

2:15 PM – 4:15 PM Room 706, Meeting Room Level, Colorado Convention Center
Combining Mathematical and Computational Thinking in a General Education Math Course.
Presenters: Michelle Friend, University of Nebraska, Omaha
Betty Love, University of Nebraska, Omaha
Michael Matthews, University of Nebraska, Omaha
Victor Winter, University of Nebraska, Omaha

MAA Minicourse #5: Part A

2:15 PM – 4:15 PM Room 708, Meeting Room Level, Colorado Convention Center
Presenter: Martin Flashman, Humboldt State University

MAA Minicourse #4: Part A

2:15 PM – 4:15 PM Room 704, Meeting Room Level, Colorado Convention Center
Visualizing Multivariable Calculus & Differential Equations Using CalcPlot3D.
Presenters: Paul Seeburger, Monroe Community College
Monica VanDieren, Robert Morris University
AMS Contributed Paper Session on General Topics

2:15 PM – 5:25 PM Room 208, Meeting Room Level, Colorado Convention Center

2:15PM Escalator etiquette: Stand or walk? That is the question. Preliminary report.
Michael C. Fu, University of Maryland, College Park (1154-00-18)

2:30PM Preserving Identifiability in Linear Compartmental Models.
Seth Gerberding, University of South Dakota (1154-00-743)

2:45PM Communication, Representation, and Community: Entry Points to Advanced Mathematics.
Francesca Bernardi*, Florida State University, and Katrina Morgan, Northwestern University (1154-00-1581)

3:00PM Uncovering and Understanding Population Difference with Topological Method. Preliminary report.
X Wang*, Tougaloo College, WA Pruett and J Wilson, University of Mississippi Medical Center (1154-00-1964)

Timothy Jesse Redford* and Xingjie Helen Li, University of North Carolina at Charlotte (1154-00-2034)

3:30PM RNN and NMF Chatbot: Combining two machine-learning techniques to create a dynamic, topic-aware chatbot. Preliminary report.
Yuliang Wang*, Zhe Xiong, Shanghai Jiao Tong University, Jiahao Qu, Nicholas Liskij, University of California, Los Angeles, Nicholas Hanoian, University of Vermont, Henry Sojico, Harvey Mudd College, Yuchen Guo, Hunan University, Zhexiao Lin, Zhejiang University, Zhenhong Zou, Beihang University, and Hanbeak Lyu, UCLA (1154-00-2269)

3:45PM Generalized permutations. Preliminary report.
Orli Herscovici, Technion - Israel Institute of Technology (1154-05-1344)

4:00PM Multi-scale Modeling of Neurostimulation with Application to Post-traumatic Stress Disorder.
Abigail T Small* and Edward T Dougherty, Roger Williams University (1154-00-2785)

4:15PM Determinacy of Schmidt’s Game and other Intersection Games.
Logan Crone*, Lior Fishman and Stephen Jackson, University of North Texas (1154-03-1084)

4:30PM Hyperdoctrines in Relevant Logic.
Shay Allen Logan, Kansas State University (1154-03-1433)

John Temidayo Falade, Sam Houston State University (1154-03-2038)

5:00PM Uncertainty quantification of surface tension in a rising bubble using boundary integrals. Preliminary report.
Oana Marin* and Marieme Ngom, Argonne National Laboratory (1154-45-2806)

5:15PM On the Orlicz function and bicomplex paranormed space $C_2(s)$ of double sequences.
Sukhdev Singh, Lovely Professional University, Punjab, INDIA (1154-40-987)

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

2:15 PM – 4:15 PM Room 507, Meeting Room Level, Colorado Convention Center

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

2:15PM Using a Categorization Activity to Develop Students’ Reasoning about Fundamental Counting Formulas. Preliminary report.
Elise Lockwood* and Zackery Reed, Oklahoma State University (1154-D1-566)

Edmund A Lamagna, University of Rhode Island (1154-D1-894)

2:55PM Teaching Discrete Mathematics as a Writing-Intensive Course.
Miriam Harris-Botzum, Lehigh Carbon Community College (1154-D1-2386)

3:15PM Discrete Mathematics – Where to Start
William Ted Mahavier*, Lamar University, and David M. Clark, SUNY New Paltz (1154-D1-1715)

(Rachel) Shelley Stahl, Bridgewater State University (1154-D1-2262)

4:00PM Making Proofs Palatable!
Satish C. Bhatnagar, University of Nevada Las Vegas (1154-D1-1070)

MAA Contributed Paper Session on Integrating Research into the Undergraduate Classroom

2:15 PM – 5:30 PM Room 505, Meeting Room Level, Colorado Convention Center

Organizers: Timothy B. Flowers, Indiana University of Pennsylvania
2:15 PM – 5:50 PM

Room 504, Meeting Room
Level, Colorado Convention Center

Organizer: Douglas Norton, Villanova University

MAA Contributed Paper Session on Mathematics and the Arts: in the Classroom and Beyond, II

2:15 PM

Shannon R. Lockard, Bridgewater State University

“When will I ever use this?” Incorporating Student Research into an Introductory Linear Algebra Course. Preliminary report. Sarah L. Marsh, Oklahoma Baptist University (1154-I1-1922)

2:35 PM

Research in the Discrete Math and Combinatorics Classroom. Cayla D. McBee, Providence College (1154-I1-2630)

2:55 PM


3:15 PM


3:35 PM


3:55 PM

How Exposure to Research in Numerical PDEs Influenced Students In My PDE Class. Minah Oh, James Madison University (1154-I1-1135)

4:15 PM

Bringing Industrial Mathematics Projects into classroom. Mikhail Berezovsky, Embry-Riddle Aeronautical University (1154-I1-1782)

4:35 PM

Collaborative Classroom Research Projects Motivated by Applications to National Security. Mikhail Berezovsky, Embry-Riddle Aeronautical University, Marylesa Howard, Nevada National Security Site, and Aaron Luttman*, Pacific Northwest National Laboratory (1154-I1-850)

4:55 PM

Above and beyond traditional instruction through integrating research projects into Calculus classroom. Viktoria Savatorova*, Central Connecticut State University, and Aleksei Talonov, University of Nevada Las Vegas (1154-I1-35)

5:15 PM

Internationalizing the Undergraduate Calculus Course at Albany State University. Preliminary report. Chineny Ofohille, Albany State University (1154-I1-649)

2:15 PM

A NEW DAWN By ‘narrative voice’ of Leonardo da Vinci. Rosanna lembo*, Crotone, Calabria, Italy, Irene Iaccarino, High School of Music, and Maria Rosaria Iaccarino, Headmaster (1154-K1-854)

2:35 PM

The vague boundary between geometric models and mathematical art: Examples from the geometry classroom to the sculpture gallery. Zachary Treisman, Western Colorado University (1154-K1-2438)

2:55 PM


3:15 PM

Learning mathematics through mathematical modeling of crafts. Maria Alagic, Wichita State University, Wichita, Kansas (1154-K1-2775)

3:35 PM

Using Papercrafting to Create Hyperbolic Patterns. Preliminary report. Douglas Dunham*, University of Minnesota Duluth, and Lisa Shier, University of Maryland Global Campus (1154-K1-1199)

3:55 PM


4:15 PM


4:35 PM

Another cellular automaton for generative art. Preliminary report. Gary R Greenfield, University of Richmond (1154-K1-1698)

4:55 PM

Anamorphic distortion: it’s closer than you think. Annalisa Crannell, Franklin & Marshall College (1154-K1-2233)

5:15 PM


5:35 PM

Recent Progress in Opt Art. Preliminary report. Zachary Treisman, Western Colorado University (1154-K1-2438)

83
Program of the Sessions – Wednesday, January 15 (cont’d.)

2:15PM Using SIMIODE Scenarios to Drive a Differential Equations Course.
Carl Lienert, Fort Lewis College (1154-L5-1011)

2:35PM Throwing a ball can be such a drag.
Chris McCarthy, Borough of Manhattan Community College City University of New York (1154-L5-2196)

2:55PM Be sure to step out of the room – good advice for teaching modeling.
Brian J Winkel, Director, SIMIODE, Cornwall NY USA (1154-L5-1691)

MAA Contributed Paper Session on Tangents to Math Circles

2:15 PM – 6:10 PM Room 506, Meeting Room Level, Colorado Convention Center
Organizers: Amanda Serenevy, Riverbend Community Math Center
James Taylor, Math Circles Collaborative of New Mexico

2:15PM Math Circles Library as a source of thought-provoking problems for math circles and classrooms.
Tatiana Shubin, San Jose State University (1154-P5-2721)

2:35PM Math Circle-type Activities in K-5 Intervention Classes.
Gabriella Pinter, University of Wisconsin-Milwaukee (1154-P5-1890)

2:55PM Mathematical Zendo.
Corey Pooler and Philip DeOrsey, Westfield State University (1154-P5-604)

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

2:15 PM – 3:10 PM Room 503, Meeting Room Level, Colorado Convention Center
Organizers: Tom Banchoff, Brown University
Curtis Bennett, California State University Long Beach
Jacqueline Dewar, Loyola Marymount University
Edwin Herman, University of Wisconsin-Stevens Point
Lew Ludwig, Denison University

2:15PM Perspectives of MathChavrusa in Collegiate Classrooms.
Rochy Flint and Baldwin Mei, Teachers College, Columbia University (1154-O5-1740)

2:35PM Maximizing Inclusion and Engagement while Raising the Bar with Second Chance Homework. Preliminary report.
Sarah J Greenwald, Appalachian State University (1154-O5-29)

2:55PM Examining the Secondary-Tertiary Transition from Multiple Perspectives. Preliminary report.
Kathleen Michelle Clark and Seyda Uysal, Florida State University (1154-O5-2702)

MAA General Contributed Paper Session on Applied Mathematics, I

2:15 PM – 5:10 PM Room 707, Meeting Room Level, Colorado Convention Center
Organizers: Cathy Erbes, Hiram College
Holley Friedlander, Dickinson College
Steven McKay, Brigham Young University
2:15PM Stochastic Functional Expansion for Identifying the Effective Heat Conductivity Coefficient of Polydisperse Suspension.
Abhinandan Chowdhury, Savannah State University (1154-VN-2392)

2:30PM Numerical Stability Analysis Of A Weak Rectangular Method For a Class of Stochastic Differential Equations.
Ram Sharan Adhikari, Rogers State University (1154-VN-1360)

2:45PM Combining Genetic Algorithms and Machine Learning (CgALM) for Modeling Complex Systems.
Katherine Thai*, Rutgers University, New Brunswick, Jacob Chang, University of Notre Dame, Rachel Duquette, Boston College, and Tongyu Zhou, Williams College (1154-VN-373)

3:00PM A Statistical Learning Model for Embedding Rating Scale Data. Preliminary report.
Michael Lamar*, Centre College, Jordan Turley, Harvard University, and Zeyang Huang, Centre College (1154-VN-2391)

3:15PM Solving PDEs with Neural Networks.

3:30PM A distributed active subspace method for scalable surrogate modeling of function valued outputs. Preliminary report.
Hayley Guy*, Alen Alexanderian, North Carolina State University, and Mellin Yu, University of Maryland, Baltimore County (1154-VN-2351)

Francesca Bernardi*, Nicholas G. Cogan and M. Nicholas J. Moore, Florida State University (1154-VN-1582)

4:00PM Optimal Control of Coefficients in Parabolic Free Boundary Problems Modeling Laser Ablation.
Ugur Abdulla, Jonathan Goldfarb and Ali Hagverdiyev*, Florida Institute Of Technology (1154-VN-164)

4:15PM Exact Controllability of Third order Dispersion Equation.
Dimplekumar Navinchandra Chalishajar, Virginia Military Institute (1154-VN-461)

Oliver Nina, Air Force Research Laboratory, Jamison M Moody*, Brigham Young University, and Clarissa Milligan, Wright State University (1154-VN-1985)

4:45PM A bilinear Bäcklund transformation is presented for a (3+1)-dimensional generalized KP equation with variable coefficients.
Alrazi M Abdeljabbar, Khalifa University (1154-VN-1540)

5:00PM Consistent Finite Difference Scheme for 1D Nonlocal to Local Diffusion Problem: Analysis and Simulation.
Amanda K Gute* and Xingjie Helen Li, University of North Carolina Charlotte (1154-VN-1507)

MAA General Contributed Paper Session on Mentoring and Assessment

2:15PM – 5:55 PM Room 709, Meeting Room Level, Colorado Convention Center

Organizers: Cathy Erbes, Hiram College
Holley Friedlander, Dickinson College
Steven McKay, Brigham Young University

2:15PM Teaching iGen: Characteristics of Generation Z and implications for the college mathematics classroom.
Paul R. Bialek, Trinity International University (1154-VE-1032)

2:30PM Mentoring Cross Institutional Undergraduate Research Projects.
Elizabeth A. Donovan*, Murray State University, and Lesley W. Wiglesworth, Centre College (1154-VE-1736)

2:45PM Mentoring Students Through Research Projects. Preliminary report.
Frederick M Butler, York College of Pennsylvania (1154-VE-666)

3:00PM Establishing a Peer-mentoring program for Underrepresented Populations of Students at a Liberal Arts College.
Vira Babenko and Maryann Huey*, Drake University (1154-VE-2619)

3:15PM A Support Structure of Mathematics Department at a Hispanic Serving Institution.
Suleyman Tek, University of the Incarnate Word (1154-VE-1879)

3:30PM Lessons Learned in Designing & Implementing a Peer Mentoring Component to a Comprehensive Training Program for GTAs in the Mathematical Sciences.
RaiKissa D Manzanares*, Michael Ferrara, Michael Jacobson and Gary Olson, University of Colorado Denver (1154-VE-1747)

3:45PM Creating a Mathematics Community of Best Practices.
Elizabeth Schott, Laurice Garrett and Kelsea Livingstone*, Florida SouthWestern State College (1154-VE-2578)
4:00PM  College Algebra Classrooms - Assessment Study and the Challenges Ahead. Preliminary report. 
Perry Y.C. Lee* and Padraig M. McLoughlin, Kutztown University of Pennsylvania (1154-VE-2553)

Robert Campbell and Anne Sinko*, College of St. Benedict/St. John’s University (1154-VE-1849)

Timmy Ma, Dartmouth College (1154-VE-745)

4:45PM  Inter-rater reliability in departmental assessment. Preliminary report. 
Bernadette Mullins*, Catherine Cashio and Allie Ray, Birmingham-Southern College (1154-VE-2243)

5:00PM  Investigating item parameter distributions. Preliminary report. 
Fidele Ngwane, University of South Carolina, Salkehatchie (1154-VE-1939)

5:15PM  Role of Instruction on Spatial Skills on Middle School Students. 
Samuel Obara, Texas State University San Marcos TX (1154-VE-411)

5:30PM  An Inquiry into the Relationship Between Participation in Competitive Creative Math Competitions and Measures of Academic Success in High School Students. Preliminary report. 
Achyuth Syamchandra*, Transitions Lab Preparatory School, Alphonse O’Bannon, LBA Foundation, Ruchira Sarkar, Delhi Public School Faridabad, Nanda Kumar, Shanti Niketan School, Roopsa Sen, Delhi Public School Vasant Kunj, Ojus Sharma, Podar School, and Aditya Nair, Mumbai, India (1154-VE-2216)

5:45PM  Self-Efficacy in the Flipped Calculus II Classroom. Preliminary report. 
John A. Kerrigan, Rutgers University (1154-VE-70)

2:30PM  Mathematical Model for Nutrient and Wastes Exchange Across the Placenta. 
Boniface O. Kwach*, Kibabii University, Department of Mathematics and Statistics, Omolo N. Ongati and Olelo Joel Odongo, JOOUST, School of Mathematics and Actuarial Science (1154-VF-1667)

2:45PM  Automated Identification of Sinkholes. Preliminary report. 
Yonathan Admassu and Celes Woodruff*, James Madison University (1154-VF-2352)

3:00PM  Connections of Molecular Symmetry with mathematics. 
Courtney Ann Frazier* and Ramanjit K. Sahi, Austin Peay State University (1154-VF-852)

3:15PM  Cheating and its detection in games such as poker and paintball. 
Amanda Metzner and Dan Zwillinger*, BAE Systems (1154-VF-2704)

3:30PM  Modeling volatility dependence for count time series data. 
Hadi Safari Katesari* and S. Yaser Samadi, Department of Mathematics, Southern Illinois University Carbondale (1154-VF-2011)

3:45PM  Minimizing Drug Resistant Cases of Gonorrhea through Cost-Effective Treatment Plans. 
Ixtaccihuatl Hortencia Obregon, University of the Incarnate Word (1154-VF-1929)

4:00PM  Meta-modeling and uncertainty quantification of an air quality simulation chain at urban scale. 

4:15PM  A model for visual circuit development. 
Jennifer Crodelle, Courant Institute, NYU (1154-VF-970)

4:30PM  Simulating Bacterial Swimming Dynamics in Stokes Flow with a Stochastic Model of Chemotaxis. 
John LaGrone, Tulane University (1154-VF-1024)

Leif Zinn-Brooks* and Marcus Roper, University of California Los Angeles (1154-VF-2513)
5:00PM  A Hybrid Evolutionary-Gradient Algorithm for Finding the Global Minimizer of a Nonlinear Optimization Problem. 
Mahmoud El-Alem*, Department of Mathematics and Computer Science, Faculty of Science, Alexandria University, Alexandria, Egypt, and Salem Mahdi, Educational Research and Development Center Sa’ana, Yemen (1154-VF-275)

David Deng, Image Processing Center, School of Astronautics, Beihang University, Beijing, China, and Michael Xue*, Vroom Laboratory, Indianapolis, IN, U.S. (1154-VF-1389)

5:30PM  Demand Dynamics for Capital Shares in Nairobi Security Exchange. 
Omondi J. Ouno*, Maasai Mara University, Department of Mathematics and Physical Sciences, and Dr. Boniface o. Kwach, Kibabii University, Department of Mathematics and Statistics (1154-VF-2075)

SIAM Minisymposium on Applications of Machine Learning to the Analysis of Nonlinear Dynamical Systems

2:15 PM – 6:00 PM  Room 301, Meeting Room Level, Colorado Convention Center
Organizers: Juan G. Restrepo, University of Colorado at Boulder and Maziar Raissi, Brown University

2:15PM  Learning reduced dynamical-system models from data. 
Benjamin Peherstorfer, Courant Institute of Mathematical Sciences, New York University (1154-65-555)

Sifan Wang and Paris Perdikaris*, University of Pennsylvania (1154-68-2423)

Oksana A Chkrebtii*, The Ohio State University, and David A Campbell, Carleton University (1154-34-1002)

Lu Lu*, Brown University, P Jin, Chinese Academy of Sciences, Y Su, Fuzhou University, and George Karniadakis, Brown University (1154-37-581)

4:15PM  Break.

4:30PM  Physics-compatible metrics for clustering algorithms. 
Mohammad Farazmand, Department of Mathematics, NC State University (1154-37-651)

5:00PM  Uniformly Accurate Machine Learning Based Hydrodynamic Models for Kinetic Equations. 
Jiequn Han*, Chao Ma, Princeton University, Zheng Ma, Purdue University, and Weinan E, Princeton University (1154-70-2645)

5:30PM  Nonchaotic Models and Predictability of the Users’ Traffic Dynamics on Internet Platforms. 
Victoria Rayskin, Tufts University (1154-37-1845)

AMS Panel Discussion

2:15 PM – 3:45 PM  Room 203, Meeting Room Level, Colorado Convention Center
Mental Health in the Mathematics Profession
Organizers: Justin Curry, SUNY Albany and Mikael Vejdemo-Johansson, CUNY College of Staten Island / CUNY Graduate Center
Moderator: Helen Grundman, Bryn Mawr College
Panelists: Justin Curry, SUNY Albany, Adriana Salerno, Bates College, Christopher Tralie, Ursinus College, Mikael Vejdemo-Johansson, CUNY College of Staten Island / CUNY Graduate Center

MAA Workshop

2:15 PM – 3:25 PM  Room 605, Meeting Room Level, Colorado Convention Center
Designing and Implementing Assessments in Undergraduate Mathematics: Strategies and Examples.
Organizers: Beste Gucler, University of Massachusetts Dartmouth and Gulden Karakok, University of Northern Colorado

MAA Panel

2:15 PM – 3:35 PM  Room 601, Meeting Room Level, Colorado Convention Center
Leveraging Social Media for the Greater Good of Mathematics
Organizer: Quinn A. Morris, Appalachian State University
Panelists: Madeline Alvis, Mathematical Association of America and Tai-Danae Bradley, The Graduate Center, CUNY
Program of the Sessions – Wednesday, January 15 (cont’d.)

Anna Haensch, Duquesne University
Piper H., University of Hawaii at Manoa
Dave Richeson, Dickinson College

MAA Panel

2:15 PM – 3:35 PM Room 603, Meeting Room Level, Colorado Convention Center

Strategies for Mid-Career Faculty
Organizers: Erin Martin, William Jewell College
Azadeh Rafizadeh, William Jewell College
Panelists: Erica Flapan, Pomona College/AMS
Michel Lapidus, University of California, Riverside/AMS
P. Gavin LaRose, University of Michigan
T. Chris Stevens, St. Louis University/AMS

Association for Women in Mathematics Panel Discussion

2:15 PM – 3:40 PM Room 201, Meeting Room Level, Colorado Convention Center

Queer Families and Mathematical Careers.
Organizers: Alice Mark, Vanderbilt University
Corrin Clarkson, Vanderbilt University
Alex Hoover, University of Akron
Maggie Tomova, University of Iowa
Moderator: Alice Mark, Vanderbilt University
Panelists: Amanda Folsom, Amherst College
Matt Voigt, San Diego State University
May Mei, Denison University
Chikako Mese, Johns Hopkins University

AMS Special Event

2:15 PM – 4:15 PM Mile High Ballroom 4a-4c, Ballroom Level, Colorado Convention Center

Activities in NSF’s Division of Mathematical Sciences (NSF-DMS)
Organizer: Henry Warchall, NSF, Division of Mathematical Sciences, MPS/DMS

The Dolciani Award Lectures

2:15 PM – 2:45 PM Room 702, Meeting Room Level, Colorado Convention Center

Presentation by the 2019 Mary P. Dolciani Award winner, Joseph Gallian, “The Current State of Undergraduate Research in Mathematics in the U.S.”
Organizer: Tina H. Straley, Mathematical Association of America

AMS Contributed Paper Session on Functional Analysis, Operator Theory and Operator Algebras, II

2:30 PM – 5:25 PM Room 204, Meeting Room Level, Colorado Convention Center

2:30PM (529) Further generalized hybrid mappings and attractive points.
Safeer Hussain Khan, Department of Mathematics, Statistics and Physics, Qatar University, Doha 2713, Qatar.
(1154-47-2831)

2:45PM (530) A Boundary Norm for Weighted Dirichlet Spaces.
B T Kidane, University of North Georgia (1154-47-207)

3:00PM (531) Spectra of Composition Operators on the Drury-Arveson Space of Analytic Functions on the Unit Ball in $C^2$.
Michael R. Pilla, Indiana University-Purdue University, Indianapolis (1154-47-313)

3:15PM (532) New Approach to Operator theory which contradicts the Enflo Conclusion.
Tepper L. Gill, Howard University (1154-47-588)

3:30PM (533) Trace Formulas for Perturbations of Operators with Hilbert-Schmidt Resolvents.
Bishnu P. Sedai, Minot State University (1154-47-335)

3:45PM Break

4:00PM (534) Pure Quasinormal Operators have Supercyclic Adjoints. Preliminary report.
Kit C Chan and Serge P. Phanzu*, Bowling Green State University (1154-47-1462)

William Feldman, University of Arkansas (1154-47-1696)

4:30PM (536) A characterization for l2-radial completely positive multipliers on free groups. Preliminary report.
Chian Yeong Chuah, Baylor University (1154-47-2421)

4:45PM (537) Determining Hyperrigidity of Operator Systems.
Stephanie Prahl, University of Nebraska-Lincoln (1154-47-2620)
AMS Contributed Paper Session on Geometry and Differential Geometry

2:30 PM – 5:10 PM Room 206, Meeting Room Level, Colorado Convention Center

2:30PM  Space-time staircase metric tori.
► (540) Kyle Andre* Anh Tran and J Mealy, Austin College (1154-51-160)

2:45PM  Grid dissections of tangential quadrilaterals.
► (541) Joonsoo Lee, Dwight Englewood School, and Jiho Justin Lee, Canterbury School (1154-51-22)

3:00PM  On the polygon determined by the short diagonals of a convex polygon.
► (542) Yi Won Stefan Kim*, Taft School, and Andrew Woojong Lee, Choate Rosemary Hall (1154-52-21)

3:15PM  Minkowski Problems.
(543) Deane Yang, New York University (1154-52-106)

3:30PM  On the largest axis-parallel empty rectangle among points in a square.
► (544) Taeyang David Park*, Peddie School, and Geo Yeong Shuna Kwag, Blair Academy (1154-52-23)

3:45PM  Rigidity of Points, Circles, and Spheres.
► (545) Preliminary report.
Opal J Graham, Florida State University (1154-52-1285)

4:00PM  The Largest Angle Bisection Procedure.
► (546) Jeewoo Lee*, Townsend Harris HS, and Kelvin Kim, Bergen Catholic HS (1154-52-1574)

4:15PM  Isoperimetric Tilings of Closed Hyperbolic Surfaces.
► (547) Kevin Li, Christopher Xue*, Jack Hirsch and Jackson Petty, Yale University (1154-52-2579)

4:30PM  Symmetries of the Eikonal Equation on a Lorentzian space.
► (548) Preliminary report.
Riad Ghanam*, Virginia Commonwealth University in Qatar, and Gerard Thompson, University of Toledo (1154-53-30)

4:45PM  Singularity of Two-Step Nilpotent Lie Algebras Constructed from Graphs.
► (549) Preliminary report.
Rachelle DeCoste, Wheaton College, Lisa DeMeyer, Meera Mainkar, Central Michigan University, and Allie Ray*, Birmingham-Southern College (1154-53-1830)

5:00PM  Local geometry of 2-nondegenerate CR structures: classification of symbols and maximally symmetric homogeneous models. Preliminary report.
David Sykes* and Igor Zelenko, Texas A&M University (1154-53-1041)

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

2:35 PM – 5:50 PM Room 501, Meeting Room Level, Colorado Convention Center

Organizers: Brian Katz, Augustana College
Carl Mummert, Marshall University
Victor I. Piercey, Ferris State University

2:35PM  IBL and multiple choice tests.
► (551) Krystyna Kuperberg, Auburn University (1154-H5-33)

2:45PM  An inquiry-based approach to Cauchy’s Theorem.
► (552) Joshua P. Bowman, Pepperdine University (1154-H5-2012)

3:15PM  Reflective Writing for IBL Classrooms.
► (553) Erika L Ward, Jacksonville University (1154-H5-1599)

3:35PM  Guided student reflections in an inquiry-based mathematics classroom.
► (554) Preliminary report.
Ekaterina Lioutikova, University of Saint Joseph (1154-H5-3880)

3:55PM  Modeling Sound Waves in Trigonometry.
► (555) Andrew Diener, Christian Brothers University (1154-H5-2222)

Amanda Croll and Julie Melberg*, Concordia University Irvine (1154-H5-2745)

4:35PM  Encouraging Student Buy-In through Islamic Geometry with Technology.
► (557) Philip DeOrsey* and Christine von Renesse, Westfield State University (1154-H5-1870)

4:55PM  An Open Source Collection of Tasks for Inquiry-Based Numerical Analysis.
► (558) Eric Sullivan, Carroll College (1154-H5-509)

5:15PM  Using IBL Methods and Games to Teach Logic and Proof Writing to Non-Math Majors.
► (559) Heidi M. Andersen, University of Dallas (1154-H5-2407)
Program of the Sessions – Wednesday, January 15 (cont’d.)


AMS Contributed Paper Session on Partial Differential Equations and Applications, II

2:45 PM – 5:55 PM Room 202, Meeting Room Level, Colorado Convention Center

2:45 PM  ► (561) Analysis of the Bi-anisotropic Maxwell system in Lipschitz domains. Eric Stachura, Kennesaw State University (1154-35-1075)


3:15 PM  ► (563) Optimal control of sterile insect techniques. Maeve L. McCarthy*, K. Renee Fister, Murray State University, and Seth F. Oppenheimer, Mississippi State University (1154-35-1578)


4:00 PM  ► (566) On the existence of strong solution to the 3D incompressible Navier-Stokes equations with damping. Zhanerke Temirgaliyeva, University of Southern California (1154-35-2458)


4:30 PM  ► (568) Quenching in Two Dimensional Time Fractional Reaction-Diffusion Equation. Subhash Subedi*, Coastal Carolina University, and Aghalaya S. Vatsala, University of Louisiana at Lafayette (1154-35-2474)

4:45 PM  ► (569) Nonlinear diffusion equations with discontinuous nonlinearities. Dohyun Kwon*, University of California, Los Angeles, and Alpár Richárd Mészáros, Durham University (1154-35-2509)

5:00 PM  Break


5:45 PM  ► (572) An SDE Representation of Particle Transport for Low Power Implementation. J. Darby Smith* and Rich Lehoucq, Sandia National Laboratories (1154-35-265)

AMS Special Session on Quantization for Probability Distributions and Dynamical Systems

3:00 PM – 5:50 PM Room 109, Meeting Room Level, Colorado Convention Center

Organizer: Mrinal Kanti Roychowdhury, University of Texas Rio Grande Valley

3:00 PM  ► (573) An application of entropy to genomics. Preliminary report. Jane M. Hawkins, Univ. of North Carolina at Chapel Hill (1154-37-1612)

3:30 PM  ► (574) Can the dimension of a fractal set or measure be inferred from projections? William Ott* and Edward Stout, University of Houston (1154-37-2463)

4:00 PM  ► (575) Orbit equivalence and Bernoulli rigidity. David Kerr*, Texas A&M University, and Hanfeng Li, SUNY at Buffalo (1154-37-1422)


5:00 PM  ► (577) Orders of Oscillation Motivated By Sarnak’s Conjecture. Yunping Jiang, The City University of New York-Queens College and Graduate Center (1154-37-889)

**Relatively Prime Live: Truthiness in the Mathematical Domain**

3:00 PM – 3:55 PM  
Room 702, Meeting Room Level, Colorado Convention Center

Organizer: Samuel Hansen, University of Michigan and ACMEScience.com

**MAA Invited Address**

3:20 PM – 4:10 PM  
Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center  

(579) *The art and craft of problem design.*  
Mohamed Omar, Harvey Mudd College  
(1154-A0-75)

**MAA Contributed Paper Session on Abstract Algebra: Teaching, Topics, and Techniques, I**

3:40 PM – 4:55 PM  
Room 503, Meeting Room Level, Colorado Convention Center

Organizers: Jessie Lenarz, St. Catherine University  
Kristi Meyer, Wisconsin Lutheran College

3:40 PM  
Enhancing Abstract Algebra Classes with Various Teaching Techniques and Activities. Preliminary report.  
Violeta Vasilevska, Utah Valley University (1154-A1-901)

4:00PM  
Bringing back the take-home exam: an experiment to assess ownership in an Abstract Algebra course. Preliminary report.  

4:20PM  
Incorporating Student Choice in Assessment in Abstract Algebra. Preliminary report.  
Myron Minn-Thu-Aye, University of Connecticut (1154-A1-1288)

4:40PM  
John K Osoinach, The University of Dallas (1154-A1-2329)

**MAA Workshop**

3:40 PM – 5:00 PM  
Room 605, Meeting Room Level, Colorado Convention Center

Improving Undergraduate Mathematics Courses Using Problems from Partner Disciplines.  
Organizers: Suzanne Dor/ee, Augsburg University  
Susan Ganter, Embry-Riddle Aeronautical University  
Stella Hofrenning, Augsburg University  
Victor Piercey, Ferris State University

**AWM Business Meeting**

3:45 PM – 4:15 PM  
Room 201, Meeting Room Level, Colorado Convention Center

**MAA Section Officers**

4:00 PM – 5:00 PM  
Room 702, Meeting Room Level, Colorado Convention Center

Chair: Lisa Marano, West Chester University of Pennsylvania

**AMS Committee on the Profession Panel Discussion**

4:30 PM – 6:00 PM  
Room 203, Meeting Room Level, Colorado Convention Center

Mathematics and Ethics  
Moderator: Gigliola Staffilani, Massachusetts Institute of Technology  
Panelists: Catherine Buell, Fitchburg State University  
Michael Harris, Columbia University  
Dagan Karp, Harvey Mudd College  
Jill Pipher, Brown University

**Project NExT**

4:30 PM – 5:45 PM  
Mile High Ballroom 4d-4f, Ballroom Level, Colorado Convention Center

Getting Started in Undergraduate Mathematics Education Research.  
Organizers: Steve Bennoun, Cornell University  
Aubrey Kemp, California State University Bakersfield  
Zoe Misiewicz, State University of New York Oswego  
Christina Osborne, Ohio State University

**Premiere of a documentary film about the Duluth REU**

5:00 PM – 6:00 PM  
Room 607, Meeting Room Level, Colorado Convention Center

Join us for the first ever public showing of a film about the longest running REU in the nation.  
Organizer: Shah Roshan Zamir, University of Nebraska Lincoln
### SIGMAA on Mathematics and the Arts Business Meeting and Reception

5:00 PM – 7:00 PM  
Room 502, Meeting Room Level, Colorado Convention Center

**Reception for Graduate Students and First-Time Participants**

5:30 PM – 6:30 PM  
Centennial Ballroom A, B, C, 3rd Floor, Hyatt Regency Denver

Mathematical Institutes Open House

5:30 PM – 8:00 PM  
Centennial Ballroom F, G, H, 3rd Floor, Hyatt Regency Denver

### MAA Panel

6:00 PM – 7:00 PM  
Room 601, Meeting Room Level, Colorado Convention Center

**Students’ Perspectives on Undergraduate Research Experiences**

Organizers:  
- **Allison Henrich**, Seattle University  
- **Laramie Paxton**, Marian University-Wisconsin  
- **Maria Mercedes Franco**, Queensborough Community College, CUNY

Moderator: **Maria Mercedes Franco**, Queensborough Community College, CUNY

Panelists:  
- **Amelia Cantwell**, University of Montana  
- **Natasha Crepeau**, Harvey Mudd  
- **Esteban Escobar**, California State Polytechnic University, Pomona  
- **Harold Jimenez Polo**, University of Florida  
- **Vinny Jodoin**, University of Tennessee

### SIGMAA on the History of Mathematics (HOM SIGMAA) Business Meeting and Reception

6:00 PM – 6:55 PM  
Room 505, Meeting Room Level, Colorado Convention Center

Organizer: **Toke Lindegaard Knudsen**, State University of New York at Oneonta

### SIGMAA on the History of Mathematics (HOM SIGMAA) Guest Speaker

7:00 PM – 7:50 PM  
Room 505, Meeting Room Level, Colorado Convention Center

**The historical representation of women in mathematics.**

**June Barrow-Green,** School of Mathematics & Statistics, The Open University, Milton Keynes, UK  
(1154-A0-358)

### MathILY, MathILy-Er, MathILy-EST Yearly Gather

7:00 PM – 8:30 PM  
Mineral Hall A, 3rd Floor, Hyatt Regency Denver

**AMS Josiah Willard Gibbs Lecture**

8:30 PM – 9:20 PM  
Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center

**In praise of small data: statistical and data science.**

**Nancy Reid,** University of Toronto  
(1154-62-10)

---

**Thursday, January 16**

### Joint Meetings Registration

7:30 AM – 4:00 PM  
Lobby C, Meeting Room Level, Colorado Convention Center

### Email Center

7:30 AM – 7:00 PM  
Lobby C, Meeting Room Level, Colorado Convention Center

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

8:00 AM – 11:50 AM  
Room 210/212, Meeting Room Level, Colorado Convention Center

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
Thursday, January 16 – Program of the Sessions

8:00 AM – 11:40 AM Room 404, Meeting Room

Unlikely Intersections and Portraits of Dynamical Semigroups.
Colby Kelin*, University of Michigan, Talia Blum, Massachusetts Institute of Technology, and Henry Tahlott, Brown University (1154-14-793)

8:30 AM

Graph Universal Cycles of Combinatorial Objects. Preliminary report.
Amelia Cantwell*, University of Montana, and Juliann Geraci, SUNY at Oswego (1154-05-731)

9:00 AM

Codes from Cayley Graphs. Preliminary report.
Doel A Rivera, Pontifical Catholic University of Puerto Rico (1154-94-807)

9:30 AM

Coevolving Network Model for the Diffusion of Opinep Dependency in a Population.
Trevor Lax*, University of Evansville, and Gabrielle Wolf, Rochester Institute of Technology (1154-91-62)

10:00 AM

On the Ramsey Number R(K_4 \times e, K_8 \times e). Preliminary report.
Ryan Kannanaikal*, Cornell University, and Noah Krakoff, University of California, Berkeley (1154-05-61)

10:30 AM

Large Rank Numbers & (K_4 \times e) \times P_t. Preliminary report.
Marina Jacobo*, Hofstra University, and David Shuster, Amherst College (1154-05-60)

11:00 AM

Modeling New Low-Energy Defibrillation Methods and Heartbeat Patterns in Canines.
Rhiannan Reuf*, California State University, Channel Islands, and Yasa Syed, Rutgers University (1154-32-58)

11:30 AM

Characterizing Nearly Asymmetric Graphs.
Emma Farnsworth*, University of Rochester, Natalie Gomez, Texas State University, and Herlandt Lino, Rochester Institute of Technology (1154-05-59)

AMS-ASL Special Session on Logic Facing Outward, II (Associated with Joint AMS-MAA Invited Address Karen Lange)

10:00 AM Logic and Combinatorics.

10:00 AM Logic and Combinatorics.

AMS Special Session on Algorithms, Experimentation, and Applications in Number Theory, I

8:00 AM – 11:50 AM Room 113, Meeting Room

Number Theory, I

Experimentation, and Applications in AMS Special Session on Algorithms, Experimentation, and Applications in Number Theory, I

8:00 AM – 11:50 AM Room 113, Meeting Room

Level, Colorado Convention Center

Organizers: Beth Malmskog, Colorado College
Christopher Rasmussen, Wesleyan University

8:00 AM

Repairing codes and applications.
Gretchen L. Matthews, Virginia Tech (1154-12-2647)

8:30 AM

Hester Graves, IDA/CCS, and Lindsey-Kay Lauderdale*, Towson University (1154-11-510)

9:00 AM

Computing curves on surfaces. Preliminary report.
Mckenzie West, University of Wisconsin-Eau Claire (1154-11-2325)

9:30 AM

Non-monogenic Division Fields of Elliptic Curves.
Hanson Smith, University of Colorado Boulder (1154-11-832)

10:00 AM

Computing hyperelliptic modular invariants from period matrices. Preliminary report.
Christelle Vincent, University of Vermont (1154-11-2124)

10:30 AM

Adriana Salerno, Bates College, and Joseph H Silverman*, Brown University (1154-11-121)

11:00 AM

Computations of GL(3) eigencurves. Preliminary report.
David Pollack*, Wesleyan University, and Avner Ash, Boston College (1154-11-1841)

11:30 AM

Counting n-arcs in projective planes.
Kelly Isham*, Nathan Kaplan, University of California, Irvine, and Max Weinreich, Brown University (1154-11-219)

AMS Special Session on Analytic Theory of Automorphic Forms and L-Functions, I

8:00 AM – 11:50 AM Room 402, Meeting Room

Level, Colorado Convention Center

Organizers: Amanda Folsom, Amherst College
Michael Griffin, Brigham Young University
Larry Rolan, Vanderbilt University
Jesse Thorner, University of Florida

8:00 AM – 11:20 AM Room 403, Meeting Room
Asymptotic identities for additive convolutions of sums of divisors.
Preliminary report.
Robert J. Lemke Oliver, Sunrose Shrestha, Tufts University, and Frank Thorne*, University of South Carolina (1154-11-1844)

8:30 AM Zeros of derivatives of the completed Riemann zeta function.
Amita Malik, Rutgers University, New Brunswick (1154-11-1210)

9:00 AM Small Scale Equidistribution of Lattice Points on the Sphere.
Peter Christopher Leslie Humphries, University College London (1154-11-192)

9:30 AM Small gaps between zeros of the Riemann zeta-function.
D. A. Goldston, San Jose State University, and C. L. Turnage-Butterbaugh*, Carleton College (1154-11-468)

10:00 AM On the sparsity of positive-definite automorphic forms.
Junehyuk Jung, Texas A&M University (1154-11-2159)

10:30 AM A new subconvex bound for GL(3) L-functions in the t-aspect.
Keshav Aggarwal, University of Maine (1154-11-190)

11:00 AM Open Problems in Analytic Number Theory I.
Nickolas Andersen, Brigham Young University, and Kyle Pratt*, All Souls College, University of Oxford (1154-11-1318)

11:30 AM Open Problems in Analytic Number Theory II.
Nickolas Andersen*, Brigham Young University, and Kyle Pratt, All Souls College, University of Oxford (1154-11-1946)

AMS Special Session on Analytic and Probabilistic Combinatorics, I

8:00 AM – 11:20 AM Room 403, Meeting Room
Organizers: Miklós Bóna, University of Florida
Jay Pantone, Marquette University

8:00 AM Some crossing number results using probabilistic techniques.
Eva Czabarka, University of South Carolina (1154-05-571)

8:30 AM Periodic Pattern-Avoiding Permutations.
Preliminary report.
Neal Madras*, York University, Toronto, Canada, and Justin M. Troyka, York University, Toronto, Ontario (1154-05-751)

9:00 AM Distance sets in discrete and continuous settings.
Alex Iosevich, University of Rochester (1154-05-171)

9:30 AM Exact Mixing and the Thorp Shuffle.
Preliminary report.
Christopher Costia, Dartmouth College (1154-05-722)

10:00 AM Some Random Words.
Jamal Bardbrak, The Alan Turing Institute (1154-05-779)

AMS Special Session on Computational and Categorical Methods in Homotopy Theory, I

8:00 AM – 11:50 AM Room 104, Meeting Room
Level, Colorado Convention Center
Organizers: Agnes Beaudry, University of Colorado Boulder
Julie Bergner, University of Virginia

8:00 AM The Cyclotomic Trace and the Characteristic Polynomial.
Jonathan A Campbell, Duke University (1154-55-303)

8:30 AM Strict units of commutative ring spectra.
Jun Hou Fung, Harvard University (1154-55-567)

9:00 AM Expanding Tools for Topological Cohomology.
Sarah Klanderman, Michigan State University (1154-55-1818)

9:30 AM Towards the Topological Hochschild Homology of the second truncated Brown-Peterson spectrum. Preliminary report.
Gabe Angelini-Knoll, Freie Universitat Berlin, and Dominic Culver*, University of Illinois, Urbana-Champaign (1154-55-1817)

10:00 AM Revisiting homotopy associative structures of Moore spectra.
Prasit Bhattacharya, University of Virginia (1154-55-1575)

10:30 AM Classification of S(1)-modules. Preliminary report.
Katharine L Adamyk, University of Colorado Boulder (1154-55-1725)

11:00 AM Equivariant fundamental classes in RO(C2)-graded cohomology.
Christy Hazel, University of Oregon (1154-55-1754)
11:30 AM - Power operations and transfers in equivariant cohomology theory.
Peter J Bonventre*, Bertrand Guillou and Nathaniel Stapleton, University of Kentucky (1154-55-2313)

AMS Special Session on Current Areas of Interest in the Mathematical Sciences of Medieval Islam

8:00 AM – 11:40 AM Room 102, Meeting Room Level, Colorado Convention Center
Organizers: Emelie A. Kenney, Siena College
Mohammad Javaheri, Siena College
Mohammad K. Azarian, University of Evansville

8:00 AM Discussion
9:00 AM – Al-Kashi’s Miftah al-Hisab: a 21st century translation and reading.
Nuh Aydin, Department of Mathematics, Kenyon College, and Lakhdar Hammoudi*, Department of Mathematics, Ohio University (1154-01-1936)

10:00 AM – Al-Būrūnī and the mathematics of medieval Indian poetry. Preliminary report.
Kim Plofker, Union College, NY (1154-01-1309)

11:00 AM – Islamic Trigonometry: A Very Short Introduction.
Glen R Van Brummelen, Quest University (1154-01-308)

AMS Special Session on Differential Geometry and Global Analysis, I Honoring the Memory of Tadashi Nagano (1930-2017)

8:00 AM – 11:50 AM Room 105, Meeting Room Level, Colorado Convention Center
Organizers: Bang-Yen Chen, Michigan State University
Nicholas D. Brubaker, California State University, Fullerton
Thomas Murphy, California State University, Fullerton
Takashi Sakai, Tokyo Metropolitan University
Makiko Sumi Tanaka, Tokyo University of Sciences
Bogdan D. Suceava, California State University, Fullerton
Mihaela B. Vajiac, Chapman University

8:00 AM – Positive intermediate Ricci curvature with symmetries. Preliminary report.
Lawrence Mouilllé, University of California, Riverside (1154-53-721)

8:30 AM – Positive curvature and fundamental group.
Elhe Khalili Samani, Syracuse University (1154-53-1453)

9:00 AM – A twist on TTY-algebra of symplectic manifolds.
Jiawei Zhou*, Yau Mathematical Science Center, Tsinghua University, and Li-Sheng Tseng, University of California, Irvine (1154-51-991)

9:30 AM – Convex functional and the stratification of the singular set of their stationary points.
Zahra Sinaei, University of Massachusetts Amherst (1154-51-1308)

10:00 AM – Instabilities and bifurcations of minimal surfaces.
Nicholas D Brubaker, California State University, Fullerton (1154-53-1729)

10:30 AM – Witten deformation on noncompact manifolds.
Xianzhe Dai and Junrong Yan*, UC, Santa Barbara (1154-51-166)

11:00 AM – Left-invariant metrics and submanifold geometry of noncompact symmetric spaces.
Hiroshi Tambar, Osaka City University (1154-53-1233)

11:30 AM Discussion

AMS Special Session on Explicit Methods in Arithmetic Geometry in Characteristic p, I (a Mathematics Research Communities Session)

8:00 AM – 11:50 AM Room 109, Meeting Room Level, Colorado Convention Center
Organizers: Vaidehee Thatte, Binghamton University
Sarah Arpin, University of Colorado Boulder
Nicholas Triantafillou, University of Georgia

8:00 AM – Local integral models of cubic del Pezzo surfaces with a nontrivial Brauer class. Preliminary report.
Bianca Viray, University of Washington (1154-11-1236)

8:30 AM – Periodic Points of Polynomials in Finite Fields.
Emerald T Stacy*, Washington College, Ozlem Ejder, Colorado State University, Jaime Juul, University of British Columbia, and Borys Kadets, Massachusetts Institute of Technology (1154-11-499)

9:00 AM – On the square-freeness of elliptic divisibility sequences over function fields.
Seoyoung Kim*, Queen’s University, and Nicole Looper, Brown University (1154-11-531)
AMS Special Session on Extremal and Probabilistic Combinatorics, I

8:00 AM – 11:50 AM  Room 303, Meeting Room Level, Colorado Convention Center

Organizers: Sean English, University of Illinois Urbana Champaign
Emily Heath, University of Illinois Urbana Champaign
Michael Tait, Villanova University

8:00 AM  Large triangle packings and Tuza’s conjecture in sparse random graphs.
Patrick Bennett, Andrzej Dudek, Western Michigan University, and Shira Zerbib*, Iowa State University (1154-05-1848)

8:30 AM  Realization Problems for Hypergraphic Sequences. Preliminary report.
Cathy Erbes, Hiram College, Michael Ferrara, Nathan Graber*, University of Colorado Denver, and Paul Wenger, Rochester Institute of Technology (1154-05-2197)

9:00 AM  Rainbow variants of the Erdős-Rothchild problem.
Lina Li, University of Illinois at Urbana-Champaign (1154-05-1634)

9:30 AM  Extremal problems for directed graphs and hypergraphs.
Alex Cameron, Vanderbilt University (1154-05-2279)

10:00 AM  The Iterated Local Model for Social Networks.
Erin Meger*, Anthony Bonato, Ryerson University, Sean English, University of Illinois Urbana-Champaign, Bill Kay, Oak Ridge, Tennessee, and Huda Chuangpishit, Ryerson University (1154-05-2753)

10:30 AM  Hadamard matrices are even harder to find.
Asaf Ferber, Vishesh Jain* and Yufei Zhao, MIT (1154-05-851)

11:00 AM  Induced Turán problems for hypergraphs.
Ruth Luo*, University of California, San Diego, and Zoltan Furedi, Alfred Renyi Institute of Mathematics (1154-05-1998)

11:30 AM  Super-logarithmic cliques in dense inhomogeneous random graphs.
Gweneth McKinley, MIT (1154-05-376)
9:00 AM – 11:40 AM Room 304, Meeting Room Level, Colorado Convention Center
Irreducible representations of elliptic quantum groups.
Sachin Gautam*, The Ohio State University, and Valerio Toledano Laredo, Northeastern University (1154-17-2328)

9:30 AM
Analog of Dirichlet L-functions in K(1)-local homotopy theory.
Ningchuan Zhang, University of Illinois at Urbana-Champaign (1154-55-1272)

10:00 AM
Branes and DAHA Representations.
Peter Koroteev, University of California, Berkeley (1154-51-1090)

10:30 AM
Elliptic Coulomb Branches. Preliminary report.
Justin Hilburn*, Perimeter Institute for Theoretical Physics, Benjamin Gammage, University of Miami, Mikayel Mkrtchyan, Harvard, Matej Penciak, Northeastern, and Alex Sherman, University of California, Berkeley (1154-14-2540)

11:00 AM
Level Structures and Morava E-theory.
Zhen Huan*, Center for Mathematical Sciences, Huazhong University of Science and Technology, and Nathaniel Stapleton, University of Kentucky (1154-55-935)

11:30 AM
On the geometric model for de Rham elliptic cohomology.
Daniel Berwick-Evans, UIUC, and Arnav Tripathy*, Harvard (1154-55-2582)

AMS Special Session on Harmonic Analysis, I

8:00 AM – 11:40 AM Room 407, Meeting Room Level, Colorado Convention Center
Organizers: Taryn C. Flock, Macalester College
Betsy Stovall, University of Wisconsin-Madison

8:00 AM
Soliton stability in higher-dimensional generalization of KdV equation.
Svetlana Roudenko, Florida International University (1154-35-2507)

9:00 AM
Improved bounds for restricted projection families via Fourier restriction.
Terry Harris, University of Illinois at Urbana-Champaign (1154-42-694)

9:30 AM
Discrete variants of maximal functions: spheres, primes and triangles. Preliminary report.
Theresa C Anderson, Purdue University (1154-42-2180)

10:00 AM
$L^p$ improving estimates for maximal spherical and circular averages.
Joris Roos, University of Wisconsin-Madison (1154-42-1692)

10:30 AM
Fuglede's spectrum is rational in dimension one.
Chun-Kit Lai*, San Francisco State University, and Yang Wang, Hong Kong University of Science and Technology (1154-42-879)

11:00 AM
Spectral properties of pseudodifferential operators on fractals.
Kasso A Okoudjou, MIT/UMD (1154-42-513)

AMS Special Session on Mathematical Analysis in Data Science, I (Associated with AMS Colloquium Lectures Ingrid Daubechies)

8:00 AM – 11:50 AM Room 407, Meeting Room Level, Colorado Convention Center
Organizers: Radu Balan, University of Maryland
Tingran Gao, University of Chicago
Sinan Gunturk, New York University
Ozgur Yilmaz, University of British Columbia

8:00 AM
Matching component analysis for transfer learning.
Dustin G. Mixon, The Ohio State University (1154-15-2300)

8:30 AM
On Best s-Term Approximation.
Guarantees for Bounded Orthonormal Product Bases in Sublinear-Time.
Mark A Iwen*, Michigan State University, Bosu Choi, University of Texas at Austin, and Toni Vokmer, TU Chemnitz (1154-65-163)

9:00 AM
Regression of functions on low-dimensional manifolds by deep ReLU networks.
Wenjing Liao*, Minshuo Chen, Haoming Jiang and Tuo Zhao, Georgia Institute of Technology (1154-41-1087)

9:30 AM
Nonlinear Approximation and (Deep) ReLU Networks.
Simon Foucart, Texas A&M University (1154-41-167)

10:00 AM
Random Matrix Products in Deep Learning.
Boris Hanin*, Texas A&M University, Mihai Nica, University of Toronto, and Grigoris Paouris, Texas A&M (1154-60-1357)

10:30 AM
Learning Interaction laws in particle- and agent-based systems.
Mauro Maggioni*, Fei Lu, Jason Miller, Sui Tang and Ming Zhong, Johns Hopkins University (1154-60-1576)

11:00 AM
Graph neural networks for combinatorial optimization problems on graphs.
Soledad Villar, New York University (1154-68-1257)

11:30 AM
Learning the Geometry of Data Through Many Representations.
Tingran Gao*, University of Chicago, and Zhizhen Zhao, University of Illinois at Urbana-Champaign (1154-62-158)
AMS Special Session on Mathematical Physics
Some Open Problems for the 21st Century, I

8:00 AM – NOON  Room 106, Meeting Room
Level, Colorado Convention Center
Organizer:  Michael Maroun

8:00AM  (677)
Continuum and microscopic models of electrochemical transport.
Charles W. Monroe and M. Zyskin*, University of Oxford (1154-82-2111)

8:50AM  (678)
The Ehlers-Kundt Conjecture in General Relativity.
Amir Babak Aazami, Clark University (1154-53-2225)

9:40AM  (679)
Schwartz diagonalizable operators, relativistic Quantum Mechanics and Dirac equation in distribution spaces.
David Carfi* and Alessia Donato, University of Messina (1154-81-1287)

10:30AM  (680)
The Feynman Formulation of Quantum Mechanics.
Tepper L Gill, Howard University (1154-81-466)

11:20AM  (681)
Open Problems in Mathematical Physics:
Feynman Integrals, Complex Fractal Dimensions, Origins of Fractality, Scaling Laws and Quantized Number Theory.
Michel L Lapidus, University of California, Riverside (1154-81-245)

AMS Special Session on Matrices and Graphs, I

8:00AM  (690)
Directed Forests and the Constancy of Kemeny's Constant. Preliminary report.
Steve Kirkland, University of Manitoba (1154-15-381)

9:00AM  (691)
Kemeny's constant and random walks on graphs. Preliminary report.
Jane Breen, Ontario Tech University (1154-15-602)

10:00AM  (692)
The normalized distance Laplacian.
Carolyn Reinhart, Iowa State University (1154-15-744)

11:00AM  (693)
Some graphs whose maximum nullity and zero forcing number are the same.
Shaun Fallat*, University of Regina, and Mohammad Adm, Palestine Polytechnic University (1154-15-409)

11:30AM  (694)
On the maximum multiplicity of the kth largest eigenvalue of a tree.
Shaun Fallat*, University of Regina, and Mohammad Adm, Palestine Polytechnic University (1154-15-409)

AMS Special Session on Mathematical Programming and Combinatorial Optimization

8:00 AM – 11:50 AM  Room 712, Meeting Room
Level, Colorado Convention Center
Organizers:  Steffen Borgwardt, University of Colorado Denver
Tamon Stephen, Simon Fraser University

8:00AM  (682)
Constructing Clustering Transformations.
Steffen Borgwardt* and Charles Viss, University of Colorado Denver (1154-90-1716)

8:30AM  (683)
Quantum Bridge Analytics: A Tutorial on Formulating and Using QUBO Models.
Yu Du, University of Colorado Denver (1154-90-1022)

9:00AM  (684)
Semidefinite Programming Relaxations of the Traveling Salesman Problem and Their Integrality Gaps.
Samuel C Gutekunst* and David P Williamson, Cornell University (1154-90-564)

9:30AM  (685)
Proving a variant of a polynomial positivity conjecture.
Edward D Kim, University of Wisconsin-La Crosse (1154-90-1232)

10:00AM  (686)
A perspective on piecewise linear convex under-estimators.
Jon Lee, University of Michigan, Daphne Skipper, United States Naval Academy, Emily Speakman*, University of Colorado Denver, and Luze Xu, University of Michigan (1154-90-554)

10:30AM  (687)
Aspects of Symmetry for Sparse Reflexive Generalized Inverses.
Jon Lee, University of Michigan (1154-90-133)

11:00AM  (688)
A simplex-like algorithm for linear programs on lattice polytopes.
Alberto Del Pia and Carla Michini*, University of Wisconsin-Madison (1154-90-805)

11:30AM  (689)
On the hardness of computing the diameter of a polytope.
Laura Sanità, University of Waterloo (1154-90-1707)
### AMS Special Session on Pedagogical Innovations That Lead to Successful Mathematics

8:00 AM - 11:50 AM Room 406, Meeting Room Level, Colorado Convention Center

**Organizers:** Michael A. Radin, Rochester Institute of Technology  
Natali Hritonenko, Prairie View A&M University  
Ellina Grigorieva, Texas A&M University  
Olga A Orlova, Munich Technical University

**8:00AM**  
Doing Calculus to Learn Calculus.  
James R. Valles, Jr.*, and Natali Hritonenko, Prairie View A&M University (1154-97-2327)  

**8:30AM**  
Boyans Kostadinov, New York City College of Technology, CUNY (1154-97-2777)

**9:00AM**  
University level teaching styles with high school students and international pedagogical innovations.  
Michael A Radin*, Rochester Institute of Technology, and Olga A Orlova, Munich Technical University (1154-97-321)

**9:30AM**  
Use of VoiceThread Audio-Visual Commenting in Partially Online Algebra Classes at a Community College. Preliminary report.  
Zeynep Akcay* and Dona Boccio, Queensborough Community College-CUNY (1154-97-2109)

**10:00AM**  
YouTube University II: Shared upper level math courses across schools.  
Steven J Miller, Williams College (1154-97-1043)

**10:30AM**  
Teaching Methods of Solving Nonstandard Problems.  
Ellina Grigorieva, Texas Woman's University (1154-97-309)

**11:00AM**  
The students from knowledge receiver to the pivot of the group leader. Preliminary report.  
Wisam Bukaita, Lawrence Technology University (1154-97-1478)

**11:30AM**  
The course "Mathematical Modeling in Life Sciences" at Xavier University of Louisiana.  
Vlajko L. Kocic, Xavier University of Louisiana (1154-97-530)

### AMS Special Session on Pedagogical Innovations That Lead to Successful Mathematics

8:00 AM - 11:50 AM Room 405, Meeting Room Level, Colorado Convention Center

**Organizers:** Brendan Hassett, Brown/ICERM  
Andrew Sutherland, MIT  
Anthony Varilly-Alvarado, Rice University

**8:00AM**  
Computing Coleman integrals on modular curves. Preliminary report.  
Kiran S. Kedlaya, University of California, San Diego (1154-11-286)

**8:30AM**  
Rational points on varieties and the unipotent Albanese map. Preliminary report.  
Daniel Rayor Hast, Boston University (1154-11-1722)

**9:00AM**  
Explicit arithmetic intersection theory and computation of Néron-Tate heights.  
Raymond van Bommel, Massachusetts Institute of Technology (1154-11-877)

---

*Denotes speaking at both sessions.
### AMS Special Session on Recent Advances in Function and Operator Theory, I

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
<th>Institution(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:30AM</td>
<td>A database of group actions on Riemann surfaces.</td>
<td>Jen Paulhus, Grinnell College</td>
<td>(1154-11-1951)</td>
</tr>
<tr>
<td>10:00AM</td>
<td>Obstructions to rational points from Galois actions on fundamental groups. Preliminary report.</td>
<td>Dean Bisogno, Colorado State University, Wanlin Li, Massachusetts Institute of Technology, Daniel Litt and Padmavathi Srinivasan*, University of Georgia</td>
<td>(1154-11-1100)</td>
</tr>
<tr>
<td>10:30AM</td>
<td>(2^k)-Selmer groups and Goldfeld’s conjecture.</td>
<td>Alexander D Smith, Harvard</td>
<td>(1154-11-1743)</td>
</tr>
<tr>
<td>11:00AM</td>
<td>Nonvanishing of hyperelliptic zeta functions over finite fields.</td>
<td>Jordan S Ellenberg, University of Wisconsin-Madison, Wanlin Li*, MIT, and Mark Shusterman, University of Wisconsin-Madison</td>
<td>(1154-11-427)</td>
</tr>
<tr>
<td>11:30AM</td>
<td>Hasse-Witt matrices and mirror toric pencils.</td>
<td>Adriana Salerno*, Bates College, and Ursula Whitcher, American Mathematical Society</td>
<td>(1154-11-990)</td>
</tr>
</tbody>
</table>

### AMS Special Session on Stochastic Spatial Models (a Mathematics Research Communities Session), I

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
<th>Institution(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00AM</td>
<td>Interval parking functions.</td>
<td>Emma Christensen*, University of Kansas, Ryan DeMuse, University of Denver, Jeremy Martin, and Mel Yin*, University of Denver</td>
<td>(1154-05-383)</td>
</tr>
<tr>
<td>9:00AM</td>
<td>The contact process on random graphs.</td>
<td>Danny Nam*, Princeton University, Shankar Bhamidi, University of North Carolina, Chapel Hill, Oanh Nguyen and Allan Sly, Princeton University</td>
<td>(1154-60-364)</td>
</tr>
<tr>
<td>9:30AM</td>
<td>Survival dynamics for the contact process with avoidance on (\mathbb{Z}, \mathbb{Z}^n), and the star graph.</td>
<td>Shirshendu Chatterjee, The City College of New York, David Sivakoff and Matthew Wascher*, Ohio State University</td>
<td>(1154-60-1511)</td>
</tr>
<tr>
<td>10:00AM</td>
<td>Estimation in the Sparse Popularity Adjusted Stochastic Block Model.</td>
<td>Ramchandra Rimal* and Marianna Pensky, University of Central Florida</td>
<td>(1154-62-1103)</td>
</tr>
<tr>
<td>10:30AM</td>
<td>Community Detection on Euclidean Random Graphs.</td>
<td>Abhishek Sankararaman*, The University of California, Berkeley, Emmanuel Abbe, Princeton University, and Francois Baccelli, The University of Texas at Austin</td>
<td>(1154-60-2206)</td>
</tr>
</tbody>
</table>

### AMS Special Session on Stochastic Spatial Models (a Mathematics Research Communities Session), I

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
<th>Institution(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30AM</td>
<td>Old Results and New Observations for Optimal Approximants on the Bidisk.</td>
<td>Meredith Sargent*, University of Arkansas, and Alan Sola, Stockholm University</td>
<td>(1154-46-488)</td>
</tr>
<tr>
<td>11:00AM</td>
<td>Reducing Subspaces of de Branges-Rovnyak Spaces.</td>
<td>Cheng Chu, Laval University</td>
<td>(1154-47-191)</td>
</tr>
<tr>
<td>11:30AM</td>
<td>Error Bounds and Singularity Degree in Semidefinite Programming.</td>
<td>Stefan Sremac, University of Waterloo, Hugo J Woerdeman*, Drexel University, and Henry Wolkowicz, University of Waterloo</td>
<td>(1154-90-717)</td>
</tr>
</tbody>
</table>

### AMS Special Session on Stochastic Spatial Models (a Mathematics Research Communities Session), I

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
<th>Institution(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00AM</td>
<td>Interval parking functions.</td>
<td>Emma Christensen*, University of Kansas, Ryan DeMuse, University of Denver, Jeremy Martin, and Mel Yin*, University of Denver</td>
<td>(1154-05-383)</td>
</tr>
<tr>
<td>9:00AM</td>
<td>The contact process on random graphs.</td>
<td>Danny Nam*, Princeton University, Shankar Bhamidi, University of North Carolina, Chapel Hill, Oanh Nguyen and Allan Sly, Princeton University</td>
<td>(1154-60-364)</td>
</tr>
<tr>
<td>9:30AM</td>
<td>Survival dynamics for the contact process with avoidance on (\mathbb{Z}, \mathbb{Z}^n), and the star graph.</td>
<td>Shirshendu Chatterjee, The City College of New York, David Sivakoff and Matthew Wascher*, Ohio State University</td>
<td>(1154-60-1511)</td>
</tr>
<tr>
<td>10:00AM</td>
<td>Estimation in the Sparse Popularity Adjusted Stochastic Block Model.</td>
<td>Ramchandra Rimal* and Marianna Pensky, University of Central Florida</td>
<td>(1154-62-1103)</td>
</tr>
<tr>
<td>10:30AM</td>
<td>Community Detection on Euclidean Random Graphs.</td>
<td>Abhishek Sankararaman*, The University of California, Berkeley, Emmanuel Abbe, Princeton University, and Francois Baccelli, The University of Texas at Austin</td>
<td>(1154-60-2206)</td>
</tr>
</tbody>
</table>
### AMS Special Session on Topological Measures of Complexity: Inverse Limits, Entropy, and Structure of Attractors, I

**Room 111, Meeting Room Level, Colorado Convention Center**

**8:00 AM – 11:50 AM**

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker(s)</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00</td>
<td>Erik Davis, Rigetti Computing, and Sunder Sethuraman*</td>
<td>Approximating geodesics via random points.</td>
</tr>
<tr>
<td>8:30</td>
<td>Joanna Furno, University of Houston</td>
<td>Characterizations of points.</td>
</tr>
<tr>
<td>9:00</td>
<td>Piotr Oprocha, AGH University of Science and Technology</td>
<td>On the Barge entropy conjecture.</td>
</tr>
<tr>
<td>9:30</td>
<td>Jakub Byszewski, Jagiellonian University</td>
<td>A transitive map on a dendrite with zero topological entropy.</td>
</tr>
<tr>
<td>10:00</td>
<td>Lori Alvin*, Furman University</td>
<td>Topological Entropy of Markov Set-valued Functions.</td>
</tr>
<tr>
<td>10:30</td>
<td>Iztok Banic, University of Maribor, Judy Kennedy*, Lamar University, Uros</td>
<td>Characterizations of $\beta$-like continua that do not have the fixed point property.</td>
</tr>
<tr>
<td>11:00</td>
<td>Veronica Martinez de la Vega*, IMATE, UNAM, D Darji, University of Kentucky</td>
<td>Topological Mixing and UPE Preliminary report.</td>
</tr>
<tr>
<td>11:30</td>
<td>Piotr Oprocha, AGH University of Poland</td>
<td>On completely scrambled systems.</td>
</tr>
</tbody>
</table>

### AMS Special Session on Utilizing Mathematical Models to Understand Tumor Heterogeneity and Drug Resistance

**Room 103, Meeting Room Level, Colorado Convention Center**

**8:00 AM – 11:50 AM**

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker(s)</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00</td>
<td>Kathleen Storey, Virginia Commonwealth University, Angela Reynolds, United</td>
<td>Heterogeneity and Drug Resistance Model.</td>
</tr>
<tr>
<td>8:30</td>
<td>Lisette dePillis, Worcester Polytechnic Institute</td>
<td>Data-driven Modeling of Tumor Growth and Response to Radiotherapy.</td>
</tr>
<tr>
<td>9:00</td>
<td>Helen Byrne, University of Oxford, Heyrim Cho, University of California,</td>
<td>A multicompartment mathematical model of cancer stem cell-driven tumor growth dynamics.</td>
</tr>
<tr>
<td>9:30</td>
<td>Suzan Melentieva, Worcester Polytechnic Institute</td>
<td>Non-Parametric Estimation of Intratumoral Heterogeneity from Spatiotemporal Data.</td>
</tr>
<tr>
<td>10:00</td>
<td>Suzanne L Weekes, Worcester Polytechnic Institute</td>
<td>Mathematical Models of Immune System Dynamics and Cancer.</td>
</tr>
<tr>
<td>10:30</td>
<td>Erica M. Rutter*, University of California, H.T. Banks and Kevin B. Flores</td>
<td>Control Structures of a Cancer Drug Resistance Model.</td>
</tr>
<tr>
<td>11:00</td>
<td>Martha Lacka, Jagiellonian University in Krakow</td>
<td>The ecology and evolution of intratumoral heterogeneity.</td>
</tr>
</tbody>
</table>

---

* Representing institutions and affiliations.
11:30AM Finding the optimal metronomic chemotherapy regimen: a delicate balance between immune recruitment, cancer resistance, and drug cytotoxicity. Anh Phong Tran*, Muhammad Ali Al-Radhawi, Northeastern University, Irina Kareva, EMD Serono Research Institute, and Eduardo D Sontag, Northeastern University (1154-92-2447)

MAA Invited Paper Session on Trends in Mathematical and Computational Biology

8:00 AM – 10:50 AM Room 610/612, Meeting Room Level, Colorado Convention Center

Organizers: Timothy Comar, Benedictine University

Hannah Highlander, University of Portland

Bori Mazzag, Humboldt State University

Raina Robeva, Randolph-Macon College

8:00AM Using computational fluid dynamics to understand muscle driven movement: Case studies in tubular hearts and jellyfish. Laura A Miller, University of North Carolina at Chapel Hill (1154-AG-2138)

8:30AM Volvox: Modeling the Synchronization of Flagella on the Exterior of a Sphere. Forrest O Mannan*, Western Colorado University, Karin Leiderman and Miika Jarvela, Colorado School of Mines (1154-AG-1856)

9:00AM Modeling Cone Aerobic Glycolysis. Erika Tatiana Camacho*, Arizona State University, Thierry Leveillard, Vision Institute of Paris, and Danielle Brager, Arizona State University (1154-AG-2650)

9:30AM Comparing Intervention Strategies for Reducing Clostridioides difficile Transmission: An Agent-Based Modeling Study. Preliminary report. Brittany Stephenson*, Lewis University, Cristina Lanzas, North Carolina State University, Suzanne Lenhart, University of Tennessee, Jason Bintz, Johnson University, Eduardo Ponce and Judy Day, University of Tennessee (1154-AG-1039)

10:00AM Reproductive numbers, metastability and extinction in discrete-time models of endemic diseases. Sebastian J. Schreiber*, University of California, Davis, Shuo Huang, Jifa Jiang, Shanghai Normal University, and Hao Wang, University of Alberta, Edmonton (1154-AG-2626)

10:30AM Persistence of a discrete-time predator-prey model with stage-structure in the predator. Preliminary report. Azmy S. Ackleh, Professor of Mathematics, University of Louisiana at Lafayette, Lafayette, LA., Md Istiaq Hossain*, Graduate student, Department of Mathematics, University of Louisiana at Lafayette, Lafayette, LA., Amy Veprauskas, Assistant Professor, Applied Mathematics, Department of Mathematics, University of Louisiana at Lafayette, Lafayette, LA, and Aijun Zhang, Postdoctoral Research Associate, Department of Mathematics, University of Louisiana at Lafayette, Lafayette, LA (1154-AG-1222)

AMS Contributed Paper Session on Computer Science, Programming, and Information and Related Topics

8:00 AM – 11:25 AM Room 206, Meeting Room Level, Colorado Convention Center

8:00AM Fusing Visual and Textual Information to Determine Content Safety. Amber Hu*, Yale University, Rodrigo Leonardo, Universidad del Valle de Guatemala, and Mohammad Uzair, National University of Science and Technology (1154-68-1302)

8:15AM Model-Agnostic Linear Competitors - Preliminary report. Hassan Rafique*, Applied Mathematical and Computational Sciences Program, The University of Iowa, Tong Wang and Qihang Lin, Dept. of Business Analytics, The University of Iowa (1154-68-1573)

8:30AM Higher-order Preferential Attachment Models. Nicole Eikmeier, Grinnell College (1154-68-1633)

8:45AM Developing Hybrid PSO Algorithm Models. Preliminary report. Hum Nath Bhandari, Roger Williams University (1154-68-1853)

9:00AM Automating Artifact Detection in Video Games. Preliminary report. Parmida Davarmanesh*, University of Michigan, Kuanhao Jiang, University of Pennsylvania, Tingting Ou, Johns Hopkins University, Artem Vysogoretz, New York University, Shantanu Joshi, University of California Los Angeles, and Nicholas Malaya, Advanced Micro Devices (1154-68-2599)

9:15AM Synthetic data augmentation with DCGANs for better diagnoses of osteoarthritis. Camille Moyer*, Hannes Baukamm and Tim Conrad, Zuse Institute Berlin (1154-68-2496)
Thursday, January 16 – Program of the Sessions

9:30AM Utilizing the sparsity structure generated by the wavelet transform with compressed sensing. Preliminary report.
Nicholas Dwork*, University of California, San Francisco, Daniel O’Connor, University of San Francisco, Corey A. Baron, Western University, Ethan M. L. Johnson, Northwestern University, John M. Paulj, Stanford University, and Peder Larson, University of California, San Francisco (1154-90-492)

9:45AM An Empirical Quantification of the Impact of Choice Constraints on Generalizations of the 0-1 Knapsack Problem using CPLEX®.
Yun Lu and Francis Vasko, Kutztown University (1154-90-1945)

10:00AM Efficiency of Quantum Circuits for Multiplication Operation using different algorithms. Preliminary report.
Parshuram Budhathoki, Cameron University (1154-94-2476)

10:15AM A Block Principal Pivoting Algorithm for the Vertical Generalized Linear Complementarity Problem (VGLCP) with a Vertical Block P-matrix.
Aniek A. Ebiefung, The University of Tennessee at Chattanooga, Chattanooga, TN (1154-90-2170)

10:30AM Nash embedding: a road map to realizing quantum hardware.
Faisal Shah Khan, Khalifa University of Science & Technology (1154-94-567)

10:45AM A New Algorithm for Equivalence of Cyclic Codes and Its Applications.
R Oliver VandenBerg* and Nuh Aydin, Kenyon College (1154-94-1469)

11:00AM On graph substructures that impede the interval passing algorithm in compressed sensing. Preliminary report.
Kathryn Haymaker*, Villanova University, Jessalyn Bolkema, Harvey Mudd College, Katherine Benson, University of Wisconsin-Stout, Christine A Kelley, University of Nebraska-Lincoln, Sandra Kingan, Brooklyn College, Gretchen Matthews, Virginia Tech, and Esmeralda Natase, Xavier University (1154-94-1678)

11:15AM Isometry-Dual Flags of AG Codes.
Maria Bras-Amorós, Universitat Rovira iVirgili, Iwan Duursma, University of Illinois at Urbana-Champaign, and Euijin Hong*, University of Colorado Boulder (1154-94-1837)

AMS Contributed Paper Session on Mechanics, Mathematical Physics and Other Applications, I

8:00 AM – 11:25 AM Room 202, Meeting Room Level, Colorado Convention Center

8:00AM Structural Analysis of the force chains within communities of particles.
Preliminary report.
Patrycja A Przewoznik* and David B Damiano, College of the Holy Cross (1154-70-2201)

8:15AM Confining Charged Particles in 3 Dimensions Using Bounded Magnetic Fields.
Gabriel Martins, Sacramento State University (1154-70-2178)

Michael C. Barg, Niagara University (1154-74-2607)

8:45AM A novel preconditioning technique for fluid-structure interaction with applications in biomechanics.
Guoyi Ke*, Louisiana State University at Alexandria, Sara Calandrini, Florida State University, and Eugenio Aulisa, Texas Tech University (1154-76-1337)

9:00AM A Deterministic Model for Mammal Migration based on a Continuum Mechanics Phase-Field Approach of Fluid Flow through Porous Media. Preliminary report.
Lynn Schreyer*, Nikolai Voulgarakis, Zachary Hilliard, Sergey Lapin, Department of Mathematics and Statistics, Washington State University, and Loren Cobb, Denver, CO (1154-76-2396)

9:15AM Steady-states of thin film droplets on chemically heterogeneous substrates.
Weifan Liu*, Syracuse University, and Thomas Witelski, Duke University (1154-76-1249)

9:30AM Robust Analysis of Different Models for Fracture Propagation in Formations with Bedlayers.
Lihua Zuo*, Department of Mathematics, Texas A&M University-Kingsville, and Kan Wu, Department of Petroleum Engineering, Texas A&M University (1154-76-1120)

Z. M. Mbugua*, P - Sibanda, University of KwaZulu -Natal, and S - Mondal, Amity University Kolkata (1154-76-645)

10:00AM Finite element analysis and simulation of surface plasmon polaritons in graphene.
Jichun Li, University of Nevada Las Vegas (1154-78-630)
Jamal Benbourenane, Abu Dhabi University (1154-81-2497)

Antonino Travia* and Razvan Teodorescu, University of South Florida (1154-81-1838)

10:45 AM  The solutions of $\mathfrak{g}(1|n)$ Bethe ansatz equation and rational pseudodifferential operators.  
Chenliang Huang*, Evgeny Mukhin, IUPUI, Benoit Vicedo, University of York, and Charles Young, University of Hertfordshire (1154-81-903)

11:00 AM  A step toward the T:O:E: with Fermion and Boson matrices; using both Transpose(), and Cispose() operations.  
Michael G. Dombrski, Los Angeles City College (1154-81-112)

11:15 AM  On the $\mathfrak{g}_{1|1}$ supersymmetric XXX spin chains. Preliminary report.  
Kang Lu*, Indiana University Purdue University Indianapolis, and Evgeny Mukhin, Indiana University Purdue University Indianapolis (1154-82-1327)

MAA Contributed Paper Session on Incorporating Realistic Applications of Mathematics Through Interdisciplinary Collaborations

8:00 AM – 11:35 AM  Room 507, Meeting Room Level, Colorado Convention Center  
Organizers: Mary Beisiegel, Oregon State University  
Suzanne Dorée, Augsburg University  
Mary R. Parker, University of Texas Austin  
Moderator: Rebecca Segal, Virginia Commonwealth University

8:00 AM  Integrating Geoscience Contexts into College Algebra.  
Theresa Jorgensen*, Department of Mathematics, University of Texas at Arlington, Elizabeth Griffith, W. Ashley Griffith, Casey Saup, School of Earth Sciences, Ohio State University, and Rebekah Aduddell, Department of Mathematics, University of Texas at Arlington (1154-G1-2755)

8:20 AM  Contextualize College Algebra with Economics. Preliminary report.  
Tao Chen*, CUNY LaGuardia Community College, Glenn Henshaw, Soloman Kone and Choon Shan Lai, CUNY LaGuardia Community College (1154-G1-1721)

Victor I. Piercey, Ferris State University (1154-G1-231)

9:00 AM  Magnifying the Role of Mathematics in the World of Sciences in Math Courses.  
Shahrooz Moosavizadeh, Norfolk State University (1154-G1-1658)

9:20 AM  Creating Calculus Activities through Interdisciplinary Collaborations.  
Jody Sorensen* and Suzanne Dorée, Augsburg University (1154-G1-2204)

10:00 AM  Connecting Partner Disciplines with Mathematics through Applications in Differential Equations. Preliminary report.  
Rebecca Segal, Virginia Commonwealth University (1154-G1-654)

10:20 AM  Incorporating Dentistry Applications from Interdisciplinary Collaborations into the Classroom.  
Nicoleta Corcodel, University of Heidelberg, Kevin Rion, Irina Secleanu* and Wanchunzi Yu, Bridgewater State University (1154-G1-2443)

10:40 AM  Introductory Statistics for nursing, physical therapy and allied health students.  
Katherine Radler*, Kimberly Druschel, Michael May and Sadita Salihovic, Saint Louis University (1154-G1-1558)

11:00 AM  Collaboration between the College of Education and Department of Mathematical Sciences at Lee University. Preliminary report.  
Caroline Maher-Boulis, Lee University (1154-G1-733)

Kyle Evans, Trinity College (1154-G1-2593)

MAA Contributed Paper Session on Mathematical Experiences and Projects in Business, Industry, and Government (BIG)

8:00 AM – 9:15 AM  Room 502, Meeting Room Level, Colorado Convention Center  
Organizer: Robert Burks, Naval Postgraduate School

8:00 AM  The ALIEN Network: An Automatic Target Recognition Algorithm.  
Travis Shrontz*, Seth Zucker, Timothy Klein, Alexander Boxer and Amanda Steck, Areté (1154-G1-2393)
MAA Contributed Paper Session on Re-Envisioning the Calculus Sequence, II

8:00 AM – 11:35 AM Room 505, Meeting Room Level, Colorado Convention Center

Organizers: Robin Cruz, College of Idaho
Tom Halverson, Macalester College
Joel Kilty, Centre College
Alison Marr, Southwestern University
Alex M. McAllister, Centre College
Chad Topaz, Williams College

8:00 AM Re-envisioning the Math Pathways in Massachusetts Public Higher Education. Maura A. Murray, Salem State University (1154-N1-1681)

8:20 AM Re-envisioning Calculus with Constraints: A Diverse Research State University’s Ongoing Work. Mary Nelson*, Robert Sachs and Joanna Jauch, George Mason University (1154-N1-2479)

9:00 AM Co-requisite and Fall-back Courses for Calculus Students. Preliminary report. Katrina Palmer*, Katie Mawhinney and Greg Rhoads, Appalachian State University (1154-N1-174)

9:20 AM Re-envisioning Assessment at Scale: Curricular and Programmatic Design to Improve Outcomes, Inclusiveness, and Retention. Hanna Bennett, Paul Kessenich* and P. Gavin LaRose, University of Michigan (1154-N1-2119)

9:40 AM Pairing Mastery-based Testing and Active Based Learning to Improve Student Performance and Persistence in the Calculus Sequence. Jessie K Lenarz, St. Catherine University (1154-N1-2129)

10:00 AM Active and Applied Calculus: a SUMMIT-P collaboration. Suzanne I. Dorée* and Jody Sorensen, Augsburg University (1154-N1-2158)

10:20 AM Calculus in Context: An Innovative Approach to Calculus. Sarah Hews* and Geremias Polanco, Amherst College (1154-N1-2317)

10:40 AM Re-Envisioning Calculus Sequence - Example of a Challenge Based Unit. Preliminary report. Girija Sarada Nair-Hart, University of Cincinnati Clermont College (1154-N1-93)

11:00 AM A Re-Envisioning of the Calculus Sequence for the Modern Student. Preliminary report. Joel Kilty*, Alex M McAllister, Centre College, Alison Marr and John Ross, Southwestern University (1154-N1-2685)

11:20 AM Pedagogical Advantages of Teaching Calculus Using the Hyperreal Numbers. Troy D. Riggs, Union University (1154-N1-549)

MAA Contributed Paper Session on Research in Undergraduate Mathematics Education (RUME), I

8:00 AM – 11:55 AM Room 501, Meeting Room Level, Colorado Convention Center

Organizers: Nicole Engelke Infante, West Virginia University
Shiv Smith Karunakaran, Michigan State University
Megan Wawro, Virginia Tech

8:00 AM The levers beyond personal beliefs that enable inquiry-oriented instruction: Professional obligations in instructor decision-making. Mollee C. Shultz* and Patricio Herbst, University of Michigan (1154-N5-1567)

8:20 AM For whom do workshops work? Personal and contextual factors associated with college instructors’ implementation of inquiry-based learning after professional development. Tim Archie*, Sandra Laursen and Charles N Hayward, University of Colorado Boulder (1154-N5-899)

8:40 AM Purposeful placement: How to group a room full of students. Candice M. Quinn, Middle Tennessee State University (1154-N5-236)
9:00AM  ►  (812) Moving towards equitable teaching: A continuum of transforming collegiate mathematics teaching. 
   Clera N Street*, Andrea C Alt, Lida M.L. Bentz and Hortensia Soto, University of Northern Colorado (1154-N5-870)

   Erin D Glover, Oregon State University (1154-N5-2731)

9:40AM  ►  (814) You Don’t Want to Come Into a Broken System: Critical and Dominant Perspectives for Increasing Diversity in STEM among Undergraduate Mathematics Program Stakeholders. 
   Rachel Tremaine*, Jessica Ellis Hagman, Colorado State University, Matthew Voigt, San Diego State University, and Jessica Gehrtz, University of Georgia (1154-N5-1485)

10:00AM  ►  (815) Cartesian Graphs, Covariational Reasoning, and Powerful Positioning in College Algebra. 
   Heather Lynn Johnson*, Gary Olson, Amber Gardner, Amy Smith, University of Colorado Denver, and Xin Wang, RMC Research (1154-N5-2303)

   Keri Kornelson*, Deborah Moore-Russo, Stacy Reeder, Matthew Grover, Justin Wollenberg and Randa Shehab, University of Oklahoma (1154-N5-1807)

   Susan L Addington*, Lamies Nazzal, Madonna McCabe, Pilar Olid and Kelli Wasserman, California State University, San Bernardino (1154-N5-2689)

11:00AM  ►  (818) Investigating Mathematical Needs and Helpful Support Strategies through the Perspectives of Students and Tutors. 
   Melissa Newell*, Iona College, and Fabiana Cardetti, University of Connecticut (1154-N5-2426)

11:20AM  ►  (819) Integrated College Algebra into General Biology by Interdisciplinary Course Projects. 
   Qingxia Li*, Fisk University, Thomas Gross, Western Kentucky University, and Patricia McCarrison, Fisk University (1154-N5-189)

11:40AM  ►  (820) Mathematics Stretch Courses as an Alternative to Remedial Mathematics Classes. 
   Natalie LF Hobson and Martha Byrne*, Sonoma State University (1154-N5-1207)

MAA Contributed Paper Session on Tell Me a Story: Connections between Mathematics and Performed or Print Narrative

8:00 AM – 11:15 AM  Room 503, Meeting Room Level, Colorado Convention Center

Organizers: Kristin Camenga, Juniata College
   Judith Covington, Northwestern State University of Louisiana
   Sharon K. Robbert, Trinity Christian College

8:00AM  ►  (821) Choose Your Own Adventure: An Analysis of Interactive Gamebooks Using Graph Theory. 
   Alison M. Marr*, Daniela Beckelhymer and D’André Adams, Southwestern University (1154-R1-2477)

8:20AM  ►  (822) Discussing the Accuracy of Mathematics in Film. 
   Paul R. Coe and Jeanette Mokry*, Dominican University (1154-R1-2202)

   Kim Regnier Jongerius, Northwestern College (1154-R1-532)

9:00AM  ►  (824) Reaching STEM Students Through Storytelling. 
   Beverly L. Wood* and Debra T. Bourdeau, Embry-Riddle Aeronautical University (1154-R1-926)

9:20AM  ►  (825) Free Your Inner Mathematician Through Stories. 
   Susan D’Agostino, Johns Hopkins University (1154-R1-46)

   Elizabeth A. DeWitt, Trinity Christian College (1154-R1-2725)

   Bill Linderman, King University (1154-R1-1774)

   Andy R. Magid, University of Oklahoma (1154-R1-1490)

10:40AM  ►  (829) Oh, the Books You Can Read! 
   Rebekah Yates, Houghton College (1154-R1-2065)

11:00AM  ►  (830) Novels with a Geometric Twist. 
   Preliminary report. 
   Sharon K. Robbert, Trinity Christian College (1154-R1-902)
Thursday, January 16 - Program of the Sessions

MAA General Contributed Paper Session on Number Theory, I

8:00 AM – 11:55 AM    Room 707, Meeting Room Level, Colorado Convention Center

Organizers: Cathy Erbes, Hiram College
            Holley Friedlander, Dickinson College
            Steven McKay, Brigham Young University

8:00 AM    Ternary Pell Strings - The Palindromes.  (831)
            Ralph P Grimaldi, Rose-Hulman Institute of Technology (1154-VS-2193)

8:15 AM    Rational Polynomials Based on the Fibonacci Numbers.  (832)
            Brian Hopkins, Saint Peter's University, and Aram Tangboonduangjit*, Mahidol University International College (1154-VS-2175)

8:30 AM    Class groups and narrow class groups of $S_n$-fields of even degree.  (833)
            Benjamin Kibort Breen, Dartmouth (1154-VS-1668)

8:45 AM    Automorphisms of 2-adic fields of degree twice an odd number.  (834)
            Chad Awtrey* and Briana Brady, Elon University (1154-VS-2094)

9:00 AM    Simultaneous Cubic and Quadratic Diagonal Equations Over the Primes.  (835)
            Alan Talmage, Pennsylvania State University (1154-VS-2088)

9:15 AM    Plus-Minus Davenport Constant - a zero-subsum problem on Finite Abelian Groups.  (836)
            Darleen S Perez-Lavin, University of Kentucky (1154-VS-835)

9:30 AM    Using Inclusion-Exclusion to find Bent and Balanced Monomial Rotation Symmetric Functions.  (837)
            Elizabeth M Reid, Marist College (1154-VS-44)

9:45 AM    Regularity Conditions on Hermitian Lattices. Preliminary report.  (838)
            Freda Li, Wesleyan University (1154-VS-1265)

10:00 AM   On Some Properties of Latin Square Determinants.  (839)
            Eugene Fiorini, Muhlenberg College, Froylan Maldonado*, UCLA, Sabrina Traver, King's College, Peterson Lenard, Muhlenberg College, and Tony W. H. Wong, Kutztown University (1154-VS-2363)

10:15 AM   Higher Reciprocity Laws, Modular Forms of Weight One and Their Galois Representations.  (840)
            John Lien, Louisiana State University (1154-VS-2597)

10:30 AM   Patterns of Primes in the Intersection of Beatty and Chebotarev Sets.  (841)
            Caleb Ji, Washington University in St. Louis, Joshua Kazdan*, Stanford University, and Vaughan McDonald, Harvard University (1154-VS-978)

10:45 AM   Automorphisms of Rational Functions over Fields of Characteristic $p > 0$.  (842)
            Julia Cai†, Yale University, Benjamin Hutz, Saint Louis University, Leopold Mayer, Lawrence University, and Max Weinreich, Brown University (1154-VS-2715)

11:00 AM   The Modified Szpiro Conjecture and Elliptic Curves with Specified Isogeny.  (843)
            Marietta Elizabeth Geist*, Carleton College, Alvaro Jose Cornejo, University of California - Santa Barbara, Kayla Iman Harrison, Eckerd College, Abigail G Loe, Carleton College, and Owen Gary-Dennis Ekblad, University of Michigan - Dearborn (1154-VS-2683)

11:15 AM   Some properties of functions behaving like Jacobi forms. Preliminary report.  (844)
            Matthew Krauel, California State University, Sacramento (1154-VS-2612)

11:30 AM   A Note on Polynomial Sequences Modulo Integers.  (845)
            Mohammad Javaheri, Siena College (1154-VS-1702)

11:45 AM   Factorization of prime powers with the same sum.  (846)
            Byungchul Cha, Adam Claman, Muhlenberg College, Joshua Harrington, Cedar Crest College, Ziyu Liu, Mount Holyoke College, Barbara Maldonado, University of Houston, Alexander Miller, Kutztown University of Pennsylvania, Ann Palma, Muhlenberg College, Wing Hong Tony Wong*, Kutztown University of Pennsylvania, and Hongkwon Yi, University of California, Berkeley (1154-VS-928)

MAA General Contributed Paper Session on Topology

8:00 AM – 11:55 AM    Room 710, Meeting Room Level, Colorado Convention Center

Organizers: Cathy Erbes, Hiram College
            Holley Friedlander, Dickinson College
            Steven McKay, Brigham Young University

9:15 AM    The C-complex clasp number of links.  (847)
            Eric Anderson, Jonah Amundsen, Christopher Davis and Daniel Guyer*, University of Wisconsin-Eau Claire (1154-VU-2283)

9:30 AM    Stratified spaces, Directed Algebraic Topology, and State-Sum TQFTs. Preliminary report.  (848)
            Ik Jae Lee*, Rowan University, and David N Yetter, Kansas State University (1154-VU-2339)

9:45 AM    Surgery on Penrose Tilings. Preliminary report.  (849)
            Josh Thompson* and Davin Hemmila, Northern Michigan University (1154-VU-2674)
10:00AM  Character Varieties of a Family of 2-Bridge Knots. Preliminary report.  
Leona Sparaco, College of the Holy Cross (1154-VU-2442)

10:15AM  The disk complex and topologically minimal surfaces in the 3-sphere. Preliminary report.  
Marion Campisi and Luis Torres, San Jose State University (1154-VU-2595)

10:30AM  Random grid diagrams.  
Max Folkers, Eli Marriott and Miguel Sanchez, Simpson College (1154-VU-2369)

10:45AM  The Datasaurus and Persistent Homology. Preliminary report.  
Ryan J. Jensen, Stephen F. Austin State University (1154-VU-1624)

11:00AM  Using reinforcement learning to find the slice genus.  
Mark Hughes, Thomas Liddle, Jamison Moody and Spencer Reschke, Brigham Young University (1154-VU-1295)

11:15AM  Tunnel Number and Unknotting Numbers of Twist Spun Knots. Preliminary report.  
Vincent Lonto, University of Nebraska-Lincoln (1154-VU-1532)

Wako T Bungula, University of Wisconsin-La Crosse (1154-VU-2835)

11:45AM  Compact and extremally disconnected spaces via generalized continuous functions.  
Zeinab Bandpey, Morgan State University (1154-VU-769)

SIAM Minisymposium on Preparing Faculty to Prepare Students for Tomorrow’s Workforce

8:00 AM – 11:00 AM Room 301, Meeting Room Level, Colorado Convention Center  
Organizer: Katie Kavanagh, Clarkson University

8:00AM  Computational Thinking in the Secondary Mathematics Classroom.  
Ben Galluzzo, Clarkson University (1154-97-2811)

8:30AM  Preparing for the workforce through integration of technology, modeling, and writing.  
Karen M. Bliss, Virginia Military Institute (1154-97-558)

9:00AM  Ecosystem Development: Supporting new programs for the next generation of applied mathematicians.  
Joe Skufca, Clarkson University (1154-97-2103)

9:30AM  Data science for the liberal arts.  
Chad M. Topaz, Williams College (1154-97-671)

10:00AM  Workforce Preparation in Mathematics: An Industry Panel Perspective.  

Project NExT Workshop

8:00 AM – 6:00 PM  Mile High Ballroom 4d-4f, Ballroom Level, Colorado Convention Center  
Organizers: Matt DeLong, Marian University  
Dave Kung, St. Mary’s College of Maryland  
Alicia Prieto Langarica, Youngstown State University

PME Council Meeting

8:00 AM – 11:30 AM  Granite C, 3rd Floor, Hyatt Regency Denver

Employment Center

8:00 AM – 5:30 PM  Mile High Ballroom 1,2,3, Ballroom Level, Colorado Convention Center

AMS Contributed Paper Session on Topology and Knot Theory, I

8:15 AM – 11:10 AM  Room 204, Meeting Room Level, Colorado Convention Center  

8:15AM  Genera of knots in the complex projective plane.  
Jacob Pichelmeyer, Kansas State University (1154-54-1133)

8:30AM  Universal Knot Diagrams.  
Chaim Even-Zohar, The Alan Turing Institute, Joel Hass, University of California, Davis, Nati Linial, School of Computer Science and Engineering, The Hebrew University of Jerusalem, and Tahl Nowik, Bar-Ilan University (1154-54-1546)

8:45AM  Selection Games: Equivalence and Duality.  
Jared Holshouser, University of South Alabama, and Chris Caruvana, Indiana University Kokomo (1154-55-2321)

9:00AM  Constructing Partial Configuration Spaces Using Limits.  
Amy Qing Hai Li, Wellesley College (1154-55-2321)

9:15AM  Sliding window embeddings of quasiperiodic functions.  
Hitesh Gakhar and Jose A Perea, Michigan State University (1154-55-483)

9:30AM  Coordinatizing Data With Lens Spaces and Persistent Cohomology.  
Luis G. Polanco, Michigan State University, and Jose Perea, Michigan State University (1154-55-893)

9:45AM  Abelian Homotopy Groups.  
Michael A. Hill, Kansas State University (1154-55-1670)

10:00AM  2-Cocycle Invariant and Oriented Singular Knots.  
Indu Rasika Churchill, State University of New York at Oswego (1154-55-1814)
709, Meeting Room

Organizers: Cathy Erbes, Hiram College
Holley Friedlander, Dickinson College
Steven McKay, Brigham Young University

8:45AM Data Science for All: The first course in Data Science.
Rasitha R. Jayasekare, Butler University, Indiana (1154-VI-176)

9:00AM A preliminary report: In and in front of a Math for ESL classroom. Preliminary report.
Monica Deni Morales Hernandez and Josh Hiller, Adelphi University (1154-VI-450)

9:15AM Teaching a Redesigned Mathematics Course for Business Majors. Preliminary report.
Timothy B Flowers, Indiana University of Pennsylvania (1154-VI-2611)

Amy Been Bennett, University of Arizona (1154-VI-2801)

9:45AM An Approach to Improve Students’ Participation and Performance in Introductory Math Classes. Preliminary report.
Ganga Acharya, CNM, Albuquerque, NM (1154-VI-2019)

10:00AM Using an Activity to Illustrate Conditional Probability and Baye’s Formula.
Jay A Malmstrom, Oklahoma City Community College (1154-VI-129)

10:15AM Using Coded Messages to Teach One-to-one and Inverse Functions.
Jenna P. Carpenter, Campbell University (1154-VI-1009)

10:30AM Student Perceptions on Adding Mathematical Journals into a Precalculus Course.
Kevin Bombardier, University of Wisconsin, Platteville (1154-VI-1334)

10:45AM Application Projects in Calculus II.
Yun Lu, Kutztown University (1154-VI-2294)

11:00AM Improving students’ knowledge retention through daily quizzes in pre-calculus class: An experimental approach. Preliminary report.
Chamil K. Ranaweera*, University of Colorado Boulder, and Uditha N. Katugampola, Florida Polytechnic University (1154-VI-2562)

11:15AM Observations from (Co)Sine Clock beyond the Unit Circle Definition.
L. Franklin Kemp, Plano Texas (1154-VI-1904)

11:30AM Integrating Energy Use into Curriculum.
Kaitlyn A Perry, Wingate University (1154-VI-1012)

MAA Contributed Paper Session on Developments, Directions, and Experiences in Open Educational Resources, I

8:40AM - 11:55 AM Room 506, Meeting Room
Level, Colorado Convention Center

Organizers: Benjamin Atchison, Framingham State University
Robert Beezer, University of Puget Sound
Oscar Levin, University of Northern Colorado

8:40AM TeX in the browser.
Jim Fowler* and Bart Snapp, The Ohio State University (1154-CS-1473)

9:00AM Teaching Mathematics with Jupyter and Pretext. Preliminary report.
Virgil U Pierce, University of Northern Colorado (1154-CS-1141)

Kent E Morrison, American Institute of Mathematics (1154-CS-1811)
9:40 AM  Building a Differential Equations course on collaborative Overleaf projects: better instructor feedback, active learning benefits during homework, and zero cost!  
Kenneth M Monks, Front Range Community College - Boulder County Campus (1154-C5-2218)

10:00 AM  PreTeXt for day-to-day teaching.  
Oscar Levin, University of Northern Colorado (1154-C5-2181)

10:20 AM  Embedding WeBWorK problems anywhere. Preliminary report.  
Michael E. Gage, University of Rochester (1154-C5-1178)

10:40 AM  Making WeBWorK Fun: Using Game Design to Increase Student Engagement.  
K. Andrew Parker, NYC College of Technology (1154-C5-2445)

11:00 AM  Transforming Math Documents with MathJax Version 3.  
Volker Sorge*, University of Birmingham, and Davide P Cervone, Union College (1154-C5-1930)

11:20 AM  The PreTeXt-Nemeth Connection: Enabling Sighted and Blind People to Share the Mathematical Experience.  
Al P. Maneki, U.S. Government Ret. (1154-C5-367)

11:40 AM  Automated transcription of a mathematics textbook into Nemeth Braille.  
Alexei Kolesnikov, Towson University (1154-C5-1194)

MAA Invited Address  
9:00 AM – 9:50 AM  Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center  
(898) Prospering through mathematics.  
Della Dumbaugh, University of Richmond (1154-A0-79)

MAA Minicourse #7: Part A  
9:00 AM – 11:00 AM  Room 708, Meeting Room Level, Colorado Convention Center  
A Short Road to the Modern Theory of Integration.  
Presenter: Jonathan Lewin, Kennesaw State University

MAA Minicourse #6: Part A  
9:00 AM – 11:00 AM  Room 706, Meeting Room Level, Colorado Convention Center  
IBL SIGMAA Minicourse: Introduction to Inquiry-Based Learning.  
Presenters: Susan Crook, Loras College  
Carl Mummert, Marshall University

MAA Minicourse #10: Part A  
9:00 AM – 11:00 AM  Room 704, Meeting Room Level, Colorado Convention Center  
Wall to Wall Modeling Scenarios for Differential Equations.  
Presenters: Kurt Bryan, Rose-Hulman Institute of Technology  
Rosemary Farley, Manhattan College  
Patrice Tiffany, Manhattan College  
Brian J. Winkel, SIMIODE  
Dina Yagodich, Frederick Community College

MAA Contributed Paper Session on Recreational Mathematics: Puzzles, Card Tricks, Games, and Gambling, I  
9:00 AM – 11:55 AM  Room 504, Meeting Room Level, Colorado Convention Center  
Organizers: Paul R. Coe, Dominican University  
David A. Nash, Le Moyne College  
Andrew Niedermaier, Jane Street Capital  
Sara B. Quinn, Dominican University  
(899) Counting Catan Configurations.  
Jathan Austin, Salisbury University, Brian Kronenthal*, Kutztown University, and Susanna Molitoris Miller, Kennesaw State University (1154-M5-294)

(900) Applications of Graph Theory and Probability in the Board Game Ticket to Ride.  
R. Teal Witter* and Alex Lyford, Middlebury College (1154-M5-220)

(901) Sequences and Patterns Arising from Mancala on an Infinite Board.  
L. Kerry Mitchell, Peoria, Arizona (1154-M5-2510)

(902) Proofs by Board Games. Preliminary report.  
Robert A. Cohen, Western Colorado University (1154-M5-2686)

(903) A bijection on maximum arrangements of nonattacking pawns.  
Tricia Muldoon Brown, Georgia Southern University (1154-M5-294)

Daniel C Florentino* and Ryan Higginbottom, Washington & Jefferson College (1154-M5-1014)

(905) Waiting for Penney’s to Turn Up.  
Robert W Vallin, Lamar University (1154-M5-1054)
11:20AM  
In Search of a Card Trick.
John M. Harris, Furman University
(1154-MS-673)

11:40AM  
Magic Tricks on Codes over GF(4).
Hideo Nagahashi, University of Guam
(1154-MS-2041)

AMS-MAA Panel Discussion on Looking for Teaching Oriented Positions
9:00 AM – 10:30 AM  
Room 201, Meeting Room Level, Colorado Convention Center
A panel for graduate students and postdocs.
Organizers: John Boller, University of Chicago
Alissa Crans, Loyola Marymount
Solomon Friedberg, Boston College
Tom Roby, University of Connecticut
Michael Weingart, Rutgers University
Moderator: Tom Roby, University of Connecticut
Panelists: Jennifer Beineke, Western New England University
Matthew DeLong, Marian University
Brendan Kelly, Harvard University
Alicia Prieto Langarica, Youngstown State University

MAA Workshop
9:00 AM – 10:20 AM  
Room 605, Meeting Room Level, Colorado Convention Center
Generating Ideas of Undergraduate Research Projects.
Organizers: Pamela Harris, Williams College
Azadeh Rafizadeh, William Jewell College

MAA Panel
9:00 AM – 10:20 AM  
Room 601, Meeting Room Level, Colorado Convention Center
Session for Chairs Topic: Equity, Diversity, Inclusion in the Mathematics Classroom
Organizers: Linda Braddy, Tarrant County College Northeast Campus
Catherine Murphy, Purdue University Northwest
Panelists: Minerva Cordero, University of Texas at Arlington
Ricardo Cortez, Tulane University

MAA Panel
9:00 AM – 10:20 AM  
Room 603, Meeting Room Level, Colorado Convention Center
So You Want to Start an Undergraduate Statistics or Data Science Program?
Organizers: Lisa Carnell, High Point University
Alana Unfried, California State University, Monterey Bay
Panelists: Judith Canner, California State University, Monterey Bay
Albert Y. Kim, Smith College
Christopher Malone, Winona State University
Kimberly Roth, Juniata College

Exhibits and Book Sales
9:30 AM – 5:30 PM  
Hall D, Exhibit Level, Colorado Convention Center

Estimathon!
10:00 AM – NOON  
Room 607, Meeting Room Level, Colorado Convention Center
A mindbending mixture of math and trivia.
Organizer: Andy Niedermaier, Jane Street Capital

AWM-AMS Noether Lecture
10:05 AM – 10:55 AM  
Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center
(908) Branching laws for representations of a non compact orthogonal group.
Birgit Speh, Cornell University
(1154-22-347)

MAA Contributed Paper Session on Inquiry-Based Learning and Teaching, III
10:20 AM – 11:55 AM  
Room 502, Meeting Room Level, Colorado Convention Center
Organizers: Brian Katz, Augustana College
Carl Mummert, Marshall University
Victor I. Piercey, Ferris State University

Thursday, January 16 – Program of the Sessions

Sandra Rucker, Clark Atlanta University
Monica Y. Stephens, Spelman College
Program of the Sessions – Thursday, January 16 (cont’d.)

10:20 AM
Understanding Mathematics Matters (Umm... ) Camp: Improving School Students’ Perception of Mathematics.
Ahmad Alhammouri, Jacksonville State University (1154-H5-65)

10:40 AM
From Redesigning a Class Curriculum to Redesigning a Classroom Instead.
Elizabeth W Schott, Florida SouthWestern State College, and Laurice Garrett*, Florida SouthWestern State College (1154-H5-2572)

11:00 AM
Nicholas E Weaver* and Gary Olson, University of Colorado Denver (1154-H5-2519)

11:20 AM
Why Aren’t We All Using IBL?
Susan B. Crook, Loras College (1154-H5-2622)

11:40 AM
How to choose Topics in Liberal Arts Math for an IBL course? Preliminary report.
Hansun To and Eileen B. Perez*, Worcester State University (1154-H5-869)

AMS-MAA Panel Discussion: Preparing your graduate students for teaching oriented positions

10:30 AM – NOON Room 201, Meeting Room Level, Colorado Convention Center
A panel for Ph.D. granting departments and faculty
Organizers: John Boller, University of Chicago
Alissa Crans, Loyola Marymount University
Solomon Friedberg, Boston College
Tom Roby, University of Connecticut
Michael Weingart, Rutgers University
Moderator: Solomon Friedberg, Boston College
Panelists: Jennifer Beineke, Western New England University
John Boller, University of Chicago
Alissa Crans, Loyola Marymount University
Matthew DeLong, Marian University
Natasha Speer, University of Maine

MAA Workshop

10:35 AM – 11:55 AM Room 605, Meeting Room Level, Colorado Convention Center
Identifying and Managing Microaggressions in the Academic Setting.
Organizers: Omayra Ortega, Sonoma State University
Semra Kiliç-Bahi, Calby Sawyer College

MAA Project NExT Lecture on Teaching and Learning

11:10 AM – NOON Four Seasons Ballroom 1, Ballroom Level, Colorado Convention Center
(914) Todxs Cuentan: Difference, humanity, and belonging in the mathematics classroom.
Federico Ardila-Mantilla, San Francisco State University (1154-A0-242)

SIAM Invited Address

11:10 AM – NOON Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center
James Keener, University of Utah (1154-92-49)

AMS Colloquium Lectures: Lecture II

1:00 PM – 1:50 PM Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center
(916) Mathematical Frameworks for Signal and Image Analysis. Lecture II: Diffusion methods in manifold and fibre bundle learning.
Ingrid Daubechies, Duke University (1154-94-12)

AMS-ASL Special Session on Choiceless Set Theory and Related Areas, II

1:00 PM – 3:50 PM Room 404, Meeting Room Level, Colorado Convention Center
Organizers: Paul Larson, Miami University
Jindrich Zapletal, University of Florida

1:00 PM
Barren extensions.
Natasha Dobrinen*, University of Denver, and Daniel Hathaway, University of Vermont (1154-03-1565)

1:30 PM
Borel ideals and topological Ramsey spaces.
Sonia Navarro Flores, National University of Mexico (1154-03-2467)
2:00PM  Parametrizing the Ramsey theory of block sequences. 
        lian B. Smythe, Rutgers University - New Brunswick (1154-03-945)

2:30PM  Forcing over Cohen’s symmetric model. 
        Philipp Schlicht, University of Bristol (1154-03-829)

3:00PM  Definable Combinatorics at the First Uncountable Cardinal. 
        William Chan* and Stephen Jackson, University of North Texas (1154-03-589)

3:30PM  The decomposability conjecture. 
        Andrew S Marks, UCLA (1154-03-350)

AMS Special Session on Algorithms, Experimentation, and Applications in Number Theory, II

1:00 PM – 3:50 PM  Room 113, Meeting Room
Level, Colorado Convention Center

Organizers: Beth Malmskog, Colorado College
Christopher Rasmussen, Wesleyan University

1:00PM  Primes in Apollonian circle packings. 
        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, Utrecht University, and Katherine E Stange*, University of Colorado, Boulder (1154-11-2459)

1:30PM  Computing elliptic curves over Q. 
        Adela Gherga, The University of British Columbia (1154-11-473)

2:00PM  Life, the universe, and everything. 
        Andrew R. Booker, University of Bristol, and Andrew V. Sutherland*, Massachusetts Institute of Technology (1154-11-1874)

2:30PM  Equidistribution counts abelian varieties. 
        Jeff Achter*, Colorado State University, S. Ali Altug, Boston University, Luis Garcia, University of Toronto, and Julia Gordon, University of British Columbia (1154-11-1362)

3:00PM  Computing the endomorphism ring of an ordinary abelian surface over a finite field. 
        Caleb J. Springer, The Pennsylvania State University (1154-11-1439)

3:30PM  Sporadic Points on Modular Curves. 
        Abbey Bourdon, Wake Forest University, Ozlem Ejder*, Colorado State University, Yuan Liu, University of Michigan, Frances Oduomodu, Institut de Mathematiques de Bordeaux, Universite de Bordeaux, and Bianca Viray, University of Washington (1154-11-2027)
Program of the Sessions – Thursday, January 16 (cont’d.)

2:00PM Recursive functions on conditional Galton-Watson trees.
   Nicolas Brouin, Sorbonne Université, Luc Devroye, McGill University, and
   Nicolas Fraiman*, University of North Carolina at Chapel Hill (1154-60-2653)

2:30PM Analyzing the outputs of grammars.
   Torin Greenwood, North Dakota State University (1154-05-783)

3:00PM Asymptotic Results on Weighted Ordered Trees. Preliminary report.
   J. W. Moon, Department of Mathematical and Statistical Sciences, University
   of Alberta, and Laura L.M. Yang*, Department of Mathematics, University of
   Central Florida (1154-05-1580)

3:30PM The probability of avoiding consecutive patterns in the Mallows distribution.
   Harry Crane, Rutgers University, Stephen DeSalvo, Activision, and
   Sergi Elizalde*, Dartmouth College (1154-05-280)

AMS Special Session on C*-Algebras, Dynamical Systems and Applications, I

1:00 PM – 3:50 PM Room 712, Meeting Room Level, Colorado Convention Center

Organizers: Robin Deoely, University of Colorado Boulder
           Zhuang Niu, University of Wyoming
           Ping Zhong, University of Wyoming

1:00PM Higher indices and cyclic cohomology.
   Alexander Gorokhovsky*, University of Colorado, Boulder, and Henri Moscovici,
   Ohio State University (1154-46-1464)

2:00PM Negative Definite Functions and Matrix-valued Euler-Phi functions.
   Preliminary report.
   Martin E. Walter, University of Colorado, Boulder (1154-46-326)

AMS Special Session on Commutative Algebra, I

1:00 PM – 3:50 PM Room 103, Meeting Room Level, Colorado Convention Center

Organizers: Patricia Klein, University of Kentucky
           Hayde Lindo, Williams College

1:00PM The Prime Spectra of Precompletions.
   Erica Barrett, Emil Graf, Susan Loepp*, Williams College, Kimball Strong,
   University of California, Berkeley, and Sharon Zhang, Princeton University
   (1154-13-834)

2:00PM Generators of Koszul homology.
   Rachel N. Diethorn, Syracuse University (1154-13-1276)

3:00PM The local cohomology of a parameter ideal with respect to an arbitrary ideal.
   Monica Ann Lewis, University of Michigan (1154-13-403)

AMS Special Session on Computational and Categorical Methods in Homotopy Theory, II

1:00 PM – 3:50 PM Room 104, Meeting Room Level, Colorado Convention Center

Organizers: Agnes Beaudry, University of Colorado Boulder
           Julie Bergner, University of Virginia

1:00PM Motivic t-structures and stable homotopy groups of spheres.
   Zhouli Xu, Massachusetts Institute of Technology (1154-55-2380)

1:30PM Higher categories and factorization algebras.
   Laura Wells Murray, University of Notre Dame (1154-18-2383)
2:00 PM
Twisted tangential Pin\(^+\)-bordism.
Meng Guo*, University of Toronto/Perimeter Institute, and Michael J Hopkins, Harvard University
(1154-55-1888)

2:30 PM
Periodic Points: Vanishing and Realizability.
Shane Clark, University of Kentucky
(1154-55-2092)

3:00 PM
A combinatorial model for an honest \(\infty\)-operad. Preliminary report.
Safia Chettih*, Southwestern University, L Bonatto, University of Oxford, A Linton, University of Southampton, S Raynor, Maquarie University, M Roberston, University of Melbourne, and N Wahl, University of Copenhagen
(1154-55-1981)

3:30 PM
Decomposing \(C_2\)-equivariant spectra. Preliminary report.
Clover May, University of California Los Angeles (1154-55-1271)

AMS Special Session on Differential Geometry and Global Analysis, II Honoring the Memory of Tadashi Nagano (1930-2017)

1:00 PM – 3:50 PM Room 105, Meeting Room Level, Colorado Convention Center

Organizers: Bang-Yen Chen, Michigan State University
Sarah Arpin, University of Colorado Boulder
Nicholas Triantafillou, University of Georgia

1:00 PM
Hecke Orbits and Unlikely Intersections. Preliminary report.
Maria Fox, University of Oregon, Vlad Matei, University of California, Irvine, and Soumya Sankar*, University of Wisconsin - Madison (1154-11-534)

1:30 PM
Computability of rational points on curves over function fields in characteristic \(p\). Campbell Hewett, Massachusetts Institute of Technology (1154-14-333)

2:00 PM
A non-hyperelliptic curve with torsion \(l\)-adic Ceresa class.
Dean Bisogno*, Colorado State University, Wanlin Li, MIT, Daniel Litt, University of Georgia, and Padmavathi Srinivasan, Georgia Institute of Technology (1154-11-552)

2:30 PM
Formal Groups with Complex Multiplication.
Caroline Matson, University of Colorado at Boulder (1154-11-422)

3:00 PM
Abelian varieties not isogenous to a hyperelliptic jacobian.
Ravi Donepudi*, University of Illinois at Urbana-Champaign, Edgar Costa, Massachusetts Institute of Technology, Ravi Fernando, University of California Berkeley, Valentin Karemaker, Utrecht University, Caleb Springer, The Pennsylvania State University, and Mckenzie West, University of Wisconsin Eau Claire (1154-11-562)
### AMS Special Session on Extremal and Probabilistic Combinatorics, II

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
<th>Affiliation(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00PM</td>
<td>Stability for maximal independent sets and its applications.</td>
<td>Jeff Kahn and Jinyoung Park*</td>
<td>Rutgers University</td>
</tr>
<tr>
<td>1:30PM</td>
<td>Find Berge hypergraphs by looking at the shadow.</td>
<td>Linyuan Lu and Zhiyu Wang*</td>
<td>University of South Carolina</td>
</tr>
<tr>
<td>2:00PM</td>
<td>Extremal Configurations in Point-Line Arrangements. Preliminary report.</td>
<td>Mozghan Mirzai* and Andrew Suk, UC San Diego</td>
<td></td>
</tr>
<tr>
<td>2:30PM</td>
<td>On Rainbow Turán Numbers of Paths and Other Trees.</td>
<td>Daniel P Johnston*</td>
<td>Skidmore College, and Puck Rombach, University of Vermont</td>
</tr>
<tr>
<td>3:00PM</td>
<td>The Chromatic Number of Random Lifts of Regular Graphs.</td>
<td>JD Nir</td>
<td>University of Nebraska-Lincoln</td>
</tr>
<tr>
<td>3:30PM</td>
<td>On the Erdős-Gyárfás distinct distances problem with local constraints.</td>
<td>Cosmin Pohoata, California Institute of Technology</td>
<td></td>
</tr>
</tbody>
</table>

### AMS Special Session on Geometric Representation Theory and Equivariant Elliptic Cohomology, II (a Mathematics Research Communities Session)

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
<th>Affiliation(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00PM</td>
<td>Schubert calculus beyond K-theory.</td>
<td>Cristian Lenart*, State University of New York at Albany, USA, Kirill Zainouline, Changlong Zhong, State University of New York at Albany, USA</td>
<td></td>
</tr>
<tr>
<td>2:00PM</td>
<td>Twisted quasi-elliptic cohomology and a twisted Chern character map.</td>
<td>Matthew Spong*, University of Melbourne, and Zhen Huan, Huazhong University of Science and Technology</td>
<td></td>
</tr>
<tr>
<td>3:00PM</td>
<td>Elliptic Cohomology at the Tate Curve.</td>
<td>Kiran Luecke, UC Berkeley</td>
<td>(1154-55-1984)</td>
</tr>
</tbody>
</table>

### AMS Special Session on Hamiltonian Systems, II

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
<th>Affiliation(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00PM</td>
<td>Hamiltonian vortex-body interactions, inviscid vortex shedding, and models for aquatic locomotion.</td>
<td>Scott David Kelly, University of North Carolina at Charlotte</td>
<td>(1154-76-2723)</td>
</tr>
<tr>
<td>1:30PM</td>
<td>Optimizing Mixing in Aref's Blinking Vortex Flow.</td>
<td>James D Meiss*, University of Colorado Boulder, and Rebecca A Mitchell, National Renewable Energy Laboratory</td>
<td>(1154-34-882)</td>
</tr>
<tr>
<td>2:00PM</td>
<td>Self-similarity in the Kepler-Heisenberg problem. Preliminary report.</td>
<td>Corey Shanbrom*, Sacramento State University, and Victor Dods, MSRI</td>
<td>(1154-70-140)</td>
</tr>
<tr>
<td>2:30PM</td>
<td>On the Simultaneous Binary Collision and the Curious 8/3.</td>
<td>Nathan Duignan, University of Sydney</td>
<td>(1154-70-2024)</td>
</tr>
</tbody>
</table>
3:00PM  Existence and Uniqueness of Solutions to the Weakly Nonlinear Schrodinger-Newton System. Preliminary report. Robert L Hingtgen, Mercyhurst University (1154-46-1767)

3:30PM Discussion

AMS Special Session on Highly Accurate and Structure-Preserving Numerical Methods for Nonlinear Partial Differential Equations, I

1:00 PM – 3:50 PM  Room 102, Meeting Room Level, Colorado Convention Center

Organizers: Qin Sheng, Baylor University
Jorge E. Macias-Diaz, Universidad Autonoma de Aguascalientes
Joshua L. Padgett, Texas Tech University


1:30PM  A hybridized discontinuous Galerkin method for the Stokes equations with symmetric stress tensor approximation. Jeonghun Lee, Department of Mathematics, Baylor University (1154-65-2376)

2:00PM  Propagation of light in multi-frequency moving focus model. Alexey Sukhinin, NDSU (1154-78-2495)

2:30PM  A splitting approximation for the numerical solution of a self-adjoint quenching problem. Julienne Kabre* and Qin Sheng, Baylor University (1154-35-430)

3:00PM  Solving highly oscillatory wave equations with an asymptotically stable dual-scale compact method. Tiffany N Jones, The University of Arizona (1154-65-2350)

3:30PM  A review and expectation of the numerical stabilities for nonlinear Kawarada equations. Preliminary report. Qin Sheng, Baylor University (1154-65-228)

AMS Special Session on Iterative Methods for Large-Scale Data Analysis, II

1:00 PM – 4:00 PM  Room 106, Meeting Room Level, Colorado Convention Center

Organizer: Michael Maroun

1:00PM  Open problems in understanding singularities in general relativistic spacetimes. Deborah Ann Konkowski, United States Naval Academy (USNA) (1154-83-1313)

1:50PM  Friedmann’s Equation and the Creation of the Universe. Arthur E Fischer, Department of Mathematics, University of California, Santa Cruz (1154-83-1305)

2:40PM  Open problems in the mathematical definition of Feynman path integrals. Sonia Mazzucchi, Department of Mathematics, University of Trento (1154-81-432)

3:30PM  Quantum Cayley Graphs of Finite Groups. Erica K Swindle*, Washington and Lee University, Jon Harrison and Mark Sepanski, Baylor University (1154-81-1823)

AMS Special Session on Mathematical Physics Some Open Problems for the 21st Century, II

1:00PM  Adaptive sketch-and-project methods for solving linear systems. Robert Gower, Télécop ParisTech, Denali Molitor*, Jacob Moorman and Deanna Needell, University of California, Los Angeles (1154-65-592)


2:00PM  Iterative re-weighted Kaczmarz algorithm for compressed sensing. Preliminary report. Halyun Jeong*, Kateryna Melnykova and Ozgur Yilmaz, University of British Columbia (1154-65-2312)

2:30PM  Kaczmarz and Least Absolute Deviations. Anna C Aboud, Westmont College (1154-41-1980)


3:30PM  Online nonnegative matrix factorization for Markovian data. Laura Balzano, University of Michigan, Hanbaek Lyu* and Deanna Needell, University of California, Los Angeles (1154-68-2274)
AMS Special Session on Matrices and Graphs, II

1:00 PM – 3:50 PM Room 401, Meeting Room Level, Colorado Convention Center

Organizers: Leslie Hogben, Iowa State University and American Institute of Mathematics
Bryan L. Shader, University of Wyoming

1:00PM (1003) Tree covers and the positive semidefinite maximum nullity of a graph.
Chassidy Bozeman, Mount Holyoke College (1154-15-1083)

Daniela Ferrero, Texas State University, San Marcos, TX 78666 (1154-05-1191)

2:00PM (1005) Opinion and Spreading Models on Social Networks.
Mason A Porter, UCLA (1154-91-47)

2:30PM (1006) Infectious Power Domination for Hypergraphs.
Beth Bjorkman, Iowa State University (1154-05-2128)

3:00PM (1007) Propagation time for probabilistic zero forcing.
Jesse Geneson* and Leslie Hogben, Iowa State University (1154-05-624)

3:30PM (1008) Extreme Throttling Numbers.
Joshua Carlson*, Williams College, and Juergen Kritschgau, Iowa State University (1154-05-687)

AMS Special Session on Modeling Natural Resources, II

1:00 PM – 3:50 PM Room 112, Meeting Room Level, Colorado Convention Center

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

1:00PM (1009) A Viral Dispersal Linked Farmed - Wild Salmon Infectious Salmon Anemia Virus Discrete - Time Model. Abdul-Aziz Yakubu, Howard University (1154-92-1246)

1:30PM (1010) Persistence or Extinction in a Discrete-Time Nutrients-Phytoplankton-Oysters (NPO) Model of a bay ecosystem.
Najat Ziyadi*, Morgan State University, and Abdul-Aziz Yakubu, Howard University (1154-92-1247)

2:00PM (1011) Agent-based and Continuous Models of Locust Hopper Bands.
W Christopher Strickland*, University of Tennessee, Knoxville, Andrew Bernoff, Harvey Mudd College, Michael Culshaw-Maurer, University of California, Davis, Rebecca Everett, Haverford College, Maryann E. Hohn, Pomona College, and Jasper Weinburd, Harvey Mudd College (1154-92-658)

2:30PM (1012) Transboundary Management Under Alternative Objectives with Applications to Diseases.
Julie C Blackwood*, Williams College, Junyan Duan, UC Irvine, Mykhaylo Malakhov, Andrews University, Jordan Pellett, University of Tennessee, Ishan Phadke, Pennsylvania State University, Suzanne Lenhart, University of Tennessee, and Katriona Shea, Pennsylvania State University (1154-92-1187)

3:00PM (1013) Recent results for the Trojan Y Chromosome Model.
Rana Parshad, Iowa State University (1154-00-2058)

3:30PM (1014) Darwinian dynamic models of adaptation in changing environments. Preliminary report.
Jim Michael Cushing, Department of Mathematics, Interdisciplinary Program in Applied Mathematics, University of Arizona (1154-92-1008)

AMS Special Session on Outreach Strategies for Reaching Underrepresented Students at the Pre-College Level, II

1:00 PM – 3:50 PM Room 210/212, Meeting Room Level, Colorado Convention Center

Organizers: Jacob Castaneda, The Art of Problem Solving/Bridge to Enter Advanced Mathematics (BEAM)
Cory Colbert, Washington & Lee University
Li-Mei Lim, Boston University/PROMYS
Max Warshauer, Texas State University at San Marcos
Daniel Zaharopol, The Art of Problem Solving Initiative/Bridge to Enter Advanced Mathematics (BEAM)

1:00PM (1015) Principles of Running an Outreach Program.
Mark Tomforde, University of Houston (1154-00-1503)

Cory H Colbert, Washington & Lee University (1154-97-2195)
2:00PM Art of Problem Solving’s Pathway Program: Connecting Underserved Students to the New Ecosystem of Mathematics Enrichment.
Sarah Trebat-Leder, Art of Problem Solving (1154-97-2514)

Emily Cilli-Turner*, University of La Verne, Robin Wilson, California Polytechnic University, Pomona, and Gail Tang, University of La Verne (1154-97-1145)

3:00PM PROMYS Math Circle: A Case Study in Organizing and Sustaining an Outreach Program.
Demi Dubois* and Li-Mei Lim, Boston University (1154-97-2692)

3:30PM Panel on Reaching Underrepresented Students at the Pre-College Level.
Li-Mei Lim*, Boston University/PROMYS, Max Warshauer, Texas State University, Dan Zahrapel, Jacob Castaneda, Bridge to Enter Advanced Mathematics (BEAM), and Cory Colbert, Washington & Lee University (1154-97-2086)

AMS Special Session on Rational Points on Algebraic Varieties: Theory and Computation, III (Associated with AMS Invited Address Anthony Varilly-Alvarado)

1:00 PM – 3:50 PM Room 405, Meeting Room Level, Colorado Convention Center
Organizers: Brendan Hassett, Brown/ICERM
Andrew Sutherland, MIT
Anthony Varilly-Alvarado, Rice University

1:00PM Heights of rational points on stacks.
Jordan Ellenberg*, University of Wisconsin-Madison, Matthew Satriano, University of Waterloo, and David Zureick-Brown, Emory University (1154-11-1672)

1:30PM Derived equivalence and rational points.
Sarah Frei, Rice University (1154-14-1486)

2:00PM Conic bundles over positive rank elliptic curves. Preliminary report.
Jennifer Berg*, Bucknell University, and Masahiro Nakahara, University of Bath (1154-11-1459)

2:30PM Torsion points on curves of the form $y^n = x^d + 1$. Preliminary report.
Vishal Arul, Massachusetts Institute of Technology (1154-11-735)

3:00PM Resultants of division polynomials and their derivatives, and singular torsion on elliptic curves.
David Grant, University of Colorado Boulder (1154-11-1123)

3:30PM Local-global principles in circle packings.
Elena Fuchs, University of California, Davis, Katherine E Stange*, University of Colorado, Boulder, and Xin Zhang, Institut des Hautes Études Scientifiques (1154-11-1780)

AMS Special Session on Recent Advances in Function and Operator Theory, II

1:00 PM – 3:50 PM Room 110, Meeting Room Level, Colorado Convention Center
Organizers: Kelly Bickel, Bucknell University
Alberto Condori, Florida Gulf Coast University
William Ross, University of Richmond
Alan Sola, Stockholm University

1:00PM Singular parts of matrix-valued Aleksandrov-Clark measures.
Constanze Liaw, University of Delaware (1154-47-276)

1:30PM An invitation to analytic variable exponent function spaces.
Gerardo R. Chacon*, Gallaudet University, and Gerardo A. Chacon, Universidad Antonio Narino (1154-30-206)

2:00PM Automatic real analyticity and a regal proof of a commutative multivariate Löwner theorem.
J. E. Pascoe, University of Florida, and Ryan Tully-Doyle*, University of New Haven (1154-46-1917)

2:30PM A Nevanlinna-Pick theorem in the context of the weighted Hardy algebra over a W*-correspondence.
Rachael M. Norton, Fitchburg State University (1154-47-1367)

3:00PM The zero sets of $\ell_p$ are nested.
Ray Cheng, Old Dominion University (1154-46-243)

3:30PM Nonvanishing Minors and Uncertainty Principles.
Stephan Ramon Garcia, Pomona College (1154-47-103)

AMS Special Session on Stochastic Spatial Models (a Mathematics Research Communities Session), II

1:00 PM – 3:50 PM Room 108, Meeting Room Level, Colorado Convention Center
Organizers: Tobias Johnson, College of Staten Island
Erin Beckman, Duke University
Katelynn Kochalski, SUNY Geneseo
### AMS Special Session on Topological Measures of Complexity: Inverse Limits, Entropy, and Structure of Attractors, II

1:00 PM – 3:50 PM
Room 111, Meeting Room Level, Colorado Convention Center

**Organizers:**
Lori Alvin, Furman University
Jan P. Boronski, National Supercomputing Centre IT4Innovations
Joanna Furno, University of Houston
Piotr Oprocha, AGH University of Science and Technology

#### 1:00 PM – 3:50 PM

- **1:00PM** (1038)
  **Internal Chain Transitivity and \( \omega \)-limit sets in Baire space.**
  Jonathan Meddaugh* and Brian Raines, Baylor University (1154-37-2271)

- **1:30PM** (1039)
  **Folding points for inverse limits generated by a sequence of unimodal maps.**
  Brian E Raines, Baylor University (1154-54-2220)

- **2:00PM** (1040)
  **Folding points in inverse limits.**
  Ana Anusic, University of Sao Paulo, Brazil (1154-37-1679)

### MAA Invited Paper Session on The Mathematics of the COMAP Modeling Contests

1:00 PM – 3:50 PM
Room 610/612, Meeting Room Level, Colorado Convention Center

**Organizers:**
Amanda Beecher, Interdisciplinary Contest in Modeling, Ramapo College of New Jersey
Michelle Isenhour, Naval Postgraduate School

#### 1:00PM

- **1:00PM** (1044)
  **The Mathematics of the COMAP Modeling Contests - Problem A.**
  Elizabeth W Schott, Florida SouthWestern State College (1154-AC-1587)

- **1:30PM** (1045)
  **Perspectives on Student’s Mathematical Approaches for the “B Problem” (Discrete) of COMAP’s Mathematical Modeling Contest.**
  William C. Baudry, Appalachian State University (1154-AC-2255)

- **2:00PM** (1046)
  **Data Driven Mathematical Modeling.**
  Rodney X Sturdivant*, Henry M. Jackson Foundation for the Advancement of Military Medicine, and Robert E Burks, Naval Postgraduate School (1154-AC-2163)

- **2:30PM** (1047)
  **Time to Leave the Louvre: Student Modeling Approaches.**
  Michelle Lynn Isenhour, Naval Postgraduate School (1154-AC-2417)

- **3:00PM** (1048)
  **Simple Models for the Complex Problem of Measuring and Improving Sustainable Development.**
  Jessica M. Libertini, Virginia Military Institute (1154-AC-993)

- **3:30PM** (1049)
  **Who should we send to colonize Mars?**
  Amanda Beecher*, Ramapo College of New Jersey, and Chris Arney, COMAP, Inc. (1154-AC-1390)
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 PM</td>
<td>MAA Minicourse #8: Part A</td>
<td>Room 706, Meeting Room Level</td>
<td>Stats for Data Science. Presenter: Daniel Kaplan, Macalester College</td>
</tr>
<tr>
<td>1:00 PM - 3:00 PM</td>
<td><strong>AMS Contributed Paper Session on Mechanics, Mathematical Physics and Other Applications, II</strong></td>
<td>Room 202, Meeting Room Level</td>
<td></td>
</tr>
<tr>
<td>1:00 PM</td>
<td>Hyper-Dimensional Space-Time Topology and the Riemann Zeta Function: Applications in a Dimensional Field Theory.</td>
<td>Room 202, Meeting Room Level</td>
<td>Demond C. Adams, Miami, FL (1154-85-814)</td>
</tr>
<tr>
<td>1:30 PM</td>
<td>Automated Identification of Landslides. Preliminary report.</td>
<td>Room 202, Meeting Room Level</td>
<td>Colleen Collins*, University of Washington Bothell, Sarah Glidden, Smith College, Katherine Johnston, Lafayette College, Grace Rogers, Appalachian State University, Hasan Hamdan and Celes Woodruff, James Madison University (1154-86-2290)</td>
</tr>
<tr>
<td>1:45 PM</td>
<td>On ellipticity of balance equations for atmospheric dynamics.</td>
<td>Room 202, Meeting Room Level</td>
<td>Andrei Bourchtein* and Ludmila Bourchtein, Institute of Physics and Mathematics, Pelotas Federal University, Brazil (1154-86-1323)</td>
</tr>
<tr>
<td>2:00 PM</td>
<td>Tracking the Evolution of a Large Ice Disk in Westbrook, Maine, USA. Preliminary report.</td>
<td>Room 202, Meeting Room Level</td>
<td>Darrell Jarrett Valenti*, Roger Williams University, Bristol, Rhode Island, and Christopher Horvat, Institute at Brown for Environment and Society (1154-86-2401)</td>
</tr>
<tr>
<td>2:15 PM</td>
<td>Physical characterization of string stability with applications to automobile platoons.</td>
<td>Room 202, Meeting Room Level</td>
<td>Lance Dengelegi* and Hasala Gallolu Kankanamalage, Roger Williams University (1154-93-2687)</td>
</tr>
<tr>
<td>2:30 PM</td>
<td>A Model for the Influence of Media on the Ideology of Content in Online Social Networks.</td>
<td>Room 202, Meeting Room Level</td>
<td>Heather Zinn Brooks* and Mason A Porter, University of California Los Angeles (1154-91-209)</td>
</tr>
<tr>
<td>2:45 PM</td>
<td>Implementation of Toyota’s e-Palette Mobility System to Develop Data-driven Optimization of Transportation Networks.</td>
<td>Room 202, Meeting Room Level</td>
<td>Julia E Vasile, Stony Brook University (1154-91-2838)</td>
</tr>
</tbody>
</table>
AMS Contributed Paper Session on Probability Theory, Stochastic Processes and Statistics

1:00 PM – 3:10 PM  Room 208, Meeting Room Level, Colorado Convention Center

1:00PM  A Finite-Memory Elephant Random Walk and the Central Limit Theorem for Additive Functionals of Markov Chains. Preliminary report.
**Nicholas Owad**, University of Texas at Dallas, and **Felipe Castellano-Macias**, Northeastern University, and **Colby College** (1154-62-2455)

1:15PM  Hyperpfaffian descriptions of $\beta$-ensembles when $\beta$ is a perfect square. Preliminary report.
**Jonathan M. Wells**, Reed College (1154-60-2455)

1:30PM  Non-existence results for space-time fractional stochastic partial differential equations.
**Sunday A. Asogwa**, Auburn University, **Jebessa B. Mijena***, Georgia College & State University, and **Erkan Nane**, Auburn University (1154-60-2320)

1:45PM  Closed form Bayes factor techniques for measuring evidential value from analysis of variance models.
**Thomas J. Faulkenberry**, Tarleton State University (1154-62-1142)

2:00PM  Probabilistic models on fibre bundles.
**Shan Shan***, **Douglas M Boyer**, **Sayan Mukherjee** and **Ingrid Daubechies**, Duke University (1154-60-1663)

2:15PM  Chip-Firing in Abelian Sandpiles.
**Jiajun Hoo**, Sam Houston State University (1154-60-1034)

**Aradhana Soni***, and **Anant Godbole**, East Tennessee State University (1154-62-1673)

**Yu-Sin Chang**, Milwaukee School of Engineering (1154-60-128)

3:00PM  On the range of the transient frog model on $\mathbb{Z}$. Preliminary report.
**Arka Ghosh**, Iowa State University, **Steven Noren***, Illinois Wesleyan University, and **Alex Roitershtein**, Texas A&M University (1154-60-89)

AMS Contributed Paper Session on Topology and Knot Theory, II

1:00 PM – 3:25 PM  Room 204, Meeting Room Level, Colorado Convention Center

1:00PM  The finite group actions on $I$-bundle over the projective plane $\mathbb{P}^2$. Preliminary report.
**Ryo Ohashi**, King’s College (1154-57-495)

1:15PM  The multi-variable affine index polynomial.
**Nicolas Petit**, Oxford College of Emory University (1154-57-186)

1:30PM  Virtual Rational Tangles.
**Blake Mellor***, and **Sean Nevin**, Loyola Marymount University (1154-57-519)

1:45PM  Artworks and Articles Meet Mapper and Persistent Homology.
**H. Zhang***, and **A. Ledesma Alonso**, Grinnell College (1154-54-323)

2:00PM  The tunnel number of all 11 and 12 crossing alternating knots.
**Felipe Castellano-Macias***, Northeastern University, and **Nicholas Owad**, Colby College (1154-57-2592)

2:15PM  The bracket polynomial of a polygonal curve in 3-space.
**Eleni Panagiou**, Department of Mathematics and SimCenter, University of Tennessee at Chattanooga, and **Louis H. Kauffman**, t of Mathematics, Statistics, and Computer Science, University of Illinois at Chicago (1154-57-1104)

2:30PM  Bordered Heegaard Floer Homology over $\mathbb{Z}$. Preliminary report.
**Douglas D Knowles***, and **Ina Petkova**, Dartmouth College (1154-57-1606)

2:45PM  A new cohomology for planar trivalent graphs with perfect matchings. Preliminary report.
**Scott Baldridge**, Louisiana State University (1154-57-1353)

3:00PM  Coloring invariants of knots and links are often intractable.
**Eric Samperton**, University of Illinois at Urbana-Champaign (1154-57-2757)
### MAA Contributed Paper Session on Active Learning in Introductory Courses: Insights from Math Departments in the Process of Change, I

#### 1:00 PM – 3:55 PM

**Room 507, Meeting Room Level, Colorado Convention Center**

**Organizers:**
- Chris Rasmussen, San Diego State University
- Wendy Smith, University of Nebraska Lincoln
- Matthew Voigt, San Diego State University

1:00PM ▶ (1098) **Moving large lectures to collaborative learning in newly designed classrooms.** Preliminary report.
- Martina Bode*, Jenny Ross and Matthew Lee, University of Illinois at Chicago (1154-A5-2499)

1:20PM ▶ (1099) **Active Learning in an Undergraduate Precalculus Course: Insights from a Course Redesign.** Preliminary report.
- Sean Gruber*, Kasso Okoudjou and Raluca Rosca, University of Maryland, College Park (1154-A5-2394)

1:40PM ▶ (1100) **First Year Mathematics Program at the University of Oklahoma.**
- Deborah Moore-Russo*, Keri Kornelson, Milos Savic and Noel Brady, University of Oklahoma (1154-A5-2089)

2:00PM ▶ (1101) **Learning about Active Learning While Actively Learning: Best Practices for Faculty Professional Development.**
- Roberto C Soto* and Alison Marzocchi, California State University, Fullerton (1154-A5-2547)

2:20PM ▶ (1102) **Using Strand Committees to Build Faculty Support for Departmental Change.**
- Lake R Ritter*, Jennifer Vandenburgsch, Kadian Callahan and Erik Westlund, Kennesaw State University (1154-A5-477)

2:40PM ▶ (1103) **What Active Learning Looks Like at Morgan State University.**
- Kendra E Pleasant* and Ahlam Tannouri, Morgan State University (1154-A5-2818)

3:00PM ▶ (1104) **Active Learning and Coordination in Precalculus to Calculus 2 classes.**
- Cristina Villalobos*, Tim Huber, Hyung Kim, Roger Knobel, Shaghayegh Setayesh, Andras Balogh and Anahit Galstyan, University of Texas Rio Grande Valley (1154-A5-2799)

3:20PM ▶ (1105) **Flipping the Formula in Active Learning Classrooms.**
- Mike Weimerskirch, University of Minnesota, and Shelley Kandola*, Michigan State University (1154-A5-1596)
MAA Contributed Paper Session on Innovations in Complex Analysis

Program of the Sessions – Thursday, January 16 (cont’d.)

1:00 PM – 2:35 PM Room 502, Meeting Room Level, Colorado Convention Center

Organizers: Mike Brilleslyper, United States Air Force Academy
Russell W. Howell, Westmont College
Beth Schaubroeck, United States Air Force Academy

1:00PM The Beautiful Chaotic Dynamics of $i^z$.
Joseph Previte and Michelle Previte*, Penn State Erie, The Behrend College (1154-G5-2330)

1:20PM Iteration of Newton Maps.
Kasey Bray, University of Kentucky, Jerry Dwyer, Roger W. Barnard, Texas Tech University, Erin Williams, University of Central Oklahoma, and G. Brock Williams*, Texas Tech University (1154-G5-2152)

Beth Schaubroeck, U. S. Air Force Academy (1154-G5-2148)

2:00PM Visual Explorations for a 1-Parameter Family of Harmonic Trinomials. Preliminary report.
Michael A. Brilleslyper, U. S. Air Force Academy (1154-G5-2130)

Stephen Deterding, West Liberty University (1154-G5-1132)

MAA Contributed Paper Session on Recreational Mathematics: Puzzles, Card Tricks, Games, and Gambling, II

Program of the Sessions – Thursday, January 16 (cont’d.)

1:00 PM – 2:55 PM Room 504, Meeting Room Level, Colorado Convention Center

Organizers: Paul R. Coe, Dominican University
David A. Nash, Le Moyne College
Andrew Niedermaier, Jane Street Capital
Sara B. Quinn, Dominican University

1:00PM Snakes: Legal, Illegal and Dodecahedral.
Therese Aglialoro and Robert Hochberg*, University of Dallas (1154-M5-2576)

1:20PM New Developments on the Benjamin Franklin Magic Squares.
Hossein Behforooz, Mathematics Department, Utica College, Utica, New York (1154-M5-1764)

David A Nash, Le Moyne College (1154-M5-1608)

2:00PM Colonel Blotto, 10 Years Later. Preliminary report.
Andrew Niedermaier, Jane Street Capital (1154-M5-761)

2:20PM Making Money on Scratch Tickets—The Impact of Prize Structures.
Michael Czekanski* and Alex Lyford, Middlebury College (1154-M5-1770)

2:40PM Squaring the Circle in a Mirror.
David Richeson, Dickinson College (1154-M5-2188)

MAA Contributed Paper Session on The EDGE (Enhancing Diversity in Graduate Education) Program: Pure and Applied Talks by Women Math Warriors

Program of the Sessions – Thursday, January 16 (cont’d.)

1:00 PM – 3:55 PM Room 505, Meeting Room Level, Colorado Convention Center

Organizers: Laurel Ohm, University of Minnesota
Shanise Walker, University of Wisconsin-Eau Claire

1:00PM Celebrating the Career of Dr. Fern Hunt.
Bonita V Saunders, National Institute of Standards & Technology (1154-D5-2766)

1:20PM Dr. Roselyn Williams: The Work and Influence of a Woman Math Warrior.
Talitha Washington, Howard University (1154-D5-2575)

1:40PM Highlights From the EDGE Book: The EDGE Program, Inclusivity and Outreach, Math Teaching, Math Research, and Mathematical Lives.
Susan D’Agostino, Johns Hopkins University, Amy Buchmann, University of San Diego, Sarah Bryant, Dickinson College, Michelle Craddock Guinn*, Belmont University, and Leona Harris, University of the District of Columbia (1154-D5-1548)

2:00PM A Class of Virtual Knots With Crossing Weight Zero. Preliminary report.
Carolyn Otto*, University of Wisconsin-Eau Claire, Griffen Potrykus and Bethany Schueller, University of Wisconsin-Milwaukee (1154-D5-1458)

Keisha Cook, Tulane University (1154-D5-896)
MAA General Contributed Paper Session on Graph Theory, II

1:00 PM – 4:10 PM Room 709, Meeting Room Level, Colorado Convention Center

Organizers: Cathy Erbes, Hiram College
Holley Friedlander, Dickinson College
Steven McKay, Brigham Young University

1:00PM (1128) Existence of standing pulse solutions to a skew-gradient system. Preliminary report.
Yung-Sze Choi and Jieun Lee*, University of Connecticut (1154-VN-1251)

Jeb Collins*, University of Mary Washington, and Jehanzeb Chaudhry, University of New Mexico (1154-VN-1166)

1:30PM (1130) Taylor series in higher dimensional fractal space.
Imad A Jaradat* and Marwan T Alquran, Jordan University of Science and Technology (1154-VN-580)

2:00PM (1131) Uniqueness pattern of survival of two species of animals in a domain.
Joon Hyuk Kang, Andrews University (1154-VN-1378)

2:15PM (1132) Parameter Identification in a Parabolic Partial Differential Equation from the Overspecified Data.
Joseph Allen Morgan* and Narayan Thapa, Department of Mathematical Sciences, Cameron University (1154-VN-771)

2:30PM (1133) A Minimal Time Solution to the Firing Squad Synchronization Problem with Von Neumann Neighborhood of Extent 2.
Kathryn A Boddie, University of Louisiana at Lafayette (1154-VN-2390)

2:45PM (1134) Preconditioning Techniques for solving ill-conditioned Large Linear Systems of equations.
Mohammad Tabanjah, New York University-Abu Dhabi (1154-VN-2828)

3:00PM Break

Parth Mukeshbhai Shah* and G. C. Samanta, BITS Pilani, K K Birla Goa Campus (1154-VN-150)

Ramanjit K. Sahi*, Samuel N. Jator, Austin Peay State University, and Mary I. Akinyemi, University of Lagos, Nigeria (1154-VN-1150)

3:45PM (1137) Rigidity of graphs and applications to protein signalling and experimental design.
Adnan Sljoka, RIKEN, Center for Advanced Intelligence Project (1154-VN-2168)

4:00PM (1138) Epidemic Dynamics and adaptive vaccination strategy: scalar-renewal equation approach.
aubain Hzokem* and Neal Madras, York University (1154-VN-287)

MAA General Contributed Paper Session on Applied Mathematics, II

1:00 PM – 4:10 PM Room 707, Meeting Room Level, Colorado Convention Center

Organizers: Cathy Erbes, Hiram College
Holley Friedlander, Dickinson College
Steven McKay, Brigham Young University

1:00PM (1127) Finite difference approximations for controlling hyperbolic-type partial differential equations of a piezoelectric system. Preliminary report.
Emma J Moore*, Western Kentucky University, and Ahmet Ozkan Ozer, Department of Mathematics, Western Kentucky University (1154-VN-2179)

1:15PM (1128) A Posteriori Error Estimation for the Spectral Deferred Correction Method. Jeb Collins*, University of Mary Washington, and Jehanzeb Chaudhry, University of New Mexico (1154-VN-1166)

1:30PM (1129) Taylor series in higher dimensional fractal space.
Imad A Jaradat* and Marwan T Alquran, Jordan University of Science and Technology (1154-VN-580)

1:45PM (1130) Existence of standing pulse solutions to a skew-gradient system. Preliminary report.
Yung-Sze Choi and Jieun Lee*, University of Connecticut (1154-VN-1251)

2:00PM (1131) Uniqueness pattern of survival of two species of animals in a domain.
Joon Hyuk Kang, Andrews University (1154-VN-1378)

2:15PM (1132) Parameter Identification in a Parabolic Partial Differential Equation from the Overspecified Data.
Joseph Allen Morgan* and Narayan Thapa, Department of Mathematical Sciences, Cameron University (1154-VN-771)
1:30PM  Irregularity Strength and Beyond.
Gary Chartrand, James Hallas*, Western Michigan University, Ebrahim Salehi, University of Nevada, and Ping Zhang, Western Michigan University (1154-VP-293)

1:45PM  Hunters and Rabbits on Graphs.
Jay Cummings, California State University, Sacramento (1154-VP-2724)

2:00PM  Characterize Sandpiles on Two and Three Vertices Graphs.
Julianna Doo Ree Kim, California State University, Long Beach (1154-VP-881)

2:15PM  Diffusion of PageRank on graphs.
Paul Horn, University of Denver, and Lauren M. Nelsen*, University of Indianapolis (1154-VP-1452)

2:30PM  Properly connected graphs and going the distance.
Grant Fickes, University of South Carolina, Dylan Green, Dartmouth College, Jonelle Hook, Mount St. Mary’s University, Karen McCready*, King’s College, PA, Kathleen Ryan, DeSales University, Jill Stifano, Brandeis University, and Nathaniel Sauerberg, Carleton College (1154-VP-2779)

2:45PM  Subcubic Planar Graphs Are 7-Square-Choosable.
Stephen G. Hartke, University of Colorado Denver, and Luke L. Nelsen*, University of Indianapolis (1154-VP-1452)

3:00PM  A Few Questions on Color-Critical Subgraphs.
N A Newman*, Troy University, and Matt Noble, Middle Georgia University (1154-VP-773)

3:15PM  Hamiltonicity of 3-connected Line Graphs with Diameter Three.
Hong Jian Lai, West Virginia University, Mingquan Zhan, Millersville University of Pennsylvania, Taoye Zhang*, Penn State Scranton, and Ju Zhou, Kutztown University of Pennsylvania (1154-VP-2666)

3:30PM  Iterated Line Graphs of Graphs with Regular and Bi-Regular Partitions.
Zachary Tyler King, University of Central Oklahoma (1154-VP-1398)

Zhongyuan Che, Penn State University, Beaver Campus (1154-VP-202)

4:00PM  Stamping numbers of graphs. Preliminary report.
Zechariah Hazel, Josh Laison*, Willamette University, and Allison Kerkhoff, University of British Columbia (1154-VP-2212)

MAA General Contributed Paper Session on Interdisciplinary Topics in Mathematics
1:00 PM – 3:55 PM  Room 710, Meeting Room
Level, Colorado Convention Center
Organizers: Cathy Erbes, Hiram College
Holley Friedlander, Dickinson College
Steven McKay, Brigham Young University

1:00PM  Iterated Circular Convolutions in the Binomial Options Pricing Model.
Boyan S. Kostadinov, New York City College of Technology, CUNY (1154-VC-2688)

Jonathan Fischer*, Dan D. Erdmann-Pham and Yun S. Song, University of California, Berkeley (1154-VC-2344)

1:30PM  Analyzing Facial Expression Data in Autism Research.
Chris Fagin*, Christian Brothers University, Yudong Tao, Department of Electrical and Computer Engineering, University of Miami, Yeojin Amy Ahn, Laura Vitale and Daniel Messinger, Child Division, Department of Psychology, University of Miami (1154-VC-2336)

1:45PM  Analysis of Social Network Structure Using Bayesian Exponential Random Graph Model with Heavy Tail Priors.
Dan Han*, University of Louisville, KY, USA, and Rajib Paul, University of North Carolina at Charlotte (1154-VC-2711)

2:00PM  A Survey of Proportional Apportionment Methods Used in the Republican Presidential Primary.

2:15PM  Iterative Methods and Preconditioners for Finite Element Method Based Simulations of Transcranial Direct Current Stimulation.

2:30PM  Social Network of Mathematical Concepts: A Study on Wikipedia.
Preliminary report.
Ho-Chun Herbert Chang*, University of Southern California, and Feng Fu, Department of Mathematics, Dartmouth College (1154-VC-1444)

2:45PM  A naive mathematician’s approach to finding asteroids.
James D. Martin, Hardin-Simmons University (1154-VC-1293)
Thursday, January 16 - Program of the Sessions

AMS Committee on Education Panel

1:00 PM – 2:30 PM  Room 203, Meeting Room
Level, Colorado Convention Center

Next Steps: Mathematics Departments and the Explosive Growth of
Computational and Quantitative Offerings in Higher Education

Organizers:
Katherine Kinnaird, Smith College
Katherine Stevenson, California State University, Northridge

Panelists:
Henry Adams, Colorado State University
Mario Banuelos, California State University, Fresno
Katherine Kinnaird, Smith College
Katherine Stevenson, California State University, Northridge

MAA Panel

1:00 PM – 2:20 PM  Room 601, Meeting Room
Level, Colorado Convention Center

International Engagement in Research and Education in Mathematical Sciences in Africa

Organizer: Overtoun Jenda, Auburn University

Panelists:
Peter Johnson, Auburn University
Suzanne Lenhart, University of Tennessee
Padmanabhan Seshaiyer, George Mason University

MAA Panel

1:00 PM – 2:20 PM  Room 603, Meeting Room
Level, Colorado Convention Center

So You’re (Going to Be) a Postdoc: Now What? A Panel Discussion on a Fulfilling Postdoc Experience

Organizers: Francesca Bernardi, Florida State University
Harrison Bray, University of Michigan
Patricia Klein, University of Minnesota, Twin Cities

Panelists:
Pamela Harris, Williams College
Nancy Rodriguez, University of Colorado, Boulder
Hunter Brooks, Moat Analytics
Yulan Qing, University of Toronto
Program of the Sessions – Thursday, January 16 (cont’d.)

Project NExT

1:00 PM – 2:15 PM Mile High Ballroom 4d-4f, Ballroom Level, Colorado Convention Center

Math for Non-Math Majors.
Organizers: Matt Charnley, Rutgers University
Samantha Pezzimenti, Pennsylvania State University Brandywine
Jake Price, University of Puget Sound
Marcella Torres, University of Richmond

Summer Program for Women in Mathematics (SPWM) Reunion

1:00 PM – 3:00 PM Granite B, 3rd Floor, Hyatt Regency Denver

MAA Contributed Paper Session on Developments, Directions, and Experiences in Open Educational Resources, II

1:15 PM – 2:10 PM Room 506, Meeting Room Level, Colorado Convention Center

Organizers: Benjamin Atchison, Framingham State University
Robert Beezer, University of Puget Sound
Oscar Levin, University of Northern Colorado

1:15PM Using the LibreTexts Platform to Customize OER Textbooks for Calculus II and III. Preliminary report.
Paul E Seeburger, Monroe Community College (1154-CS-2774)

1:35PM Open Educational Resources in Active Learning Classrooms.
Mike Weimerskirch*, Univ. of Minnesota, and Shelley Kandola, Michigan State University (1154-CS-1477)

1:55PM A preview of the Distributed Open Education Network (Doenet).
Duane Q. Nykamp, University of Minnesota (1154-CS-1756)

MAA Contributed Paper Session on Research in Undergraduate Mathematics Education (RUME), II

1:20 PM – 3:55 PM Room 501, Meeting Room Level, Colorado Convention Center

Organizers: Nicole Engelke Infante, West Virginia University
Shiv Smith Karunakaran, Michigan State University

1:20 PM Student-Use of Internet Resources in Undergraduate Mathematics Courses. Abigail Higgins* and Jessamyn Minners, Sacramento State University (1154-N5-2720)

1:40PM As asset oriented approach to studying students of color who thrive and survive in calculus.
Nolisa S. Malluwawadu* and Jess Ellis Hagman, Colorado State University (1154-N5-2371)

2:00PM Creativity-fostering instruction’s impact on student motivation and self-efficacy in upper-level undergraduate mathematics courses.
Paul Regier, The University of Oklahoma (1154-N5-1020)

2:20PM Factors Influencing the Development of Mathematical Problem Solving of Upper-division Undergraduate and First Year Graduate Mathematics Students. Preliminary report.
Andrew Kercher, The University of Texas at Arlington (1154-N5-2292)

2:40PM A Case of Defining as a Way to Learn about Mathematical Language. Preliminary report.
Kristen Vroom, Portland State University (1154-N5-1728)

3:00PM Two perspectives to interpret an object in relation to a coordinate system, coordinates-open and coordinates-closed. Preliminary report.
Inyoung Lee, Arizona State University (1154-H1-2703)

3:20PM Affect Toward Unusual Mathematical Tasks in Mathematically Experienced Adults on the Autism Spectrum.
J. Victoria Truman, Virginia Tech (1154-N5-2675)

3:40PM What group is it? Well it depends on who you know. Students’ varying use of group isomorphisms while investigating molecular structures.
Anna Marie Bergman, Portland State University (1154-N5-2537)

AMS Special Session on Harmonic Analysis, II

1:30 PM – 3:50 PM Room 304, Meeting Room Level, Colorado Convention Center

Organizers: Taryn C. Flock, Macalester College
Betsy Stovall, University of Wisconsin-Madison

1:30PM Fourier Restriction to a Hyperbolic Cone.
Benjamin Baker Bruce, University of Wisconsin - Madison (1154-42-1835)
2:00PM Optimal $L^p - L^q$ Estimates for Euclidean Averages Over Prototypical Hypersurfaces in $\mathbb{R}^3$.
Jeremy Schwend, University of Wisconsin-Madison (1154-42-2134)

2:30PM Explicit Salem Sets in Euclidean Space.
Kyle Hambrook*, San Jose State University, and Robert Fraser, University of Edinburgh (1154-42-131)

3:00PM Discrete directional maximal function along the primes.
Laura Cladek, UCLA, Polona Durcik*, Caltech, Ben Krause, Princeton University, and José Madrid, UCLA (1154-42-2135)

3:30PM Endpoint Sobolev continuity for the fractional maximal function.
David Beltran*, University of Wisconsin-Madison, and José Madrid, University of California, Los Angeles (1154-42-1220)

MAA Poster Session: Projects Supported by the NSF Division of Undergraduate Education

2:00 PM – 4:00 PM Hall D, Exhibit Level, Colorado Convention Center

Organizer: Jon Scott, Montgomery College

2:00PM Contextualize College Algebra with Economics. Preliminary report.
Tao Chen*, Glenn Henshaw, Soloman Kone and Choon Shan Lai, City University of New York-LaGuardia Community College

2:00PM Undergraduate Teaching and Learning in Mathematics With Open Software and Textbooks.
Robert Beezer*, University of Puget Sound, David Farmer, American Institute of Mathematics, Tom Judson, Stephen F. Austin State University, Kent Morrison, American Institute of Mathematics, Vilma Mesa, University of Michigan, and Susan Lynds, University of Colorado

2:00PM The Inquiry-Based Learning Communities Project: Transforming Undergraduate Mathematics.
Patrick X. Rault*, University of Nebraska at Omaha, Amy E. Ksir, U.S. Naval Academy, Christine Von Renesse, Westfield State University, Nina White, University of Michigan, and Kelly Gomez Johnson, University of Nebraska at Omaha

2:00PM 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 Collaborative Research: Using Networked Improvement Communities to Design and Implement Program Transformation Tools for Secondary Mathematics Teacher Preparation (NIC-Transform).
W. Gary Martin*, Auburn University, Wendy M. Smith, University of Nebraska-Lincoln, Margaret Mohr-Schroeder, University of Kentucky, Dana Franz, Mississippi State University, Marilyn Strutchens, Auburn University, Mark Ellis, California State University-Fullerton, and John Sutton, ResultED

2:00PM URI Robert Noyce Teacher Scholarship Program.
Anne Seitsinger*, Theresa Deeney, Bryan Dewsbury, Cornels de Groot, Jay Fogelman, Kathy Peno and Victor Fay-Wolfe, University of Rhode Island

2:00PM Doenet: empowering faculty to run online learning experiments.
Jim Fowler, The Ohio State University, Duane Nykamp*, Jonathan Rogness, University of Minnesota, Bart Snapp, The Ohio State University, Matt Thomas, Ithaca College, and Michael Weimerskirch, University of Minnesota

2:00PM Collaborative Research: Attaining Excellence in Secondary Mathematics Clinical Experiences with a Lens on Equity.
Marilyn Strutchens*, Auburn University, Ruthmae Sears, University of South Florida, Howard Gobstein, Association of Public and Land Grant Universities, W. Gary Martin, Auburn University, John Sutton, ResultED, Jeremy Zelkowski, University of Alabama, Basil Conway IV, Columbus State University, and Charmaine Magram, University of Hawai‘i at Mānoa

2:00PM Calculus and Virtual Reality (CalcVR).
Nicholas Long* and Jeremy Becnel, Stephen F. Austin State University

2:00PM Passion-Driven Statistics.
Robin Donatello*, California State University, Chico, and Lisa Dierker, Wesleyan University

2:00PM Heartland: The Carver Bridge to STEM Success Program.
Heidi Berger*, Mark Brodie, Derek Lyons and Clint Meyer, Simpson College

2:00PM Progress through Calculus.
David Bressoud, Macalester College, Jess Ellis Hagman*, Colorado State University, Sean Larsen, Portland State University, Chris Rasmussen, San Diego State University, Rachel Levy, Mathematical Association of America, Estrella Johnson, Virginia Tech, Naneh Apkarian, Western Michigan University, and Jess Gehrtz, University of Georgia
2:00PM StatPREP: Data-Centric 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 Discovering the Art of Mathematics.
Christine Von Renesse*, Philip Hotchkiss, Julian Fleron and Volker Ecke, Westfield State University

2:00PM Collaborative Research: Maplets for Calculus.
Philip B. Yasskin*, Texas A&M University, Douglas B. Meade, University of South Carolina, Akash Rao, Neel Pochareddy, Alex Shung, Steven Yang, Carl Van Huyck, Texas A&M University, and Luke Hoffman, University of Texas

2:00PM Inverted and Active Learning Pedagogies (IALP) for Student Success and Retention.
Reza O. Abbasian*, Mike Czuchry and John T. Sieben, Texas Lutheran University

2:00PM Examining Undergraduate STEM Majors’ Mathematical Beliefs and Self-Efficacy.
Michael Ferrara*, Robert Talbot, Michael Jacobson, University of Colorado Denver, and Marie Terry, Metropolitan State University of Denver

2:00PM Preparing to Teach Mathematics with Technology - Examining Student Practices.
Samuel D. Reed*, Middle Tennessee State University, Nina G. Bailey, University of North Carolina at Charlotte, Jennifer N. Lovett, Middle Tennessee State University, Allison W. McCulloch, University of North Carolina at Charlotte, Charity Cayton, East Carolina University, and Hollylyonne S. Lee, North Carolina State University

2:00PM New Futures in Science and Mathematics: Supporting Engagement, Retention, Graduation, and Entry of Women into STEM careers.
Susan Pustejovsky*, Angela Frey and Laurelée Guilbault, Alverno College

2:00PM Improving the Preparation of Graduate Students to Teach Undergraduate Mathematics: Supporting the Use of Case-Based Professional Development Activities.
Jack Bookman*, Duke University, Natasha Speer, University of Maine, and Shandy Hauk, San Francisco State University

2:00PM Project SLOPE: Scholarly Leaders Originating as Practicing Educators.
Ann Sitomer*, Oregon State University, Megan Breit-Goodwin, Anoka-Ramsey Community College, Kathleen Quardokus Fisher, Florida International University, Jacqueline Dewar, Loyola Marymount University, and Stephanie Campo, Florida International University

2:00PM Experiences of Mathematics Faculty in Learning to Teach Future Elementary School Teachers.
Shandy Hauk*, San Francisco State University, Jen Jong Tsay, University of Texas Rio Grande Valley, and Billy Jackson, University of Louisville

2:00PM UPTEMPO: Upgrading the Path to Mathematics Teaching by Adding Express and Multiple On-ramps.
Janet Bowers*, Susan Nickerson and Randolph Philipp, San Diego State University

2:00PM Applications from Partner Disciplines in Differential Equations (a SUMMIT-P collaboration).
Rebecca Segal* and Afroditi Filippas, Virginia Commonwealth University

2:00PM Tracking the Longitudinal Development of STEM Majors’ Autonomy and Agency in Mathematical Proof and Proving.
Shiv Smith Karanakaran*, Michigan State University, Mariana Levin, Michigan University, and John Smith III, Michigan State University

2:00PM South Plains Mathematics Fellows.
Raengan Higgins Siwatu* and G. Brock Williams, Texas Tech University

2:00PM Reshaping Mathematical Identity through Valuing Creativity in Calculus.
Emily Cilli-Turner*, Gail Tang, University of La Verne, Milos Savic, Paul Regier, University of Oklahoma, Norman, Houssein El Turky, University of New Haven, and Gulden Karakok, University of Northern Colorado, Greeley

2:00PM Designing Learning Activities.
Ivona Grzegorczyk, California State University Channel Islands

2:00PM Integrating Statistical Ideas into a Modern Calculus Course for Biology (a SUMMIT-P collaboration).
Janet Bowers*, Kathy Williams and Antonio Luque, San Diego State University

2:00PM The Mathematical Education of Teachers as an Application of Undergraduate Mathematics (META Math).
Doug Ensley*, Shippensburg University, James Alvarez, University of Texas - Arlington, Elizabeth Burroughs, Montana State University, Nancy Neudauer, Pacific University, and James Tanton, Mathematical Association of America
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Authors/Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:00PM</td>
<td>The MAA Instructional Practices Guide</td>
<td>Doug Ensley, Shippensburg University, Linda Braddy, Tarrant County College, Lewis Ludwig, Denison University, Martha Abell, Georgia Southern University, and Hortensia Soto, University of Northern Colorado</td>
</tr>
<tr>
<td>2:00PM</td>
<td>Computing with R for Mathematical Modeling</td>
<td>Ben Galluzzo, Clarkson University, Jie Chao, Concord Consortium, and Eric Simonneau, Boston Latin School and 3Sigma Learning Labs, LLC</td>
</tr>
<tr>
<td>2:00PM</td>
<td>Transforming Instruction in Undergraduate Mathematics via Primary Historical Sources (TRIUMPHS)</td>
<td>Janet Barnett, Colorado State University, Dominic Klyve, Central Washington University, Jerry Lodder, New Mexico State University, Daniel Otero, Xavier University, Nicholas Scoville, Ursinus College, and Diana White, University of Colorado Denver</td>
</tr>
<tr>
<td>2:00PM</td>
<td>Collaborative Research: PROfessional Development and Uptake through Collaborative Teams (PRODUCT) Supporting Inquiry Based Learning in Undergraduate Mathematics</td>
<td>Sandra Laursen, Tim Archie and Chuck Hayward, University of Colorado Boulder</td>
</tr>
<tr>
<td>2:00PM</td>
<td>Developing STEM Professionals as Educators and Teacher Leaders (DSPETL)</td>
<td>Christine D. Thomas and Natalie S. King, Georgia State University</td>
</tr>
<tr>
<td>2:00PM</td>
<td>Advancing Students’ Proof Practices in Mathematics through Inquiry, Reinvention, and Engagement</td>
<td>Tenchita Alzaga Elizondo, Kristen Vroom, Sean Larsen, Portland State University, and Stephen Strand, California State University, Chico</td>
</tr>
<tr>
<td>2:00PM</td>
<td>Fostering Student Success and Diversity in STEM by Combining Scholarship Support with Mentoring and Research Engagement</td>
<td>James R. Valles, Jr., Prairie View A&amp;M University, Fred Bonner, Prairie View A&amp;M University, Orion Citfja, Alphonso Keaton and E. Gloria C. Regisford, Prairie View A&amp;M University</td>
</tr>
<tr>
<td>2:00PM</td>
<td>PROfessional Development and Uptake through Collaborative Teams (PRODUCT) Supporting Inquiry Based Learning in Undergraduate Mathematics</td>
<td>Brian Katz, Augustana College, Volker Ecke, Chrissi von Renesse, Westfield State University, Sandra Laursen, University of Colorado Boulder, Jess Hagman, Colorado State University, Rebecca Glover, St. Thomas University, Xiao Xiao, Utica College, and Stan Yoshinobu, California Polytechnic State University, San Luis Obispo</td>
</tr>
<tr>
<td>2:00PM</td>
<td>STEM UP New York (Robert Noyce Teacher Scholarship Program)</td>
<td>Ben Galluzzo, Katie Kavanagh, Jan DeWaters, Mike Ramsdell and Seema Rivera, Clarkson University</td>
</tr>
<tr>
<td>2:00PM</td>
<td>Transforming Instruction in Undergraduate Mathematics via Primary Historical Sources (TRIUMPHS)</td>
<td>Janet Barnett, Colorado State University, Dominic Klyve, Central Washington University, Jerry Lodder, New Mexico State University, Daniel Otero, Xavier University, Nicholas Scoville, Ursinus College, and Diana White, University of Colorado Denver</td>
</tr>
<tr>
<td>2:00PM</td>
<td>Collaborative Research: PROfessional Development and Uptake through Collaborative Teams (PRODUCT) Supporting Inquiry Based Learning in Undergraduate Mathematics</td>
<td>Sandra Laursen, Tim Archie and Chuck Hayward, University of Colorado Boulder</td>
</tr>
<tr>
<td>2:00PM</td>
<td>Developing STEM Professionals as Educators and Teacher Leaders (DSPETL)</td>
<td>Christine D. Thomas and Natalie S. King, Georgia State University</td>
</tr>
<tr>
<td>2:00PM</td>
<td>Advancing Students’ Proof Practices in Mathematics through Inquiry, Reinvention, and Engagement</td>
<td>Tenchita Alzaga Elizondo, Kristen Vroom, Sean Larsen, Portland State University, and Stephen Strand, California State University, Chico</td>
</tr>
<tr>
<td>2:00PM</td>
<td>Fostering Student Success and Diversity in STEM by Combining Scholarship Support with Mentoring and Research Engagement</td>
<td>James R. Valles, Jr., Prairie View A&amp;M University, Fred Bonner, Prairie View A&amp;M University, Orion Citfja, Alphonso Keaton and E. Gloria C. Regisford, Prairie View A&amp;M University</td>
</tr>
<tr>
<td>2:00PM</td>
<td>PROfessional Development and Uptake through Collaborative Teams (PRODUCT) Supporting Inquiry Based Learning in Undergraduate Mathematics</td>
<td>Brian Katz, Augustana College, Volker Ecke, Chrissi von Renesse, Westfield State University, Sandra Laursen, University of Colorado Boulder, Jess Hagman, Colorado State University, Rebecca Glover, St. Thomas University, Xiao Xiao, Utica College, and Stan Yoshinobu, California Polytechnic State University, San Luis Obispo</td>
</tr>
<tr>
<td>2:00PM</td>
<td>STEM UP New York (Robert Noyce Teacher Scholarship Program)</td>
<td>Ben Galluzzo, Katie Kavanagh, Jan DeWaters, Mike Ramsdell and Seema Rivera, Clarkson University</td>
</tr>
<tr>
<td>2:00PM</td>
<td>Transforming Instruction in Undergraduate Mathematics via Primary Historical Sources (TRIUMPHS)</td>
<td>Janet Barnett, Colorado State University, Dominic Klyve, Central Washington University, Jerry Lodder, New Mexico State University, Daniel Otero, Xavier University, Nicholas Scoville, Ursinus College, and Diana White, University of Colorado Denver</td>
</tr>
<tr>
<td>2:00PM</td>
<td>Collaborative Research: PROfessional Development and Uptake through Collaborative Teams (PRODUCT) Supporting Inquiry Based Learning in Undergraduate Mathematics</td>
<td>Sandra Laursen, Tim Archie and Chuck Hayward, University of Colorado Boulder</td>
</tr>
<tr>
<td>2:00PM</td>
<td>Developing STEM Professionals as Educators and Teacher Leaders (DSPETL)</td>
<td>Christine D. Thomas and Natalie S. King, Georgia State University</td>
</tr>
<tr>
<td>Time</td>
<td>Title</td>
<td>Speakers</td>
</tr>
<tr>
<td>-------</td>
<td>----------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>2:00PM</td>
<td><strong>MPWR 2016 and Beyond: Fostering Sustainable Networks for Women in RUME</strong>&lt;br&gt; Jess Hagman, Colorado State University, and Megan Wawro, Virginia Tech</td>
<td></td>
</tr>
<tr>
<td>2:00PM</td>
<td><strong>Noyce@FGCU: Supporting Scholars Pre &amp; Post-Graduation</strong>&lt;br&gt;Katie Johnson, Susan Cooper, Laura Frost, Diane Kratt, Brian Johnson and Tanya Kumberger, Florida Gulf Coast University</td>
<td></td>
</tr>
<tr>
<td>2:00PM</td>
<td><strong>A-PLUS in Math (Alabama’s Practitioner Leaders for Underserved Schools in Mathematics)</strong>&lt;br&gt;Jeremy Zelekowski, Jim Gleason, Martha Makowski, Philip Westbrook and Tye Campbell, The University of Alabama</td>
<td></td>
</tr>
<tr>
<td>2:00PM</td>
<td><strong>Building a Pathway for CS Principles Teachers: A Two-course Sequence for Secondary Education Mathematics Pre-service Teachers</strong>&lt;br&gt;Jeremy Zelekowski, Jeff Gray and Rebecca Odom-Bartel, The University of Alabama</td>
<td></td>
</tr>
<tr>
<td>2:00PM</td>
<td><strong>A Collaborative Approach to Building Capacity for Interdisciplinary Quantitative Reasoning Instruction</strong>&lt;br&gt;Preliminary report. Andrea Young and McKenzie Lamb, Ripon College</td>
<td></td>
</tr>
<tr>
<td>2:00PM</td>
<td><strong>Active and Applied Calculus at Augsburg University (a SUMMIT-P collaboration)</strong>&lt;br&gt;Suzanne I Dorée, Jody Sorensen, Pavel Belik, Joan Kunz and Stella Hofrenning, Augsburg University</td>
<td></td>
</tr>
<tr>
<td>2:00PM</td>
<td><strong>Mathematics Graduate Student Peer-Mentorship Program: Impact and Adaptability in Year 3</strong>&lt;br&gt;Kimberly Cervelo Rogers, Bowling Green State University, Sean P. Yee, University of South Carolina, Jessica Deshler, West Virginia University, and Jeremiah Southwick, University of South Carolina</td>
<td></td>
</tr>
<tr>
<td>2:00PM</td>
<td><strong>Maplets for Calculus (and MYMathApps Calculus)</strong>&lt;br&gt;Douglas B. Meade, University of South Carolina—Columbia, and Philip B. Yasskin, Texas A&amp;M University</td>
<td></td>
</tr>
<tr>
<td>2:00PM</td>
<td><strong>Using Do It Yourself Interactive Simulations, Assessments that Drive Learning, and the Space Program as a Theme in First Two Year College Math Classes</strong>&lt;br&gt;Kristin Arney, Kayla Blyman, United States Military Academy, Marianna Bonanome, New York City College of Technology, CUNY, and Frank Wattenberg, United States Military Academy</td>
<td></td>
</tr>
<tr>
<td>2:00PM</td>
<td><strong>Raising Calculus to the Surface</strong>&lt;br&gt;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</td>
<td></td>
</tr>
<tr>
<td>2:00PM</td>
<td><strong>Raising Physics to the Surface</strong>&lt;br&gt;Aaron Wangberg, Winona State University, Robyn Wangberg, Saint Mary’s University of Minnesota, and Elizabeth Gire, Oregon State University</td>
<td></td>
</tr>
<tr>
<td>2:00PM</td>
<td><strong>Collaborative Research: Solving Problems of Mathematics Accessibility with Process-Driven Math</strong>&lt;br&gt;Matthew Ragland, Ann Gulley, Luke Smith, Auburn University at Montgomery, Yvette Pearson, Joshua Eyler and Canek Phillips, Rice University</td>
<td></td>
</tr>
<tr>
<td>2:00PM</td>
<td><strong>Enhancing Explorations in Functions for Preservice Secondary Mathematics Teachers</strong>&lt;br&gt;James A. M. Alvarez, Theresa Jorgensen and Janessa Beach, The University of Texas at Arlington</td>
<td></td>
</tr>
<tr>
<td>2:00PM</td>
<td><strong>Advancing STEM Teaching in Mathematics and Biology</strong>&lt;br&gt;Dhanapati Adhikari, Michael Kiel and Christine Fryer, Marywood University</td>
<td></td>
</tr>
<tr>
<td>2:00PM</td>
<td><strong>NSF Scholarship Program in Science and Mathematics at Kennesaw State University</strong>&lt;br&gt;Ana-Maria Croicu, Kennesaw State University</td>
<td></td>
</tr>
<tr>
<td>2:00PM</td>
<td><strong>The Biology and Mathematics Educator Scholarship Project to Prepare Future Secondary Education STEM Teachers</strong>&lt;br&gt;Andrew Lazowski, Sacred Heart University</td>
<td></td>
</tr>
<tr>
<td>2:00PM</td>
<td><strong>GP-IMPACT: Integrating Geoscience to Engage Majors with Mathematics (iGEM²)</strong>&lt;br&gt;Theresa Jorgensen*, The University of Texas at Arlington, W. Ashley Griffith and Elizabeth Griffith, The Ohio State University</td>
<td></td>
</tr>
<tr>
<td>2:00PM</td>
<td><strong>The Impact of ASSURE Project on AAMU’s STEM Undergraduate Program</strong>&lt;br&gt;Mohammed R Karim*, Marius P Schainschula, Nesar Ahmed, Linda Skeete McClelan, Alabama A&amp;M University, Huntsville, Alabama, and R. Keith Esch, Horizon Research Inc., Chapel Hill, NC</td>
<td></td>
</tr>
<tr>
<td>2:00PM</td>
<td><strong>Scaling Up: Implementing a Comprehensive Graduate Training Model at Multiple Institutions</strong>&lt;br&gt;Rakissa D. Manzanares*, Gary Olson, Michael Jacobson, Michael Ferrara, University of Colorado Denver, John Haddock, Leigh Harrell-Williams, University of Memphis, and Chris Rodger, Auburn University</td>
<td></td>
</tr>
</tbody>
</table>
2:00PM  Implementing Tectivities to Promote Students’ Reasoning in College Algebra (ITSCoRe).
Gary Olson*, Heather Lynn Johnson, Amber Gardner, Amy Smith, University of Colorado Denver, and Xin Wang, RMC Research

2:00PM  Collaborative Research: A National Consortium for Synergistic Undergraduate Mathematics via Multi-institutional Interdisciplinary Teaching Partnerships (SUMMIT-P). Preliminary report.
Susan Ganter*, Embry-Riddle Aeronautical University, Jack Bookman, Duke University, Bill Haver, Virginia Commonwealth University, Stella Hofrenning, Augsburg University, and Victor Piercey, Ferris State University

2:00PM  Extending the Reach of Mathematics Teacher Leaders.
Jodie Novak* and Frieda Parker, University of Northern Colorado

2:00PM  Collaborative Research: Initiating a Foundational Research Model for Secondary Mathematical Knowledge for Teaching (INFORMS MKT).
Melissa Troudt*, University of Wisconsin—Eau Claire, Jodie Novak, Rob Powers, Adam Ruff, University of Northern Colorado, and Michelle Morgan, Western Colorado University

2:00PM  STEM Teaching Scholars for High Need Chicago-Area Schools.
Melanie Pivarski*, Byoung Sug Kim, John McDermott and Emily Dangremond, Roosevelt University

2:00PM  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  Developing Effective Mathematical Sciences Teachers for High-Needs Middle Schools.
Masood Poorandi*, Allen Pelley, Hector N. Torres and Lawana Walden, Bethune-Cookman University

2:00PM  STEM Transfers and the “What year are you?” question.
Rebekah Dupont, Augsburg University

2:00PM  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, University of Oklahoma

2:00PM  Holyoke Community College STEM Scholars’ Program.
Ileana Vasu*, Emily Rabinski and Steve Winters, Holyoke Community College

2:00PM  Using Bricklayer Coding and Visual Art to Engage Students in Learning Mathematics.
Betty Love*, Matthew Heaton, Victor Winter and Michelle Friend, University of Nebraska - Omaha

2:00PM  Building Capacity via Micro-Internships: Engaging STEM Transformative Experiences for Early Momentum.
Mohammed Yahdi*, Hartnell College, and Zoe Buck Bracey, BSCS Science Learning

AMS Maryam Mirzakhani Lecture
2:15 PM – 3:05 PM  Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center

National Academies’ Roundtable on Data Science Postsecondary Education
2:30 PM – 3:30 PM  Room 201, Meeting Room Level, Colorado Convention Center

MAA Workshop
2:35 PM – 3:55 PM  Room 605, Meeting Room Level, Colorado Convention Center
MAA Panel

2:35 PM – 3:55 PM Room 603, Meeting Room Level, Colorado Convention Center

How to Write Op-eds for Newspapers: Shaping Public Thinking on Math

Organizers: Kira Hamman, Pennsylvania State Mont Alto
Francis Su, Harvey Mudd College

Panelists: Rafe Jones, Carleton College
Audrey Malagon, Virginia Wesleyan University
Aaron Montgomery, Baldwin-Wallace University

MAA Panel

2:35 PM – 3:55 PM Room 601, Meeting Room Level, Colorado Convention Center

Strengthening Undergraduate Research Through Community Building

Organizers: Vicky Klima, Appalachian State University
Thomas Wakefield, Youngstown State University

Panelists: Michael Dorff, Brigham Young University
Tamás Forgács, Fresno State University
Kathryn Leonard, Occidental College
Charles Toll, U.S. Department of Defense
Ulrica Wilson, Morehouse College

Project NExT

3:00 PM – 4:15 PM Mile High Ballroom 4d-4f, Ballroom Level, Colorado Convention Center

Inspired by Real, Fun Math: Practical Outreach for Sharing the Power and Beauty of Mathematics with our Communities.

Organizers: John Cummings, The University of North Georgia
Beth DeWitt, Trinity Christian College
Carl Giuffre, Adelphi University
Naama Lewis, Marian University

AMS Retiring Presidential Address

3:20 PM – 4:10 PM Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center

▶ (1266) A 2020 view of Fermat’s Last Theorem.
Ken A. Ribet, University of California, Berkeley (1154-11-24)

Joint Prize Session

4:25 PM – 5:25 PM Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center

SIGMAA on Quantitative Literacy (SIGMAA QL) Business Meeting, Reception, and Guest Speaker

6:00 PM – 6:50 PM Room 501, Meeting Room Level, Colorado Convention Center

Organizer: Victor Piercey, Ferris State University

6:00PM (1267) Calling bull (with R).
Carrie Diaz Eaton, Bates College
(1154-A0-84)

SIGMAA on the Mathematical Knowledge of Teachers (MKT SIGMAA) Business Meeting and Reception

6:00 PM – 7:00 PM Room 502, Meeting Room Level, Colorado Convention Center

Organizer: Lisa Berger, Stony Brook University

SIGMAA on Undergraduate Research (SIGMAA UR) Business Meeting and Reception

6:00 PM – 6:30 PM Room 507, Meeting Room Level, Colorado Convention Center

SIGMAA on Mathematical and Computational Biology (BIO SIGMAA) Business Meeting and Reception

6:00 PM – 7:00 PM Room 506, Meeting Room Level, Colorado Convention Center

Organizers: Borís Mazzag, Humboldt State University
Tim Comar, Benedictine University
Hannah Highlander, University of Portland

SIGMAA on Undergraduate Research (SIGMAA UR) Guest Speaker

6:40 PM – 7:30 PM Room 507, Meeting Room Level, Colorado Convention Center

6:40PM (1268) Reflections on diversity and undergraduate research.
Maria Mercedes Franco, Queensborough Community College, CUNY (1154-A0-2812)
**SIGMAA on Mathematical and Computational Biology (BIO SIGMAA) Guest Speaker**

7:00 PM – 7:50 PM Room 506, Meeting Room Level, Colorado Convention Center

Organizers: Bori Mazzag, Humboldt State University
            Tim Comar, Benedictine University
            Hannah Highlander, University of Portland

7:00 PM Recent challenges and successes in mathematical modeling of blood clotting.
Karin Leiderman, Colorado School of Mines (1154-A0-71)

**Knitting Circle**

8:15 PM – 9:45 PM Centennial Ballroom D, 3rd Floor, Hyatt Regency Denver

8:15—9:45—Knitting Circle: Bring a project (knitting/crochet/tatting/beading/etc.) and chat with other mathematical crafters.

---

**Friday, January 17**

**Joint Meetings Registration**

7:30 AM – 4:00 PM Lobby C, Meeting Room Level, Colorado Convention Center

**Email Center**

7:30 AM – 8:00 PM Lobby C, Meeting Room Level, Colorado Convention Center

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

8:00 AM – 10:50 AM Room 210/212, Meeting Room Level, Colorado Convention Center

Organizers: Darren A. Narayan, Rochester Institute of Technology
            Khang Tran, California State University Fresno
            Mark David Ward, Purdue University
            John Wieman, The Johns Hopkins University

---

**AMS-MAA Special Session on Getting Started in Undergraduate Research: Topics, Tools and Open Problems, I**

8:00 AM – 10:50 AM Room 112, Meeting Room Level, Colorado Convention Center

Organizers: Hannah Highlander, University of Portland
            Pamela E. Harris, Williams College
            Erik Insko, Florida Gulf Coast University
            Aaron Wootton, University of Portland

8:00 AM Six Fundamental Steps to Mentoring Student Research.
Allison Henrich, Seattle University (1154-00-210)
Program of the Sessions – Friday, January 17 (cont’d.)

8:30AM Early Explorations: A Variation on the Traditional Undergraduate Research Project. Preliminary report.
Katie V. Johnson, Florida Gulf Coast University (1154-05-469)

9:00AM Undergraduates count.
Steve Butler, Iowa State University (1154-05-378)

9:30AM Rainbow Problems in Groups.
Michael Young, Iowa State University (1154-05-2100)

10:00AM Undergraduate research topics in tropical geometry.
Ralph Morrison, Williams College (1154-52-792)

10:30AM Numerical semigroups - a sales pitch.
Christopher ONeill, San Diego State University (1154-05-442)

AMS Special Session on Advances in Multivariable Operator Theory: Connections with Algebraic Geometry, Free Analysis, and Free Probability, II

8:00 AM – 10:50 AM Room 109, Meeting Room Level, Colorado Convention Center

Organizers: Joseph A. Ball, Virginia Tech
Paul S. Muhly, University of Iowa

8:00AM Singular Rational Functions on the Polydisk.
Kelly Bickel*, Bucknell University. James Pascoe, University of Florida, and Alan Sola, Stockholm University (1154-46-117)

8:30AM Kummert’s approach to realization revisited.
Greg Kneese, Washington University in St. Louis (1154-47-1620)

9:00AM Spectral Properties of Model $d$-Tuples.
Edward J Timko, University of Manitoba (1154-47-1385)

9:30AM Automorphism groups of unit balls of intertwiners. Preliminary report.
Rene Ardila, Grand Valley State University (1154-47-156)

10:00AM Twisted Steinberg Algebras.
Becky Armstrong, University of Sydney, Lisa Orloff Clark, Victoria University of Wellington, Kristin Courtney, WWU Münster, Ying-Fen Lin, Queen’s University Belfast, Kathryn McCormick*, University of Minnesota, and Jacqui Ramagge, University of Sydney (1154-46-1497)

10:30AM Discussion

AMS Special Session on Applications and Computations in Knot Theory, I

8:00 AM – 10:50 AM Room 404, Meeting Room Level, Colorado Convention Center

Organizers: Harrison Chapman, Colorado State University
Heather A. Dye, McKendree University
Jesse S.F. Levitt, University of Southern California

8:00AM A Markov chain sampler for knot diagrams.
Harrison Chapman*, Colorado State University, and Andrew Rechnitzer, University of British Columbia (1154-57-1905)
### AMS Special Session on Applied Topology, I

#### Friday, January 17 - Program of the Sessions

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
</table>
| 8:00 AM | Random graph embeddings and entanglements in topological polymers. Preliminary report.  
Jason Cantarella*, University of Georgia,  
Tetsuo Deguchi, Ochanomizu University,  
Clayton Shonkwiler, Colorado State University, and Erica Uehara,  
Ochanomizu University (1154-53-858) |
| 9:00 AM | Double branched cover of knotoids and applications to proteins.  
Agnese Barbensi, Mathematical Institute, University of Oxford (1154-57-724) |
| 9:30 AM | Modeling pathways of DNA unlinking by site-specific recombination.  
Robert H Stolz, University of California, Davis (1154-55-1794) |

#### AMS Special Session on Arithmetic Dynamics, I (Associated with AMS Retiring Presidential Address Kenneth A. Ribet)

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
</table>
| 8:00 AM | Uniform Bounds for Periods of Endomorphisms of Varieties. Preliminary report.  
Keping Huang, University of Rochester (1154-11-137) |
| 9:00 AM | Totally $T$-adic functions of small height. Preliminary report.  
Sarah Koch, University of Michigan (1154-37-1328) |

#### AMS Special Session on Aspects and Applications of Algebraic Combinatorics, I

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
</table>
| 8:00 AM | The alternating central extension for the positive part of the quantum group $U_q(\mathfrak{sl}_2)$.  
Paul M Terwilliger, Math Department, U. Wisconsin-Madison (1154-05-697) |
8:00 AM – 10:50 AM Room 712, Meeting Room Level, Colorado Convention Center

**Organizers:** Robin Deeley, University of Colorado Boulder; Zhaohui Niu, University of Wyoming; Ping Zhong, University of Wyoming

8:00 AM The classification problem for amenable $C^*$-algebras.

George A. Elliott, University of Toronto (1154-46-2385)

8:30 AM Constructions in minimal amenable dynamics and applications to classification of $C^*$-algebras.

Karen R. Strung*, Institute of Mathematics, Czech Academy of Science; Robin J. Deeley, University of Colorado, Boulder, and Ian F. Putnam, University of Victoria (1154-46-1547)

9:00 AM Pure infinite dynamical systems and their $C^*$-algebras.

Xin Ma, State University of New York at Buffalo (1154-37-197)


Valentin Deaconu, University of Nevada, Reno (1154-46-674)

10:00 AM $C^*$-algebras of Artin-Tits monoids. Preliminary report.

Xin Li, Queen Mary University, Tron Omland, Oslo University, and Jack Spielberg*, Arizona State University (1154-46-611)

10:30 AM Cocycles on Deaconu-Renault Groupoids, and KMS States for Generalized Gauge Dynamics.

Leonard Tristan Huang*, University of Nevada, Reno, Carla Farsi, University of Colorado Boulder, Alex Kumjian, University of Nevada, Reno, and Judith Packer, University of Colorado Boulder (1154-46-88)

**AMS Special Session on Commutative Algebra, II**

8:00 AM – 10:50 AM Room 103, Meeting Room Level, Colorado Convention Center

**Organizers:** Patricia Klein, University of Kentucky; Haydee Lindo, Williams College

8:00 AM Covers of rational double points in mixed characteristic.

Javier Carvajal-Rojas, EPFL Lausanne, Lingquan Ma, Purdue University, Thomas Polstra, Karl Schwede*, University of Utah, and Kevin Tucker, University of Illinois at Chicago (1154-13-1992)

8:30 AM Frobenius and Homological Dimensions of Complexes.

Taran H Funk* and Thomas Marley, University of Nebraska - Lincoln (1154-13-864)

9:00 AM Free resolutions of the Frobenius powers of the maximal ideal over a general hypersurface in 3 variables. Preliminary report.

Claudia Miller, Syracuse University, Hamid Rahmati*, University of Nebraska-Lincoln, and Rebecca R.G., George Mason University (1154-13-2603)

9:30 AM Local to global principles for generation time over commutative rings.

Janina C. Letz, University of Utah (1154-18-906)

10:00 AM Relating matrix factorizations and totally acyclic complexes.

Petter Andreas Bergh and Peder Thompson*, Norwegian University of Science and Technology (1154-13-1542)

10:30 AM Homological conjectures, perfectoid spaces, and singularities in all characteristic.

Lingquan Ma, Purdue University (1154-13-1122)

**AMS Special Session on Geometry of Differential Equations, I**

8:00 AM – 10:50 AM Room 105, Meeting Room Level, Colorado Convention Center

**Organizers:** Jeanne Clelland, University of Colorado Boulder; Yuhao Hu, University of Colorado Boulder

8:00 AM – 10:50 AM Room 103, Meeting Room Level, Colorado Convention Center

**Organizers:** Patricia Klein, University of Kentucky; Haydee Lindo, Williams College
Friday, January 17 – Program of the Sessions

AMS Special Session on Groups and Topological Dynamics, I
8:00 AM – 10:50 AM Room 111, Meeting Room
Level, Colorado Convention Center
Organizers: Constantine Medynets, United States Naval Acadmey
Volodymyr Nekrashevych, Texas A&M University
Dmytro Savchuk, University of South Florida

8:00 AM Bireversible automata generating lamplighter groups.
Rachel Skipper, Ohio State University, and Benjamin Steinberg*, The City College of New York (1154-20-1167)

8:30 AM Maximal subgroups of Higman-Thompson groups. Preliminary report.
James Belk, Collin Bleak, Martyn Quick, University of St Andrews, and Rachel Skipper*, The Ohio State University (1154-20-1368)

9:00 AM Twisted Brin-Thompson groups. Preliminary report.
James Belk, University of St Andrews, and Matthew C. B. Zaremsky*, University at Albany (SUNY) (1154-20-551)

9:30 AM On the rigidity of rank gradient in a group of intermediate growth.
Rostyslav Kravchenko, University of Texas at Austin (1154-20-1950)

10:00 AM Accessibility of the Boundary of the Thurston Set.
Stefano Silvestri*, Butler University, and Rodrigo A Perez, Indiana University Purdue University of Indianapolis (IUPUI) (1154-37-1671)

10:30 AM Chromatic Zeros On Hierarchical Lattices and Equidistribution on Parameter Space.
Ivan Chio* and Roland K.W. Roeder, Indiana University Purdue University Indianapolis (1154-37-1568)

AMS Special Session on Highly Accurate and Structure-Preserving Numerical Methods for Nonlinear Partial Differential Equations, II
8:00 AM – 10:50 AM Room 102, Meeting Room
Level, Colorado Convention Center
Organizers: Qin Sheng, Baylor University
Jorge E. Macias-Diaz, Universidad Autonoma de Aguascalientes
Joshua L. Padgett, Texas Tech University

8:00 AM Multiple and nodal solutions for nonlinear equations with a nonhomogeneous differential operator and concave-convex term-Nodal solutions for nonlinear problems.
Michail E. Filippakis, Department of Digital Systems,University of Piraeus,80, Kariaoli and Dimitriou Str, 18534, Piraeus, (1154-35-226)

8:30 AM Mixed finite element methods for a linearized multilayer shallow water model.
Alan Mullenix*, P. Jameson Graber, Rob Kirby, Baylor University, and Colin Cotter, Imperial College London (1154-35-1175)

9:00 AM Smoothing Properties and Dimensional Splitting with Exponential Time Differencing Schemes for Advection-Diffusion-Reaction Systems. Preliminary report.
Bruce A. Wade, University of Louisiana at Lafayette (1154-65-2444)

9:30 AM Structure-Preserving Exponential Integrators with Applications for Damped-Driven NLS.
Brian E. Moore, University of Central Florida (1154-65-760)

10:00 AM Flux based finite element methods.
JaEun Ku, Oklahoma State University (1154-65-984)

10:30 AM A nonlinear splitting algorithm for preserving asymptotic features of stochastic singular differential equations.
Joshua Lee Padgett, Texas Tech University (1154-65-1965)
AMS Special Session on Interactions between Combinatorics, Representation Theory, and Coding Theory, I
8:00 AM – 10:50 AM  Room 104, Meeting Room Level, Colorado Convention Center
Organizers: Manabu Hagiwara, Chiba University
Richard Green, University of Colorado Boulder
8:00 AM  Classification of minuscule Kac-Moody representations built from colored posets.
Michael C. Strayer, Hampden-Sydney College (1154-05-1058)
8:30 AM  Generalized nil Temperley-Lieb algebras and particle configurations.
Richard M. Green, University of Colorado Boulder (1154-16-1174)
9:00 AM  Full heaps and their convex subheaps.
Preliminary report.
Sarah K. Salmon, University of Colorado Boulder (1154-05-1061)
9:30 AM  Order structure of infinite d-complete posets.
Kento Nakada, Okayama university, Faculty of education (1154-05-940)
10:00 AM  On elements of a-value 2 in Coxeter groups.
Tiannyan Xu* and Richard M. Green, University of Colorado Boulder (1154-05-1443)
10:30 AM  Representations of Symmetric Groups and Welter’s Game.
Yuki Irie, Research Alliance Center for Mathematical Sciences, Tohoku University (1154-05-918)

AMS Special Session on Interfaces Between PDEs and Geometric Measure Theory, I
(Associated with AMS Maryam Mirzakhani Invited Address Tatiana Toro)
8:00 AM – 10:40 AM  Room 304, Meeting Room Level, Colorado Convention Center
Organizers: Robin Neumayer, Institute for Advanced Study
Zihui Zhao, Institute for Advanced Study
8:00 AM  An existence theorem for Brakke flow with fixed boundary condition.
Yoshihiro Tonegawa, Tokyo Institute of Technology (1154-49-476)
9:00 AM  On the existence of translating solutions of mean curvature flow in slab regions.
T Bourni*, M Langford, University of Tennessee, Knoxville, and G Tinaglia, King’s College London (1154-35-311)
9:30 AM  A capillarity theory approach to the analysis of soap films.
Salvatore Stuvard, The University of Texas at Austin (1154-49-1206)
10:00 AM  A geometric stability result for Riesz-potentials. Preliminary report.
Almut Burchard, University of Toronto (1154-46-2184)

AMS Special Session on Markov Models and Matrix Properties, I
8:00 AM – 10:40 AM  Room 108, Meeting Room Level, Colorado Convention Center
Organizers: Alan Krinik, California Polytechnic Pomona
Randall J. Swift, California Polytechnic Pomona
8:00 AM  Random Processes of the Form
X_{n+1} = AX_n + B_n (mod p).
Kseniya Klyachko, University at Albany (1154-60-1472)
8:30 AM  A multiplicatively symmetrized version of the Chung-Diaconis-Graham random process. Preliminary report.
Martin V. Hildebrand, University of Albany, State University of New York (1154-60-1044)
9:00 AM  Tight bounds of performance metrics computed on Markovian queueing models. Preliminary report.
Gerardo Rubino, INRIA, France (1154-60-1397)
9:30 AM  Closed form expressions for powers and exponentials of tridiagonal Toeplitz matrices. Preliminary report.
Hubertus F von Bremen*, Alan Krinik, Saif A Aljashamy, Aaron Kim, Jeremy Lin, Thuy Vu Dieu Vu, David Perez, Mac Eloyd Fernandez and Jeffrey Yeh, Department of Mathematics and Statistics,California State Polytechnic University, Pomona (1154-15-1394)
10:00 AM  Tailored Optimal Post-Treatment Surveillance for Cancer Recurrence.
Menggang Yu* and Rui Chen, University of Wisconsin - Madison (1154-62-1030)

AMS Special Session on Mathematical Analysis in Data Science, II (Associated with AMS Colloquium Lectures Ingrid Daubechies)
8:00 AM – 10:50 AM  Room 407, Meeting Room Level, Colorado Convention Center
Organizers: Radu Balan, University of Maryland
Tingran Gao, University of Chicago
Sinan Gunturk, New York University
Ozgur Yilmaz, University of British Columbia
8:00 AM  Sparse Metric Repair.
Anna C Gilbert, University of Michigan (1154-68-2036)
AMS Special Session on Mathematical Information in the Digital Age of Science, I

8:00 AM – 11:00 AM

Room 406, Meeting Room Level, Colorado Convention Center

Organizers: Patrick Ion, IMKT & University of Michigan
Olaf Teschke, zbMath
Stephen Watt, University of Waterloo

8:00AM
Towards a Global Digital Mathematics Library.
Ingrid Daubechies, Duke University (1154-00-957)

8:30AM
Research data in mathematics: taking the high road.
Katja Berčič*, Michael Kohlhase, Florian Rabe and Tom Wiesing, FAU Erlangen-Nürnberg (1154-00-1073)

9:00AM
The Neverending Story of a Holistic Research Infrastructure for Mathematics.
Mila Runnwerth, Leibniz Information Centre for Science and Technology (1154-00-953)

9:30AM
Writing Mathematics in the Digital Age.
Preliminary report.
Bruce R Miller, National Institute of Standards and Technology (1154-33-1352)

10:00AM
The Mathematics Genealogy Project as a Dataset.
Mitchel T. Keller, Mathematics Genealogy Project and Morningside College (1154-01-1017)

10:30AM
Discussion GDML Issues

AMS Special Session on Mean Field Games: Theory and Applications

8:00 AM – 10:50 AM

Room 106, Meeting Room Level, Colorado Convention Center

Organizer: François Delarue, University of Nice Sophia Antipolis

8:00AM
MFG vs. Directed Chain Game.
Preliminary report.
Jean-Pierre Fouque, University of California Santa Barbara (1154-60-1154)

8:30AM
Stochastic Graphon Game Models as Extensions of Mean Field Games.
Rene A. Carmona, Princeton University (1154-91-904)

9:00AM
Machine Learning Methods for Mean Field Control and Mean Field Games.
Rene Carmona and Mathieu Lauriere*, ORFE, Princeton University (1154-65-1537)

9:30AM
MFGs and GANs. Preliminary report.
Haoyang Cindy Cao, Xin Guo*, UC Berkeley, and Mathieu Lauriere, Princeton University (1154-49-2006)

10:00AM
Weak solutions for variational mean field games of controls.
P. Jameson Graber*, Alan Mullenix, Baylor University, Frederic Bonnans and Laurent Pfeiffer, Ecole Polytechnique (1154-35-862)

10:30AM
Restoration of uniqueness for mean field games on a finite state space with a common noise.
E. Bayraktar, University of Michigan, A. Cecchin, University of Michigan, A. Cohen, University of Michigan, and F. Delarue*, Universite Cote d’Azur, France (1154-60-1350)

AMS Special Session on Random Combinatorial Structures, Complex Analysis and Integrable Systems, I

8:00 AM – 9:50 AM

Room 405, Meeting Room Level, Colorado Convention Center

Organizers: Virgil U. Pierce, University of Northern Colorado
Nicholas M. Ercolani, University of Arizona

8:00AM
Additions and the Toda Hierarchy.
Dylan J Murphy, University of Arizona (1154-37-2249)

8:30AM
Producing and Understanding Quaternion-valued Solutions to the KdV Equation.
Alex Kasman, College of Charleston (1154-35-546)

9:00AM
Multiple-pole solutions of the nonlinear Schrödinger equation.
Robert Buckingham, University of Cincinnati (1154-35-1496)

AMS Special Session on Stochastic Analysis and Applications in Finance, Actuarial Science and Related Fields, I

8:00 AM – 10:50 AM  Room 107, Meeting Room Level, Colorado Convention Center
Organizers: Julius N. Esunge, University of Mary Washington
See Keong Lee, Universiti Sains Malaysia
Aurel I. Stan, The Ohio State University

8:00AM  Refinement of the Barndorff-Nielsen and Shephard model with machine learning: analysis of various price indices. Indranil SenGupta, North Dakota State University (1154-60-86)


9:00AM  Real Options with the General Investment Cost. Subas Acharya**, Alain Bensoussan, Dmitry Rachinskiy and Alejandro Rivera, University of Texas at Dallas (1154-35-2583)


10:00AM  An Optimal Portfolio Control Problem. Preliminary report. Serge Love Teutu Tallia**, and Isabelle Kamajou-Brown, Morgan State University (1154-60-1204)


MAA Invited Paper Session on Can Mathematics Help Us Trust Our Elections Again?

8:00 AM – 10:20 AM  Room 610/612, Meeting Room Level, Colorado Convention Center
Organizers: Jonathon Hodge, Grand Valley State University
Audrey Malagon, Virginia Wesleyan University

8:00AM  Data Science for Election Oversight. Preliminary report. Stephanie Frank Singer, Portland State University (1154-AD-819)

8:30AM  Risk-Limiting Audits. Preliminary report. Philip B. Stark, University of California, Berkeley (1154-AD-372)

9:00AM  Auditing elections in "other ways". Ronald L. Rivest, Massachusetts Institute of Technology (1154-AD-2577)


10:00AM  Panel Q & A

AMS Contributed Paper Session on Combinatorics and Graph Theory, I

8:00 AM – 10:10 AM  Room 202, Meeting Room Level, Colorado Convention Center

8:00AM  Combinatorial Proof of Jackson’s Transformation via Overpartitions. Thomas Morrill, UNSW Canberra (1154-05-198)


8:30AM  Vertex Pasted Skeletal Graph Pairs and Zero Forcing Numbers. Houston S Schuerger**, University of North Texas, and Andrew Schwartz, Southeast Missouri State University (1154-05-377)

8:45AM  Enumerating Anchored Permutations with Bounded Gaps. Maria Monks Gillespie**, Colorado State University, Kenneth G. Monks, University of Scranton, and Kenneth M. Monks, Front Range Community College (1154-05-813)


9:15AM  Bounds on expected propagation time of probabilistic zero forcing. Shyam Narayanan and Alec Sun**, Harvard University Department of Mathematics (1154-05-561)


9:45AM  k-Configurations and Superconfigurations. Preliminary report. Benjamin Peet, St. Martin’s University (1154-05-695)
AMS Contributed Paper Session on Real and Complex Analysis

8:00 AM – 10:25 AM Room 204, Meeting Room Level, Colorado Convention Center

8:00AM Real zeros of random cosine polynomials with palindromic blocks of coefficients.
Ali Pirhadi, Oklahoma State University (1154-26-20)

8:15AM On the left fractional local general M-derivative.
George A. Anastassiou, University of Memphis (1154-26-144)

8:30AM The starlikeness of a generalized Bessel function.
See Keong Lee, Universiti Sains Malaysia (1154-30-217)

8:45AM Sampling in Analytic Tent Spaces.
Preliminary report.
Caleb G Parks, University of Arkansas (1154-30-738)

9:00AM Non-PCF Fractals: The Octacarpet and other 4N-Carpets.
Claire Marilynn Canner, Rochester Institute of Technology (1154-32-2209)

9:15AM On differential independence of ζ and Γ.
Qi Han* and Jingbo Liu, Texas A&M University at San Antonio (1154-30-922)

9:30AM Linear combinations of polynomials with three-term recurrence.
Khang D Tran*, California State University, Fresno, and Maverick Zhang, University of California, Berkeley (1154-30-1000)

9:45AM Modulus metrics in the discrete and the continuum. Preliminary report.
Jared E Hoppis, Kansas State University (1154-30-2192)

10:00AM On the Compositions of Infinitely Many Holomorphic Functions.
Kourosh Tavakoli, Oklahoma City University (1154-30-2561)

10:15AM Extensions of the notions of polynomial and rational hull.
Alexander J. Izzo, Bowling Green State University (1154-32-2448)

MAA Contributed Paper Session on A History of Mathematics in the United States and Canada: A session in Honor of Math Historian David Zitarelli

8:00 AM – 10:55 AM Room 504, Meeting Room Level, Colorado Convention Center

Organizers:
Colin McKinney, Wabash College
Amy Shell-Gellasch, Eastern Michigan University

8:00AM David Zitarelli: A Short Introduction.
Preliminary report.
Amy Shell-Gellasch, Eastern Michigan University (1154-F1-1155)
8:20AM Hassler Whitney and Fire Control in WWII.
John McCleary, Vassar College (1154-F1-2340)

8:40AM The best mathematician in the state of Missouri (in 1897)?
Leon M. Hall, Missouri S&T (1154-F1-765)

9:00AM In Search of Lillian Lieber: Google, Serendipity, and Ancestry.com.
David Lindsay Roberts, Prince George’s Community College (1154-F1-2221)

9:20AM A Brief History of the Mathematics Honor Society Kappa Mu Epsilon.
Cynthia J Huffman, Pittsburg State University (1154-F1-148)

9:40AM Helping to build the American mathematical community - two early journals.
Patricia R. Allaire*, Queensborough Community College, City University of New York, and Antonella Cupillari, Penn State Erie - The Behrend College (1154-F1-327)

10:00AM Noether in Cambridge. Preliminary report.
Lawrence A. D’Antonio, Ramapo College (1154-F1-67)

10:20AM David Zitarelli and Historical Methods: Mathematics in Early 19th-Century American Colleges.
Amy Ackerman-Hastings, Rockville, MD (1154-F1-31)

10:40AM Preserving the Legacy: An Update and Preview of the Zitarelli Volumes.
Della Dumbaugh*, University of Richmond, and Stephen Kennedy, MAA Books and Carleton College (1154-F1-385)

MAA Contributed Paper Session on Data Across the Curriculum

8:00 AM – 10:15 AM Room 501, Meeting Room Level, Colorado Convention Center
Organizer: Alana Unfried, California State University, Monterey Bay

8:00AM Data, History, and Design: Finding Common Ground in Contested Landscapes. Preliminary report.
McKenzie Lamb, Ripon College (1154-C1-2298)

8:20AM Teaching all the Math for Data Science, AI, and Beyond.
Tyler J Jarvis, Brigham Young University (1154-C1-2324)

8:40AM Calculus Through a Data Lens: Broadening Scope Through Data and Modeling.
Rachel Grotheer, Goucher College (1154-C1-1010)

9:00AM Calculus and Epidemics. Preliminary report.
Annela R Kelly, Regis College (1154-C1-2217)

9:20AM Using Atmospheric Data to Determine How Well a Separable ODE Models the Vertical Motion of a Dry Air Parcel.
Chris Oehrlein, Oklahoma City Community College (1154-C1-2072)

9:40AM Using Smartphone Sensor Data in the Mathematics Classroom.
Albert W Schueller, Whitman College (1154-C1-1662)

10:00AM Adding data analysis to a mathematical statistics course.
Johanna N.Y. Franklin, Hofstra University (1154-C1-632)

MAA Contributed Paper Session on Fostering Creativity in Undergraduate Mathematics Courses, I

8:00 AM – 10:55 AM Room 503, Meeting Room Level, Colorado Convention Center
Organizers: Emily Cilli-Turner, University of La Verne, Houssein El Turkey, University of New Haven, Gulden Karakok, University of Northern Colorado, Milos Savic, University of Oklahoma, Gail Tang, University of La Verne

8:20AM Play Dough and Dumpsters.
Erin E Martin, William Jewell College (1154-E5-2147)

8:40AM Design - 3D Print - Calculate: Student Created 3D Printed Solids of Revolution.
Lucy Spardy Oremland* and Csilla Szabo, Skidmore College (1154-E5-2270)

9:00AM Art Gallery Design: Where’s the Math in That?!? Preliminary report.
Lucas Castle, Virginia Military Institute (1154-E5-2624)

9:20AM Leveraging Wonder to Increase Accessibility in Calculus.
Emerald Tatiana Stacy, Washington College (1154-E5-43)

Lori Carmack and Veera Holdai*, Salisbury University (1154-E5-1077)

10:00AM Unleashing student creativity and mathematics in Math 100: Survey of Mathematics.
Aaron D Wangberg, Winona State University (1154-E5-2215)
Friday, January 17 – Program of the Sessions

MAA Contributed Paper Session on Making Business Calculus Relevant

8:00 AM – 10:15 AM  Room 505, Meeting Room Level, Colorado Convention Center

Organizers: Britney Hopkins, University of Central Oklahoma
 Leslie Jones, University of Tampa

8:00 AM  Assessing Preparedness for Business Calculus. Preliminary report.
Stephanie R. Branham, University of Tampa (1154-IS-967)

8:20 AM  Strengthening the Connection between Business Calculus and Business Courses. Preliminary report.
Leslie Jones*, University of Tampa, and Britney Hopkins, University of Central Oklahoma (1154-IS-161)

8:40 AM  A Cooperatively Designed Decision-Focused Approach to Business Calculus.
Steven Hetzler* and Robert Barber, Salisbury University (1154-IS-2169)

9:00 AM  A Peek into the Minds of Business Calculus Students.
Deborah L. Gochenaur* and Ji Young Choi, Shippensburg University (1154-IS-2468)

Wojciech K Kossek, University of Denver (1154-IS-1710)

9:40 AM  Using metacognitive techniques to help students learn from their first business calculus exam. Preliminary report.
Thomas Milligan* and Bradley J Paynter, University of Central Oklahoma (1154-IS-2366)

10:00 AM  A complete CRAFTY inspired Business Calculus Course.
Mike May, Saint Louis University (1154-IS-1253)

MAA Contributed Paper Session on Mathematics and Sports, I

8:40 AM  Application of Grey Model to Predict the Results and Detect the Anomalies of Olympic Track and Field Events. Preliminary report.
Reza O. Abbasian, Texas Lutheran University, John T. Sieben* and Oakley Saint-Vincent, Texas Lutheran University (1154-L1-497)

9:00 AM  An Application of the Mapper Algorithm to Sports Analytics in College Basketball. Preliminary report.
Derek L Margulies* and Christopher R Cornwell, Towson University (1154-L1-1694)

9:20 AM  Analyzing Shot Expectation Through Spatial Data Collection Applications.
Adam F Childers, Roanoke College (1154-L1-2125)

Jeffrey W Heath*, Will Britt, Shelby Montgomery and Jackson Norris, Centre College (1154-L1-2682)

10:00 AM  A Logistic Regression/Markov Chain Model for the NFL. Preliminary report.
Nicholas Gorgievski* and Brianna T Doherty, Nichols College (1154-L1-2141)

John A David, Virginia Military Institute (1154-L1-664)

10:40 AM  Dynamically Scheduling National Football League Games to Reduce Strength of Schedule Variability.

MAA Contributed Paper Session on Quantitative Literacy and Social Justice: An Ongoing Dialogue, I

8:00 AM – 10:55 AM  Room 507, Meeting Room Level, Colorado Convention Center

Organizers: Mark A. Branson, Stevenson University
 Catherine Crockett, Point Loma University
 Jason Douma, University of Sioux Falls
 Gizem Karaali, Pomonol University
 Victor Piercey, Ferris State University
 Samuel L. Tunstall, Trinity University
### MAA General Contributed Paper Session on Algebra, II

#### 8:00 AM – 10:55 AM

**Room 709, Meeting Room Level, Colorado Convention Center**

**Organizers:** Cathy Erbes, Hiram College  
Holley Friedlander, Dickinson College  
Steven McKay, Brigham Young University

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:30 AM</td>
<td>A Correspondence Between Central Extensions and Homotopy Classes of Maps</td>
<td>Michael Evan Niemeier, Florida State University (1154-VL-622)</td>
</tr>
<tr>
<td>9:45 AM</td>
<td>The word problem for one relation Adian inverse semigroups.</td>
<td>Muhammad Inam, Alabama A&amp;M University (1154-VL-1535)</td>
</tr>
<tr>
<td>10:00 AM</td>
<td>Graded Hecke algebras for the symmetric group acting in positive characteristic.</td>
<td>Naomi Krawzik, University of North Texas (1154-VL-2557)</td>
</tr>
<tr>
<td>10:15 AM</td>
<td>Jeux de taquin.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>O'Neill Kingston, Iowa State University (1154-VL-1566)</td>
</tr>
</tbody>
</table>

### MAA General Contributed Paper Session on Applied Mathematics, III

#### 8:00 AM – 10:55 AM

**Room 709, Meeting Room Level, Colorado Convention Center**

**Organizers:** Cathy Erbes, Hiram College  
Holley Friedlander, Dickinson College  
Steven McKay, Brigham Young University

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 AM</td>
<td>Backward Bifurcation in vector-borne model with direct transmission.</td>
<td>Sunil Giria and Necibe Tuncer, Florida Atlantic University (1154-VN-85)</td>
</tr>
<tr>
<td>8:15 AM</td>
<td>Sparse Sampling and Fully-3D Fast Total Variation Based Imaging Reconstruction for Chemical Shift Imaging in Magnetic Resonance Spectroscopy.</td>
<td>Zigen Song, Shanghai Ocean University, Melinda Baxter, Mingwu Jin, University of Texas at Arlington, Jian-Xiong Wang, University of Texas Southwest Medical Center, Ren-Cang Li, Talon Johnson and Jianzhong Su, University of Texas at Arlington (1154-VN-2490)</td>
</tr>
<tr>
<td>8:30 AM</td>
<td>Asymptotic Analysis of Resonances of Small Volume High Contrast Linear and Nonlinear Scatterers.</td>
<td>Taoufik Meklachi, Assistant Teaching Professor/Penn State Harrisburg, Shari Moskow, Professor of Mathematics/Drexel University, and John Schotland, Professor / University of Michigan (1154-VN-1092)</td>
</tr>
<tr>
<td>8:45 AM</td>
<td>On the spectral theory of 1-D Schrödinger operator with random sparse potentials.</td>
<td>Thomas Andrew Cook, Pfeiffer University (1154-VN-1541)</td>
</tr>
<tr>
<td>9:00 AM</td>
<td>The diffusion Frechet function and its application in classifying ECG waveforms.</td>
<td>Uyen-Minh Le, Mehmet Aktas and Emily Hendryx, University of Central Oklahoma (1154-VN-1508)</td>
</tr>
<tr>
<td>9:15 AM</td>
<td>Identifying damage in sea ice from sparse laser strain measurements.</td>
<td>Victor Churchill, Dartmouth College (1154-VN-2281)</td>
</tr>
</tbody>
</table>
Friday, January 17 – Program of the Sessions

MAA General Contributed Paper Session on Geometry

8:00 AM – 10:40 AM

Room 710, Meeting Room Level, Colorado Convention Center

Organizers: Cathy Erbes, Hiram College
Holley Friedlander, Dickinson College
Steven McKay, Brigham Young University

8:15 AM
(1483)
An Approach to Accommodating a Congenitally Blind Student in an Inclusive University Geometry Course for Preservice K-8 Teachers. Patricia Baggett, New Mexico State University (1154-VO-170)

8:30 AM
(1484)
Normal Vectors and Space Curves. Alan R Parry, Utah Valley University (1154-VO-1903)

8:45 AM
(1485)
The path from Fermat point to Steiner points. Cecilia C Fitzgerald* and Roman Wong, Washington & Jefferson College (1154-VO-1170)

9:00 AM
(1486)
Rigidity of Hyperbolic space. Daniel Martin*, Trinity college, Lan-Hsuan Huang and Hyun Chul Jang, University of Connecticut (1154-VO-2662)

9:15 AM
(1487)
Staircase metric tori. Anh Tran, Kyle Andrie and J Mealy*, Austin College (1154-VO-159)

9:30 AM
(1488)
Caustics of light rays and Euler’s angles of inclination. Preliminary report. Sergiy Koshkin* and Ivan Rocha, University of Houston-Downtown (1154-VO-1434)

10:00 AM
(1489)
Quantitative combinatorial geometry for concave functions. Sherry Sarkar*, Georgia Institute of Technology, Alex Xue, Cornell University, and Pablo Soberón, City University of New York, Baruch College (1154-VO-2286)

10:15 AM
(1490)
Improved Upper Bound for Three Dimensional Universal Covering Problem. Yuxuan Zheng, Princeton International School of Mathematics and Science (1154-VO-2066)

10:30 AM
(1491)
Six-dimensional Lie-Einstein spaces with diagonal metric form. Preliminary report. Rishi Raj Subedi, Georgia State University (1154-VO-1068)

SIAM Minisymposium on Derivative Free Optimization for High-Dimensional Problems

8:00 AM – 11:10 AM
Room 301, Meeting Room Level, Colorado Convention Center

Organizer: Louis Tenorio, Colorado School of Mines

8:00 AM
(1492)

8:40 AM
(1493)

9:20 AM
(1494)

10:00 AM
(1495)
A Stochastic Derivative Free Optimization Method with Momentum. Peter Richtarik, KAUST (1154-65-2054)

10:40 AM
(1496)
Manifold Sampling for Robust Calibration. Stefan Wild, Argonne National laboratory (1154-65-2051)
Program of the Sessions – Friday, January 17 (cont’d.)

**Project NExT Workshop**

8:00 AM – 6:00 PM  Mile High Ballroom 4d-4f, Ballroom Level, Colorado Convention Center

Organizers: Matt DeLong, Marian University  
Dave Kung, St. Mary’s College of Maryland  
Alicia Prieto Langarica, Youngstown State University

**MAA Workshop**

8:00 AM – 9:20 AM  Room 605, Meeting Room Level, Colorado Convention Center

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

Organizers: Beth Herbel-Eisenmann, National Science Foundation, Division of Research on Learning  
Karen Keene, National Science Foundation, Division of Undergraduate Education  
Swatee Naik, National Science Foundation, Division of Mathematical Sciences  
Sandra Richardson, National Science Foundation, Division of Undergraduate Education  
Michael Steele, National Science Foundation, Division of Research on Learning  
Talitha Washington, National Science Foundation, Division of Undergraduate Education  
Hank Warchall, National Science Foundation, Division of Mathematical Sciences  
Lee Zia, National Science Foundation, Division of Undergraduate Education

**Employment Center**

8:00 AM – 5:30 PM  Mile High Ballroom 1,2,3, Ballroom Level, Colorado Convention Center

**AMS-AWM Special Session on Representation Theory Inspired by the Langlands Conjectures, I (Associated with Joint AWM-AMS Noether Lecture Birgit Speh)**

8:30 AM – 10:40 AM  Room 402, Meeting Room Level, Colorado Convention Center

Organizers: Birgit Speh, Cornell University  
Peter Trapa, University of Utah

8:30AM  (1497)  Unipotent Representations Attached to Principal Nilpotent Orbits.  
Lucas Mason-Brown, Massachusetts Institute of Technology (1154-22-284)

9:00AM  (1498)  Computing Unipotent Representations.  
Preliminary report.  
Jeffrey D Adams, University of Maryland (1154-22-1625)

10:00AM  (1499)  A program for branching problems in the representation theory of real reductive groups — Classification problem of symmetry breaking operators.  
Preliminary report.  
Toshiyuki Kobayashi, The University of Tokyo, Graduate School of Mathematical Sciences & Kavli IPMU (WPI) (1154-22-1348)

**AMS Special Session on Research in Mathematics by Early Career Graduate Students, I**

8:30 AM – 10:50 AM  Room 401, Meeting Room Level, Colorado Convention Center

Organizers: Marat Markin, California State University Fresno  
Morgan Rodgers, California State University Fresno  
Khang Tran, California State University Fresno

8:30AM  (1500)  “Mathematical tools for automated detection of antimicrobial peptides”.  
Long Nguyen*, Maria Emelianenko, Amy C and Barney Bishop, George Mason University (1154-00-2549)

9:00AM  (1501)  Modeling the risk of HIV infection for drug abusers.  
Angelica Bloomquist* and Naveen K Vaidya, San Diego State University (1154-92-2516)

9:30AM  (1502)  Hyperparameters for Convolutional Neural Networks.  
M Tyler Moncur*, Michael Nelson and Tyler Jarvis, Brigham Young University (1154-49-2699)

10:00AM  (1503)  Exact and Nonstandard Finite Difference Schemes for a Modified Law of Cooling.  
William S Dula*, Department of Mathematical Sciences, Clark Atlanta University, and Ronald E Mickens, Department of Physics, Clark Atlanta University (1154-39-1989)
An Application of Quantum Annealing to the Bike Share Re-balancing Problem.

Eric Chirtel*, University of Waterloo, Juergen Kritschgau, Iowa State University, and Kota Kageie, Okayama University (1154-90-2591)

AMS-MAA Grad School Fair

8:30 AM – 10:30 AM Hall D, Exhibit Level, Colorado Convention Center

Undergrads! Take this opportunity to meet representatives from mathematical science graduate programs.

MAA Invited Address

9:00 AM – 9:50 AM Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center

(1505) Instruction and resources in post-secondary mathematics: How their interplay shapes what we do in the classroom.

Vilma Mesa, University of Michigan (1154-A0-80)

ASL Invited Address

9:00 AM – 9:50 AM Room 302, Meeting Room Level, Colorado Convention Center

(1506) Toy multiverses of set theory.

Victoria Gitman, CUNY Graduate Center (1154-03-878)

MAA Minicourse #2: Part B

9:00 AM – 11:00 AM Room 708, Meeting Room Level, Colorado Convention Center

Creating and Adapting OER Textbooks Using the LibreTexts Platform.

Presenters: Judy Dean, Monroe Community College

Paul E. Seeburger, Monroe Community College

MAA Minicourse #3: Part B

9:00 AM – 11:00 AM Room 708, Meeting Room Level, Colorado Convention Center

Creating and Adapting OER Textbooks Using the LibreTexts Platform.

Presenters: Judy Dean, Monroe Community College

Paul E. Seeburger, Monroe Community College

MAA Minicourse #1: Part B

9:00 AM – 11:00 AM Room 704, Meeting Room Level, Colorado Convention Center

Using Automated Software to Learn and Teach Numerical Solution of Partial Differential Equations.

Presenter: L. Ridgeway Scott, University of Chicago

MAA Contributed Paper Session on Combining Technological Tools and Innovative Practices to Improve Student Learning Outcomes, I

9:00 AM – 10:55 AM Room 502, Meeting Room Level, Colorado Convention Center

Organizers: Marianna Bonanome, New York City College of Technology

Manmohan Kaur, Benedictine University

Ariane M. Masuda, New York City College of Technology

K. Andrew Parker, New York City College of Technology

9:00AM (1507)

Transitioning to Free Mathematical Software in Freshman Calculus. Preliminary report.

Daniel Moseley, Daniel Franz*, Jacksonville University, and Aaron M. Montgomery, Baldwin Wallace University (1154-B5-954)

9:20AM (1508)

Virtual reality in the calculus 3 classroom.

Bart Snapp* and Chris Porter, The Ohio State University (1154-B5-741)

9:40AM (1509)

OERs Harnessing Technological Tools and Innovative Pedagogies to Support Student Learning and Engagement in Gateway Mathematics Courses. Preliminary report.

Marianna Bonanome* and Ariane Masuda, The New York City College of Technology, CUNY (1154-B5-2400)

10:00AM (1510)

Engineering Learning in Studio Calculus III Honors.

G. Gustave Greivel*, Holly Eklund and Scott A. Strong, Department of Applied Mathematics and Statistics, Colorado School of Mines (1154-B5-2657)

10:20AM (1511)

General exponential functions in calculus.

Stephen M. Walk, St. Cloud State University (1154-B5-1291)

10:40AM (1512)

The Creative Use of Technology in Dynamic Classrooms, Interactive Textbooks, and Independent Remediation.

Marilyn A. Reba, Georgia State University (1154-B5-593)

Exhibits and Book Sales

9:30 AM – 5:30 PM Hall D, Exhibit Level, Colorado Convention Center
**MAA Workshop**

9:35 AM – 10:55 AM Room 605, Meeting Room Level, Colorado Convention Center

Discussing Project Ideas with NSF/EHR Program Officers

Organizers: Karen Keene, National Science Foundation, Division of Undergraduate Education
Sandra Richardson, National Science Foundation, Division of Undergraduate 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 302, Meeting Room Level, Colorado Convention Center

(1513) Axiomatizing reasoning about sets: cardinality, mereology, and decisiveness. Wesley H. Holliday, University of California, Berkeley (1154-03-1714)

**AMS Invited Address**

10:05 AM – 10:55 AM Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center

(1514) Biomedical data sharing and analysis at scale. Bonnie Berger, Massachusetts Institute of Technology (1154-92-3)

**Radical Dash Prize Session**

10:30 AM – 11:00 AM Room 702, Meeting Room Level, Colorado Convention Center

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

**AMS-MAA Invited Address**

11:10 AM – NOON Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center

(1515) Uncovering lottery shenanigans. Skip Garibaldi, IDA Center for Communications Research, La Jolla (1154-60-1173)

**MAA Student Poster Session Judge’s Orientation**

NOON – 1:00 PM Room 607, Meeting Room Level, Colorado Convention Center

Organizers: Eric Ruggieri, College of the Holy Cross
Chasen Smith, Georgia Southern University

**AMS Colloquium Lectures: Lecture III**

1:00 PM – 1:50 PM Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center


**ASL Invited Address**

1:00 PM – 1:50 PM Room 302, Meeting Room Level, Colorado Convention Center

(1517) Countable Borel equivalence relations. Alexander S. Kechris, California Institute of Technology (1154-03-54)

**MAA Lecture for Students**

1:00 PM – 1:50 PM Four Seasons Ballroom 1, Ballroom Level, Colorado Convention Center

(1518) On the scales of one to infinity: Learning to listen to your mathematics. Ami Radunskaya, Pomona College (1154-A0-82)

**Current Events Bulletin**

1:00 PM – 4:45 PM Room 205, Meeting Room Level, Colorado Convention Center

Organizer: David Eisenbud, MSRI and UC Berkeley

1:00PM Geometry, Inference, and Democracy. Jordan S. Ellenberg, University of Wisconsin-Madison (1154-60-1680)

(1519) A p-adic approach to rational points on curves. Bjorn Poonen, Massachusetts Institute of Technology (1154-11-1340)

2:00PM Recent Progress on Moving Boundary Problems. Suncica Canic, University of California Berkeley (1154-35-2268)

3:00PM Convex integration and fluid turbulence. Vlad C. Vicol, Courant Institute, New York University (1154-35-153)
### AMS-MAA Special Session on Getting Started in Undergraduate Research: Topics, Tools and Open Problems, II

1:00 PM – 5:50 PM  
Room 112, Meeting Room  
Level, Colorado Convention Center

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Author(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00PM</td>
<td>Guiding principles for supervising undergraduate research.</td>
<td>Stephan Ramon Garcia, Pomona College (1154-97-104)</td>
</tr>
<tr>
<td>1:30PM</td>
<td>Promoting Equity in Undergraduate Research with Work Study.</td>
<td>Michael Ferrara, University of Colorado Denver (1154-97-1554)</td>
</tr>
<tr>
<td>2:00PM</td>
<td>Mathematics Education Research Ideas for Undergraduate Research.</td>
<td>Gulden Karakok, University of Northern Colorado (1154-97-1613)</td>
</tr>
<tr>
<td>2:30PM</td>
<td>&quot;I did it my way&quot;: making undergraduate research work for you.</td>
<td>Lola Thompson, Oberlin College (1154-00-2345)</td>
</tr>
<tr>
<td>3:00PM</td>
<td>On student-centered tiling research.</td>
<td>Michael P Hitchman, Linfield College (1154-52-1854)</td>
</tr>
<tr>
<td>3:30PM</td>
<td>Folding words around trees: Combinatorics inspired by biology.</td>
<td>Elizabeth Drellich*, Haverford College, and Heather Smith, Davidson College (1154-05-1028)</td>
</tr>
<tr>
<td>4:00PM</td>
<td>The Effect of External Perturbations on Ecological Oscillators.</td>
<td>Eli E Goldwyn, University of Portland (1154-34-2018)</td>
</tr>
<tr>
<td>4:30PM</td>
<td>Network Structure and Dynamics of Biological Systems.</td>
<td>Deena R Schmidt, University of Nevada, Reno (1154-60-880)</td>
</tr>
<tr>
<td>5:00PM</td>
<td>Exploring modeling by programming: a technique for involving undergraduates in mathematical biology research.</td>
<td>Brittany Bannish* and Sean Laverty, University of Central Oklahoma (1154-92-132)</td>
</tr>
<tr>
<td>5:30PM</td>
<td>Simulating Antibiotic Resistance in the Computer and Biology Labs: Ideas for Undergraduate Research.</td>
<td>Anne E. Yust* and Davida S. Smyth, Eugene Lang College of Liberal Arts at The New School (1154-92-2505)</td>
</tr>
</tbody>
</table>

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

1:00 PM – 5:50 PM  
Room 102, Meeting Room  
Level, Colorado Convention Center

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Author(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00PM</td>
<td>Ancient Greek Mathematics as Philosophy.</td>
<td>Jacqueline Feke, University of Waterloo (1154-01-985)</td>
</tr>
<tr>
<td>1:30PM</td>
<td>Erudition and Algebraic Practice at the End of the Sixteenth Century.</td>
<td>Abram Kaplan, Society of Fellows, Harvard University (1154-01-2333)</td>
</tr>
<tr>
<td>2:00PM</td>
<td>Standing on the Shoulders of Scripture. Preliminary report.</td>
<td>Thomas Drucker, University of Wisconsin-Whitewater (1154-01-1778)</td>
</tr>
<tr>
<td>2:30PM</td>
<td>How to &quot;strain at a Gnat and swallow a Camel,‘ The Analyst Controversy’ Reconsidered.</td>
<td>Julia C Tomasson, Columbia University (1154-01-2571)</td>
</tr>
<tr>
<td>3:00PM</td>
<td>Taking stock of the last 30 years: a project to survey the cultural history of mathematics. Preliminary report.</td>
<td>Thomas Archibald, Simon Fraser University (1154-01-208)</td>
</tr>
<tr>
<td>4:00PM</td>
<td>Discussion</td>
<td></td>
</tr>
<tr>
<td>4:30PM</td>
<td>Notational Norms in Charles Sanders Peirce’s Circle of Logicians.</td>
<td>David E. Dunning, Princeton University (1154-01-222)</td>
</tr>
<tr>
<td>5:30PM</td>
<td>Illustrating the Impact of the Mathematical Sciences: Opportunities in Mathematical Policy.</td>
<td>Michelle K Schwalbe*, National Academies of Sciences, Engineering, and Medicine, Mark L Green, University of California, Los Angeles, Tamara Kolda, Sandia National Laboratories, and Russel Caflisch, New York University (1154-00-2261)</td>
</tr>
<tr>
<td>Time</td>
<td>Session</td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>-------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>1:00 PM – 5:40 PM</td>
<td>AMS-AWM Special Session on Mathematical and Computational Research in Data Science, I</td>
<td></td>
</tr>
<tr>
<td>Room 407, Meeting Room Level, Colorado Convention Center</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Organizers: Linda Ness, DIMACS, Rutgers University  
F. Patricia Medina, Yeshiva University  
Kathryn Leonard, Occidental College |
| 1:00PM | Mathematics of Deep Learning, Rene Vidal, Mathematical Institute for Data Science, Johns Hopkins University (1154-49-1969) |
| 2:00PM | The loss function of overparameterized neural networks, Y Cooper, IAS (1154-68-1109) |
| 2:30PM | Learning Convolutional Sparse Representations, Cristina Garcia-Cardona, Los Alamos National Laboratory (1154-68-1176) |
| 3:00PM | Topological Data Analysis of Collective Behavior, Chad M. Topaz, Williams College (1154-55-151) |
| 4:00PM | ReLU-Singular Values and Gaussian Mean Width in Neural Networks, Emily J King*, Colorado State University, Soren Dittmer and Peter Maass, University of Bremen (1154-64-1114) |
| 4:30PM | Analyzing Hybrid Randomized and Greedy Projection Methods, Preliminary report, Jamie Haddock*, UCLA, and Anna Ma, UC Irvine (1154-65-670) |
| 5:00PM | Graphical Models in Machine Learning, Networks, and Uncertainty Quantification, Andrea Louise Bertozzi, University of California, Los Angeles (1154-65-1101) |

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 PM – 5:40 PM</td>
<td>AMS-AWM Special Session on Representation Theory Inspired by the Langlands Conjectures, II (Associated with Joint AWM-AMS Noether Lecture Birgit Speh)</td>
</tr>
<tr>
<td>Room 402, Meeting Room Level, Colorado Convention Center</td>
<td></td>
</tr>
</tbody>
</table>
| Organizers: Birgit Speh, Cornell University  
Paul S. Muhly, University of Iowa  
Freydoon Shahidi, Department of Mathematics, Purdue University (1154-11-331) |
| 1:00PM | On Dirac Cohomology for Complex Simple Lie Groups, Kayue Daniel Wong*, The Chinese University of Hong Kong, Shenzhen, Dan Barbasch, Cornell University, and Chao-ping Dong, Shanghai Normal University (1154-22-351) |
| 1:30PM | Local Langlands conjecture for finite groups of Lie type, Preliminary report, David Vogan, MIT (1154-20-1571) |
| 2:30PM | When Algebraicity Meets Orthogonality: Emergent Phenomena, Brian Hwang, Cornell University (1154-22-1524) |
| 3:00PM | Local Langlands parametrization for $G_2$, Michael Harris, Department of Mathematics, Columbia University (1154-11-824) |
| 4:00PM | On multiplicativity of gamma factors via Braverman-Kazhdan program, William Sokurski* and Freydoon Shahidi, Department of Mathematics, Purdue University (1154-11-331) |
| 5:00PM | Computing unramified orbital integrals, Preliminary report, Bill Casselman, University of BC (1154-22-285) |

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 PM – 5:40 PM</td>
<td>AMS Special Session on Advances in Multivariable Operator Theory: Connections with Algebraic Geometry, Free Analysis, and Free Probability, III</td>
</tr>
<tr>
<td>Room 109, Meeting Room Level, Colorado Convention Center</td>
<td></td>
</tr>
</tbody>
</table>
| Organizers: Joseph A. Ball, Virginia Tech  
Paul S. Muhly, University of Iowa |
| 1:00PM | Multi-Toeplitz Operators Associated With Noncommutative Domains, Gelu F Popescu, The University of Texas at San Antonio (1154-47-828) |
| 1:30PM | Observability operators and backward-shift invariant subspaces of certain reproducing kernel Hilbert spaces over the unit ball, Preliminary report, Vladimir Bolotnikov*, The College of William and Mary, and Joseph A Ball, Virginia Tech (1154-47-359) |
| 2:00PM | Advances in realization theory for special classes of noncommutative functions, J E Pascoe, University of Florida (1154-46-1701) |
| 2:30PM | Rational nc power series around a matrix centre and the free skew field, Victor Vinnikov, Ben Gurion University of the Negev (1154-47-2772) |
| 3:00PM | Free Analysis and Free Rational Automorphisms, Preliminary report, Meric Augat, Washington University in St. Louis (1154-47-2308) |
| 4:00PM | Approximation Properties of Matrix Convex Sets and Operator Systems, Benjamin W. Passer* and Vern I. Paulsen, University of Waterloo (1154-46-1124) |
AMS Special Session on Advances in Operator Algebras, II

1:00 PM – 5:50 PM  Room 110, Meeting Room
Level, Colorado Convention Center

Organizers: Ian Charlesworth, University of California, Berkeley
                         Brent Nelson, Michigan State University
                         Sarah Reznikoff, Kansas State University
                         Lauren Ruth, Vanderbilt University

1:00PM  Dynamical alternating groups and property Gamma.
(1562)  David Kerr* and Robin Tucker-Drob, Texas A&M University (1154-46-1585)

1:30PM  E-theory spectra.
(1563)  Sarah L Browne, University of Kansas (1154-19-1279)

2:00PM  On Product Rigidity.
(1564)  Krishnendu Khan, VANDERBILT UNIVERSITY (1154-46-1179)

2:30PM  Groups with infinite FC-center have the Schmidt property.
(1565)  Robin D Tucker-Drob, Texas A&M University (1154-20-2710)

3:00PM  Non-commutative Poincaré duality of the irrational rotation algebra.
(1566)  Anna Duwenig* and Heath Emerson, University of Victoria (1154-19-860)

3:30PM  Pure extension property for étale groupoid crossed product C*-algebras.
(1567)  Danny W Crytser, Saint Lawrence University (1154-46-1901)

4:00PM  Special constructions of k-graphs and their properties.
(1568)  Benjamin E Lofftartke, Kansas State University (1154-47-2589)

4:30PM  Applications of Large Subalgebras of C*-algebras.
(1569)  Dawn E. Archev, University of Detroit Mercy (1154-46-2667)

5:00PM  Spectral operators in finite von Neumann algebras.
(1570)  Amudhan Krishnaswamy-Usha* and Ken Dykema, Texas A&M University (1154-47-2258)

5:30PM  Braided tensor categories from finite von Neumann algebras.
(1571)  Corey Jones, The Ohio State University (1154-46-1555)

AMS Special Session on Applied Topology, II

1:00 PM – 5:50 PM  Room 113, Meeting Room
Level, Colorado Convention Center

Organizers: Henry Adams, Colorado State University
                         Mikael Vejdemo-Johansson, CUNY College of Staten Island

1:00PM  Topological and Geometric Analysis of Discrete Random Growth Models.
(1572)  Erika B Roldan-Roa, The Ohio State University (1154-60-2354)

1:30PM  On the Dynamics of Solvent-excluded Surface Topology under Protein Flexing.
(1573)  Preliminary report.
                         David F. Snyder, Texas State University (1154-92-2511)
                         Preliminary report.
                         Random Mapper Graphs.
                         Adam Brown, Institute of Science and Technology Austria (IST Austria), Omer Bobrowski, Technion - Israel Institute of Technology, Elizabeth Munch, Michigan State University, and Bei Wang*, University of Utah (1154-68-2004)

2:00PM  Data analysis with continuously parametrized zigzag modules and beyond.
(1575)  Preliminary report.
                         Haibin Hang and Washington Mio*, Florida State University (1154-55-1450)

3:00PM  Applied topology methods in knot theory.
(1576)  Preliminary report.
                         Radmila Sazdanovic*, NC State University, and Pawel Dlotko, Swansea University (1154-57-2025)

3:30PM  Morse theory for Wasserstein spaces.
(1577)  Joshua R Mirth, Colorado State University (1154-54-2228)

4:00PM  Vietoris-Rips homology through the looking glass.
(1578)  Antonio Rieser, CONACYT - CIMAT, Antonio Rieser, CONACYT - CIMAT (1154-55-2120)

4:30PM  The Relationship Between the Intrinsic Cech and Persistence Distortion Distances for Metric Graphs.
(1579)  Ellen Gasparovic, Union College (1154-68-1370)
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 PM – 5:50 PM</td>
<td>Room 303, Meeting Room Level, Colorado Convention Center</td>
</tr>
</tbody>
</table>

**AMS Special Session on Arithmetic Dynamics, II (Associated with AMS Retiring Presidential Address Kenneth A. Ribet)**

- **Organizers:** Rafe Jones, Carleton College
  - Nicole R. Looper, Cambridge University and Brown University
  - Joseph H. Silverman, Brown University

1:00 PM
- The Galois-dynamics correspondence for unicritical polynomials.
  - Robin Zhang, Columbia University (1154-11-1831)

1:30 PM
- The Arakelov-Zhang pairing and Julia sets.
  - Andrew Bridy, Yale University (1154-11-1840)

2:00 PM
- Arboreal Cantor actions.
  - Olga Lukina, University of Vienna (1154-37-215)

2:30 PM
- Misiurewicz polynomials and irreducibility.
  - Vefa Goksel, University of Wisconsin-Madison (1154-11-172)

3:00 PM
- A gap conjecture for heights of iterates.
  - Jason P Bell*, University of Waterloo, Dragos Chioica, University of British Columbia, and Matthew Satriano, University of Waterloo (1154-11-479)

3:30 PM
- A transcendental dynamical degree.
  - Jason Bell, University of Waterloo, Jeffrey Diller*, University of Notre Dame, and Mattias Jonsson, University of Michigan (1154-32-999)

4:00 PM
- A non-archimedean λ-lemma and J-stability.
  - Thomas Silverman, University of Michigan (1154-37-1539)

4:30 PM
- Dynamical height growth: left, right, and total orbits. Preliminary report.
  - Wade Hindes, Texas State University (1154-11-130)

5:00 PM
- Isolation of postcritically finite parameters in p-adic dynamical moduli spaces.
  - Robert L. Benedetto*, Amherst College, and Su-Li On Ih, University of Colorado (1154-11-221)

5:30 PM
- Post-critically finite cubic polynomials. Preliminary report.
  - Michelle Manes*, National Science Foundation / University of Hawaii at Manoa, and Bella Tobin, Oklahoma State University (1154-11-2083)

---

**AMS Special Session on Aspects and Applications of Algebraic Combinatorics, II**

1:00 PM – 5:50 PM | Room 403, Meeting Room Level, Colorado Convention Center |

- Organizers: William J. Martin, Worcester Polytechnic Institute
  - Jason Williford, University of Wyoming

1:00 PM
- Filtrations of ideals arising from hierarchical models. Preliminary report.
  - Aida Maraj* and Uwe Nagel, University of Kentucky (1154-13-426)

1:30 PM
- The roots of Rook Polynomials and connected graphs.
  - Kenneth Barrese, Bucknell University (1154-05-491)

2:00 PM
- The antipode of the noncrossing partition lattice.
  - Richard Ehrenborg, University of Kentucky, and Alex Happ*, Christian Brothers University (1154-06-1307)

2:30 PM
- Cyclic sieving, necklaces, and bracelets.
  - Eric Stucky, University of Minnestota — Twin Cities (1154-05-1457)

3:00 PM
- Unconditional reflexive polytopes.
  - Florian Kohl, Aalto University, McCabe Olsen*, The Ohio State University, and Raman Sanyal, Goethe-Universität, Frankfurt (1154-05-647)

3:30 PM
  - Oliver Clarke, Kevin Grace*, Fatemeh Mohammadi and Leonid Monin, University of Bristol (1154-05-528)

4:00 PM
- Cubical arrays of projective planes.
  - G Eric Moorhouse, University of Wyoming (1154-05-809)

4:30 PM
- Maximal arcs and special point sets in partial geometries. Preliminary report.
  - Stefaan De Winter, Michigan Technological University (1154-05-1745)

5:00 PM
  - Ben Nassau*, Felix Lazebnik, University of Delaware, and Andrew J. Woldar, Villanova University (1154-05-1448)
5:30PM  The Zarankiewicz problem in 3-partite graphs.  Michael Tait, Villanova University (1154-05-1758)

AMS Special Session on Commutative Algebra, III

1:00 PM – 5:50 PM  Room 103, Meeting Room Level, Colorado Convention Center

Organizers: Patricia Klein, University of Kentucky

Haydee Lindo, Williams College

1:00PM  Green-Lazarsfeld condition for toric edge ideals of bipartite graphs.  Zach Greif and Jason McCullough*, Iowa State University (1154-13-648)

1:30PM  What Makes a Complex Virtual.  Michael C. Loper, University of Minnesota (1154-13-1752)

2:00PM  Maximum Betti Numbers when fixing partial data about Hilbert functions.  Jay White, University of Kentucky (1154-13-2550)

2:30PM  A bound on the Hilbert function of a quadratic ideal.  Preliminary report.  Mel Hochster, University of Michigan (1154-13-2037)

3:00PM  Homogeneous Liaison and the Sequentially Bounded Loci Property.  Jesse Keyton, University of Arkansas (1154-13-1773)

3:30PM  Semi-Ample Asymptotic Syzygies.  Juliette Bruce, University of Wisconsin-Madison (1154-13-988)

4:00PM  On the conjecture of Vasconcelos for Artinian almost complete intersection monomial ideals.  Kuei-Nuan Lin*, Penn State University, Greater Allegheny, and Yi-Huang Shen, University of Science and Technology of China (1154-13-194)

4:30PM  Toward Free Resolutions Over Scrolls.  Laura Felicia Matushevik and Aleksandra Sobieska*, Texas A&M University (1154-13-1190)

5:00PM  Containment-Tight Ideals from Singular Loci of Reflection Arrangements.  Benjamin J Drabkin* and Alexandra Seceleanu, University of Nebraska-Lincoln (1154-13-2808)

5:30PM  Numbers of associated prime ideals of powers of monomial ideals.  Preliminary report.  Roswitha Rissner, University of Klagenfurt, Austria, and Irena Swanson*, Reed College (1154-13-1979)

AMS Special Session on Geometry of Differential Equations, II

1:00 PM – 5:50 PM  Room 105, Meeting Room Level, Colorado Convention Center

Organizers: Jeanne Clelland, University of Colorado Boulder

Yuhao Hu, University of Colorado Boulder

George Wilkens, University of Hawaii

1:00PM  2-nondegenerate CR structures of hypersurface type: bigraded Tanaka prolongation for canonical absolute parallelism and maximally symmetric models.  Igor Zelenko*, Texas A&M University, and Curtis Wade Porter, University of Hradec Kralove, Czech Republic (1154-53-616)

1:30PM  Lie algebras of homogeneous sub-Riemannian Engel manifolds.  Preliminary report.  Christopher G Moseley, Calvin University (1154-53-705)

2:00PM  Beltrami fields with nonconstant proportionality factor.  Preliminary report.  Jeanne N. Clelland*, University of Colorado, Boulder, and Taylor J. Klotz, University of Colorado, Boulder (1154-53-2409)


3:00PM  Absolute Equivalence and Linearization via a Cartan Formalism.  Yuhao Hu, University of Colorado Boulder (1154-58-568)

3:30PM  Conservation laws and parabolic Monge-Ampere equations.  Benjamin Blake McMillan, University of Adelaide (1154-35-1346)

4:00PM  Symmetries of the Eikonal Equation.  Ryad Ghanam*, Virginia Commonwealth University in Qatar, and Gerard Thompson, University of Toledo (1154-53-886)

4:30PM  A survey of the monster tower.  Corey Shanbrom, Sacramento State University (1154-58-266)

5:00PM  The stationary train and the runaway train.  Preliminary report.  Susan Jane Colley, Oberlin College, and Gary Kennedy*, Ohio State University (1154-70-474)

5:30PM  Twisted polygonal evolutions in $\mathbb{R}^m$ and discretizations of Adler-Gel'fand-Dikii flows.  Gloria Mari-Beffa*, University of Wisconsin-Madison, and Annalisa Calini, College of Charleston (1154-53-328)
### AMS Special Session on Groups and Topological Dynamics, II

**1:00 PM – 5:50 PM**  
Room 111, Meeting Room  
Level, Colorado Convention Center

**Organizers:**  
Constantine Medynets, United States Naval Academy  
Volodymyr Nekrashevych, Texas A&M University  
Dmytro Savchuk, University of South Florida

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
<th>Institution(s)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00PM</td>
<td>Groups of homeomorphisms of mapping tori over the Cantor set.</td>
<td>Nicolás Matte Bon*, École polytechnique fédérale de Lausanne (EPFL), and Michele Triestino, Université de Bourgogne</td>
<td>(1154-20-1530)</td>
<td>1622</td>
</tr>
<tr>
<td>1:30PM</td>
<td>Continuous orbit equivalence, entropy, and sparse connectivity.</td>
<td>David Kerr*, Texas A&amp;M University, and Hanfeng Li, SUNY at Buffalo</td>
<td>(1154-37-1597)</td>
<td>1623</td>
</tr>
<tr>
<td>2:00PM</td>
<td>Representations of products of free groups. Preliminary report.</td>
<td>Peter Burton, UT Austin, and Kate Juschenko*</td>
<td>(1154-20-1942)</td>
<td>1624</td>
</tr>
<tr>
<td>2:30PM</td>
<td>Branch groups with (non-)trivial rigid kernel. Preliminary report.</td>
<td>Zoran Sunic, Hofstra University</td>
<td>(1154-20-2416)</td>
<td>1625</td>
</tr>
<tr>
<td>3:00PM</td>
<td>Superrigidity, Measure Equivalence, and Weak Pinsker Entropy.</td>
<td>Robin D Tucker-Drob, Texas A&amp;M University</td>
<td>(1154-20-2701)</td>
<td>1626</td>
</tr>
<tr>
<td>3:30PM</td>
<td>On the abundance of (non)tame group actions.</td>
<td>Dominik Kwietniak*, Jagiellonian University in Krakow, and Gabriel Fuhrmann, Imperial College London</td>
<td>(1154-37-2028)</td>
<td>1627</td>
</tr>
<tr>
<td>4:00PM</td>
<td>Free and totally non-free boundary actions. Preliminary report.</td>
<td>Vadim Kaimanovich, University of Ottawa</td>
<td>(1154-37-1446)</td>
<td>1628</td>
</tr>
<tr>
<td>4:30PM</td>
<td>Generalized Grigorchuk’s Overgroups.</td>
<td>Supun T Samarakoon, Texas A&amp;M University</td>
<td>(1154-20-2153)</td>
<td>1629</td>
</tr>
<tr>
<td>5:00PM</td>
<td>Some new tools and examples for automaton groups of intermediate growth.</td>
<td>Thibault Godin, IECL, CNRS &amp; U. de Lorraine, and IMAG, CNRS &amp; U. de Montpellier</td>
<td>(1154-20-956)</td>
<td>1630</td>
</tr>
<tr>
<td>5:30PM</td>
<td>Periodic groups via orbital graphs.</td>
<td>Justin Cantu, Texas A&amp;M University</td>
<td>(1154-20-1248)</td>
<td>1631</td>
</tr>
</tbody>
</table>

### AMS Special Session on Interactions between Combinatorics, Representation Theory, and Coding Theory, II

**1:00 PM – 5:50 PM**  
Room 104, Meeting Room  
Level, Colorado Convention Center

**Organizers:**  
Manabu Hagiwara, Chiba University  
Richard Green, University of Colorado Boulder

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
<th>Institution(s)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00PM</td>
<td>An Introduction to How to Relate Coding Theory and d-complete Posets.</td>
<td>Manabu Hagiwara, Chiba University</td>
<td>(1154-94-1192)</td>
<td>1632</td>
</tr>
<tr>
<td>1:30PM</td>
<td>A certain code correcting two deletions with specified position.</td>
<td>Kento Nakada, Okayama university</td>
<td>(1154-05-942)</td>
<td>1633</td>
</tr>
<tr>
<td>2:00PM</td>
<td>Architecture of braid classes in Coxeter systems.</td>
<td>Dana C. Ernst, Northern Arizona University</td>
<td>(1154-05-1035)</td>
<td>1634</td>
</tr>
<tr>
<td>2:30PM</td>
<td>Braid shadows in simply-laced Coxeter systems. Preliminary report.</td>
<td>Jadyn V. Breland, University of California, Santa Cruz</td>
<td>(1154-05-1071)</td>
<td>1635</td>
</tr>
<tr>
<td>3:00PM</td>
<td>Recent results on Choi Seok-Jeong’s orthogonal Latin squares.</td>
<td>Jon-Lark Kim, Sogang University</td>
<td>(1154-94-936)</td>
<td>1636</td>
</tr>
<tr>
<td>3:30PM</td>
<td>Weight (q)-Multiplicities for Representations of the Exceptional Lie Algebra (g_2). Preliminary report.</td>
<td>Melissa Gutierrez-González*, Jerrell Cockerham, Amaury Minino, Mathematical Sciences Research Institute, and Pamela E Harris (Mentor), Williams College</td>
<td>(1154-05-1060)</td>
<td>1637</td>
</tr>
<tr>
<td>4:00PM</td>
<td>Positivity for symplectic (Q)-functions.</td>
<td>Soichi Okada, Graduate School of Mathematics, Nagoya University</td>
<td>(1154-05-387)</td>
<td>1638</td>
</tr>
<tr>
<td>4:30PM</td>
<td>Binary Codes from the Projective Symplectic Group (Sp(2)).</td>
<td>Lydiah K. Rukaria*, Lucy Chikamai W and Ireri .. Kamuti, Kibabii University, Mathematics Department</td>
<td>(1154-05-2827)</td>
<td>1639</td>
</tr>
<tr>
<td>5:00PM</td>
<td>Webs of type (P). Preliminary report.</td>
<td>Nicholas Davidson*, Reed College, Jonathan Kujawa, University of Oklahoma, and Robert Muth, Washington and Jefferson College</td>
<td>(1154-17-2741)</td>
<td>1640</td>
</tr>
<tr>
<td>5:30PM</td>
<td>Weight Enumerators and Cardinalities for Non-binary VT Codes.</td>
<td>Takayuki Nozaki, Yamaguchi University</td>
<td>(1154-05-932)</td>
<td>1641</td>
</tr>
</tbody>
</table>
AMS Special Session on Interfaces Between PDEs and Geometric Measure Theory, II
(Associated with AMS Maryam Mirzakhani Invited Address Tatiana Toro)

1:00 PM – 6:00 PM Room 304, Meeting Room Level, Colorado Convention Center

Organizers: Robin Neumayer, Institute for Advanced Study
Zihui Zhao, Institute for Advanced Study

1:00PM (1642) Elliptic measure and Green function on domains with lower dimensional boundaries. Preliminary report.
Svitlana Mayboroda, University of Minnesota (1154-35-2640)

2:00PM (1643) Parabolic Measure.
Alyssa D Genschaw*, University of Connecticut, and Steve Hofmann, University of Missouri (1154-35-1186)

2:30PM (1644) Weak maximum principle for biharmonic equations in quasiconvex Lipschitz domains.
Jinping Zhuge, University of Chicago (1154-35-737)

3:00PM (1645) Rectifiability of measures: the identification problem.
Matthew Badger, University of Connecticut (1154-28-1551)

4:00PM (1646) Singular integral operators in Carnot groups.
Vasileios Chousionis, Sean Li and Scott Zimmerman*, University of Connecticut (1154-28-1098)

4:30PM (1647) A Marstrand Theorem for Polynomial Norms.
Bobby Wilson, University of Washington (1154-28-2466)

5:00—6:00—Discussion

AMS Special Session on Markov Models and Matrix Properties, II

1:00 PM – 5:50 PM Room 108, Meeting Room Level, Colorado Convention Center

Organizers: Alan Krinik, California Polytechnic Pomona
Randall J. Swift, California Polytechnic Pomona

1:00PM (1648) The Voter Model on Bipartite Graphs.
Philip Speegle*, University of Alabama, and R. Oliver VandenBerg, Kenyon College (1154-60-2431)

Barbara H Margolius*, Cleveland State University, and Yiqiang Zhao, Carleton University (1154-60-998)

2:00PM (1650) Finite birth-death-like Markov chains with generalized catastrophe transitions. Preliminary report.
Alan Krinik*, Hubertus von Bremen, Saif A. Aljashamy, David Perez, Jeremy Lin, Thuy Vu Dieu Lu, Jeffrey Yeh, Aaron Kim and Mark Dela, Cal Poly Pomona (1154-60-2093)

2:30PM (1651) A Feynman Approach to Dynamic Rate Markov Processes.
William A Massey, ORFE Department / Princeton University (1154-60-185)

Manuel E. Lladser*, Department of Applied Mathematics, University of Colorado Boulder, Stephen R. Chestnut, ETH Zurich, Switzerland, and Javiera Barrera, Universidad Adolfo Ibáñez, Chile (1154-60-1583)

4:00PM (1653) Using particle-distribution duality to determine mixing time.
Mark Huber, Claremont McKenna College (1154-60-1130)

4:30PM (1654) Numerically Solving a Rank-Based Forward Backward Stochastic Differential Equation by Applying the Least-Squares Monte Carlo Method.
Mark D. Dela, Cal Poly Pomona (1154-60-795)

5:00PM (1655) Asymptotic Properties of Interacting Stochastic Processes on Large Sparse Graphs. Preliminary report.
Ankan Ganguly* and Kavita Ramanan, Brown University (1154-60-1858)

5:30PM —Discussion

AMS Special Session on Novel Teaching Practices in Mathematics

1:00 PM – 5:50 PM Room 406, Meeting Room Level, Colorado Convention Center

Organizer: David Weisbart, University of California, Riverside

1:00PM (1656) A hybrid IBL-lecture design for a freshman honors single variable calculus course. Preliminary report.
Richard J Brown, Johns Hopkins University (1154-00-2326)

1:30PM (1657) Increasing students’ conceptual understanding of linear algebra through active discussion sessions. Preliminary report.
Alessandra Pantano* and Daniel R Bergman, University of California, Irvine (1154-00-1884)

2:00PM (1658) The Big Picture of Linear Algebra.
W. Gilbert Strang, Massachusetts Institute of Technology (1154-15-686)
3:00 PM – 5:20 PM Room 405, Meeting Room Level, Colorado Convention Center

Organizers: Virgil U. Pierce, University of Northern Colorado
Nicholas M. Ercolani, University of Arizona

1:00 PM – 5:20 PM Room 405, Meeting Room Level, Colorado Convention Center

Organizers: Masoud Khalkhali, University of Western Ontario
Markus Pflaum, University of Colorado, Boulder

1:00 PM A numerical approach to Chern numbers and unbounded Fredholm modules. Preliminary report.
Terry A. Loring, University of New Mexico (1154-19-598)

2:00 PM Twisted K-theory and the classification of topological insulators.
Hessel Posthuma, Korteweg-de Vries Institute for Mathematics, University of Amsterdam (1154-55-1527)

3:00 PM The standard model of particle physics: from noncommutative geometry or Jordan geometry?
Latham Boyle, Perimeter Institute for Theoretical Physics (1154-17-816)

4:00 PM Quantum materials and symmetries.
Ralph M. Kaufmann, Sergei Khlebnikov and Erika Birgit Wehefritz-Kaufmann*, Purdue University (1154-81-1889)

5:00 PM Higher form symmetry, topological order, and fractons.
Michael Hermele and Marvin Qi*, University of Colorado Boulder (1154-82-2565)

5:30 PM Bridge Cohomology: Generalizing Hochschild and Cyclic Cohomologies.
Jonathan Adam Belcher* and Markus J. Pflaum, University of Colorado, Boulder (1154-58-583)

AMS Special Session on Random Combinatorial Structures, Complex Analysis and Integrable Systems, II

1:00 PM – 5:20 PM Room 405, Meeting Room Level, Colorado Convention Center

Organizers: Virgil U. Pierce, University of Northern Colorado
Nicholas M. Ercolani, University of Arizona

1:00 PM Consistency on a cuboctahedron.
Nalini Joshi*, University of Sydney, and Nobutaka Nakazono, Tokyo University of Agriculture and Technology (1154-39-68)

1:30 PM Recurrence coefficients for discrete orthogonal polynomials with hypergeometric weight and discrete Painlevé equations.
Anton Dzhamay*, The University of Northern Colorado, Greeley, CO, Galina Filipuk, Faculty of Mathematics, Informatics and Mechanics, University of Warsaw, Warsaw, Poland, and Alexander Stokes, Department of Mathematics, University College London, London, UK (1154-33-1519)

2:00 PM A Non-Autonomous Discrete Painlevé Equation and Counting Maps. Preliminary report.
Brandon M. Tippings, University of Arizona (1154-39-1954)

2:30 PM Combinatorial Dynamics: From Patience to the Discrete-Time Toda Lattice.
Jonathan Ramalheira-Tsu*, and Nicholas M. Ercolani, University of Arizona (1154-05-1559)

3:00 PM Discussion

3:30 PM Dimer Model: Full Asymptotic Expansion of the Partition Function.
Pavel Bleher, Indiana University-Purdue University Indianapolis (1154-82-267)

4:00 PM A tale of two matrix integrals.
Jonathan Novak, UC San Diego (1154-33-283)

4:30 PM Random matrices in the general linear group.
Brian C. Hall*, University of Notre Dame, Bruce K Driver and Todd Kemp, University of California, San Diego (1154-60-883)

5:00 PM Soliton Quantization and Random Partitions.
Alexander Moll, Northeastern University (1154-60-557)
**AMS Special Session on Research in Mathematics by Early Career Graduate Students, II**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 PM</td>
<td>Room 401, Meeting Room Level, Colorado Convention Center</td>
</tr>
<tr>
<td></td>
<td>Organizers: Marat Markin, California State University Fresno</td>
</tr>
<tr>
<td></td>
<td>Morgan Rodgers, California State University Fresno</td>
</tr>
<tr>
<td></td>
<td>Khang Tran, California State University Fresno</td>
</tr>
<tr>
<td>1:00 PM</td>
<td>The disk complex and topologically minimal surfaces in the 3-sphere. Preliminary report. Marion Campisi and Luis Torres*, San Jose State University (1154-57-2631)</td>
</tr>
<tr>
<td>1:30 PM</td>
<td>Minimal Lattice Tiled Torus Surfaces. Preliminary report. Nicholas Cazet, University of California at Davis, and Jane Park*, San Jose State University (1154-54-2717)</td>
</tr>
<tr>
<td>2:00 PM</td>
<td>Multivariate Rootfinding Using Chebyshev Approximation and Möller-Stetter Matrices. Hayden J Ringer, Brigham Young University (1154-65-2646)</td>
</tr>
<tr>
<td>3:00 PM</td>
<td>Isometric copies of $l^n_1$ and $l_1^n$ in transportation cost spaces on finite metric spaces. Preliminary report. Mutamis Mim*, Mikhail Ostrovskii and Seychelle S Khan, St. John’s University, New York (1154-46-788)</td>
</tr>
<tr>
<td>3:30 PM</td>
<td>The Non-Star-Shaped Regime of Inverse Mean Curvature Flow. Brian D Harvie, University of California, Davis (1154-53-559)</td>
</tr>
<tr>
<td>4:00 PM</td>
<td>Walls for G-Hilb via Reid’s recipe. Ben Wormleighton, UC Berkeley (1154-14-146)</td>
</tr>
<tr>
<td>5:00 PM</td>
<td>Gender Differences in the Use and Effectiveness of Adaptive Learning in Calculus I at a Private HBCU. Preliminary report. Cameisha Clark*, Daniel Teodorescu and Torina Lewis, Clark Atlanta University (1154-97-2719)</td>
</tr>
<tr>
<td>5:30 PM</td>
<td>Spanning tree modulus for secure broadcast games. Kapila Kottegoda, Kansas State University (1154-15-1949)</td>
</tr>
</tbody>
</table>

**AMS Special Session on Stochastic Analysis and Applications in Finance, Actuarial Science and Related Fields, II**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 PM</td>
<td>Room 107, Meeting Room Level, Colorado Convention Center</td>
</tr>
<tr>
<td></td>
<td>Organizers: Julius N. Esunge, University of Mary Washington</td>
</tr>
<tr>
<td></td>
<td>See Keong Lee, University of Alabama</td>
</tr>
<tr>
<td></td>
<td>Aurel I. Stan, The Ohio State University</td>
</tr>
<tr>
<td>1:00 PM</td>
<td>A Time-lagged Penalized Regression. Model and Applications to Economic Modeling. Mingwei Sun*, Samford University, and Patrick Wang, University of Alabama (1154-62-1865)</td>
</tr>
<tr>
<td>2:00 PM</td>
<td>Hypothesis Testing of Lévy Processes from Two Streams of Data. Michael Roberts, North Dakota State University (1154-60-90)</td>
</tr>
<tr>
<td>3:00 PM</td>
<td>Exponential inequalities for exit times of stochastic Navier-Stokes equations. Po-Han Hsu* and Padmanabhan Sundar, Louisiana State University (1154-60-980)</td>
</tr>
<tr>
<td>3:30 PM</td>
<td>Stochastic Differential Equations with Anticipating Initial Conditions. Hui-Hsiung Kuo, Sudip Sinha*, Louisiana State University, and Jiayu Zhai, University of Massachusetts Amherst, Amherst (1154-60-1474)</td>
</tr>
<tr>
<td>4:00 PM</td>
<td>The Volatility Change-Point Problem for Diffusion Processes. Cory Ball* and Hongwei Long, Florida Atlantic University (1154-60-203)</td>
</tr>
<tr>
<td>4:30 PM</td>
<td>Quasi-Limiting Behavior of a Drifted Brownian Process. Sangjoon Lee, University of Connecticut (1154-60-2264)</td>
</tr>
<tr>
<td>5:00 PM</td>
<td>Switching Stochastic Approximation and Applications to Networked Systems. George Yin, Le Yi Wang and Thu Thi Le Nguyen*, Wayne State University (1154-60-2695)</td>
</tr>
</tbody>
</table>
### AMS Special Session on Stochastic Differential Equations and Application of Mathematical Biology, I

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 PM</td>
<td>Room 106, Meeting Room Level, Colorado Convention Center</td>
<td>Organizers: Jianjun Paul Tian, New Mexico State University</td>
</tr>
<tr>
<td>1:00 PM</td>
<td>Most Probable Transition Pathways in Stochastic Dynamical Systems. Preliminary report.</td>
<td>Jinqiao Duan, Illinois Institute of Technology, Chicago, IL 60616 (1154-60-1026)</td>
</tr>
<tr>
<td>1:30 PM</td>
<td>Complete Evolution in Stochastic Environments.</td>
<td>Sebastian J. Schreiber*, University of California, Davis, Alexandru Hening, Tufts University, and Dang H. Nguyen, University of Alabama, Tuscaloosa (1154-92-2299)</td>
</tr>
<tr>
<td>2:00 PM</td>
<td>Dynamics of Zika Virus Epidemic in Random Environment.</td>
<td>Xiaoying Han*, Auburn University, Yusuke Asai, Hokkaido University, and Peter E Kloeden, University of Tuebingen (1154-34-1149)</td>
</tr>
<tr>
<td>2:30 PM</td>
<td>Anomalous Diffusion of Foreign Particles in Biological Fluids.</td>
<td>Scott A McKinley*, Tulane University, and Christel Hohenegger, University of Utah (1154-60-2802)</td>
</tr>
<tr>
<td>3:00 PM</td>
<td>Molecular Motor Proteins: Designing experiments through stochastic inference.</td>
<td>J Darby Smith*, Sandia National Laboratories, Scott A McKinley, Tulane University, and William O Hancock, Pennsylvania State University (1154-60-318)</td>
</tr>
<tr>
<td>3:30 PM</td>
<td>A basic model of stochastic type for tumor virotherapy.</td>
<td>Tuan A Phan* and Jianjun P Tian, New Mexico State University, Las Crucis, NM (1154-60-789)</td>
</tr>
<tr>
<td>4:00 PM</td>
<td>Stochastic Partial Differential Equation Models for Spatially Dependent Predator-Prey Equations.</td>
<td>Nhu N Nguyen*, Wayne State University, Detroit, MI, USA, and George Yin, Wayne State University, Detroit, MI, USA (1154-60-952)</td>
</tr>
<tr>
<td>4:30 PM</td>
<td>A finite volume method for infiltration dynamics in tumor growth models.</td>
<td>Xianyi Zeng*, Masihriq Saleh, University of Texas at El Paso, and Jianjun Paul Tian, New Mexico State University (1154-65-821)</td>
</tr>
</tbody>
</table>

### AMS Special Session on The Kaczmarz Algorithm with Applications in Harmonic Analysis and Data Science

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>5:00 PM</td>
<td>Using Stochastic Differential Equations to Model the Immune System Response to Bacterial Infection on the Surface of a Medical Implant Device.</td>
<td>Shelby R Stanchop*, Department of Mathematical Sciences, United States Air Force Academy, and Isaac Klapper, Department of Mathematics, Temple University (1154-92-2756)</td>
</tr>
<tr>
<td>5:30 PM</td>
<td>Random Dynamics for Stochastic Hindmarsh-Rose Equations with Multiplicative Noise.</td>
<td>Chi Phan, University of South Florida (1154-35-2829)</td>
</tr>
</tbody>
</table>

AMS Special Session on The Kaczmarz Algorithm with Applications in Harmonic Analysis and Data Science

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 PM</td>
<td>Room 404, Meeting Room Level, Colorado Convention Center</td>
<td>Organizers: Xuemei Chen, New Mexico State University</td>
</tr>
<tr>
<td>1:00 PM</td>
<td>Randomized Kaczmarz for Tensors.</td>
<td>Anna Ma*, University of California, Irvine, and Denali Molitor, University of California, Los Angeles (1154-15-1225)</td>
</tr>
<tr>
<td>1:30 PM</td>
<td>Regularized Random Kaczmarz Algorithm. Preliminary report.</td>
<td>Xuemei Chen*, New Mexico State University, and Jing Qin, University of Kentucky (1154-65-2250)</td>
</tr>
<tr>
<td>2:00 PM</td>
<td>Random products of projections in Hilbert space: Regularity, absolute convergence, statistics of displacements.</td>
<td>C. Sinan Gunturk*, Courant Institute, NYU, and Nguyen T. Thao, City College, CUNY (1154-46-2241)</td>
</tr>
<tr>
<td>3:00 PM</td>
<td>Stochastic Markov gradient descent for training low-bit neural networks.</td>
<td>Alexander M. Powell* and Jonathan Ashbrock, Vanderbilt University (1154-65-1584)</td>
</tr>
<tr>
<td>3:30 PM</td>
<td>Fourier Scattering Transforms as Efficient Feature Extractors.</td>
<td>Wojciech Czaja, University of Maryland College Park (1154-43-2632)</td>
</tr>
<tr>
<td>4:00 PM</td>
<td>Orthonormal bases generated by Cuntz algebras.</td>
<td>Dorin Ervin Dutkay, University of Central Florida (1154-47-950)</td>
</tr>
</tbody>
</table>
4:30PM  Computation of Fourier Series with Respect to the Cantor Measure via the Kaczmarz Algorithm. Preliminary report.
John E Herr, Butler University
(1154-42-1185)

5:00PM  A Dualized Kaczmarz Algorithm.
Anna C Aboud, Westmont College
(1154-43-1988)

5:30PM  Solving Linear Systems on a Distributed Network with the Kaczmarz Method.
Riley Borgard*, Purdue University, Haley Duba, Wheaton College, Steven N Harding, Iowa State University, Chloe Makad, Butler University, Jay Mayfield, Iowa State University, Randall Tuggle, Berry College, and Eric Weber, Iowa State University (1154-15-1601)

MAA Invited Paper Session on Experiencing Geometric Transformations and Evaluating Learning Progressions: Celebrating the Work of David W. Henderson
1:00 PM – 3:50 PM Room 610/612, Meeting Room Level, Colorado Convention Center
Organizer: Gregory Budzban, Southern Illinois University Edwardsville

1:00PM  In search of meaning.
Daina Taimina, Cornell University
(1154-AF-2843)

1:30PM  What stays the same? Children’s exploration of Line and Polygon on plane, cylinder, sphere and hyperbolic plane.
Richard Leher*, Vanderbilt University, and Daina Taimina, Cornell University (1154-AF-2845)

2:00PM  Young children constructing understandings of 3D symmetries.
Megan Wongkamalasai, University of Georgia (1154-AF-2845)

2:30PM  Geometric transformations and the grounding of proof.
Gregory Budzban, Southern Illinois University Edwardsville (1154-AF-2846)

3:00PM  Geometric transformations as functions: A qualitative analysis of student responses.
Edith Aurora Graf, Educational Testing Service (1154-AF-2847)

3:30PM  Experiencing high school geometry.
Kate Belin* and Fannie Lou Hamer, Freedom School, Bronx, NY (1154-AF-2848)

MAA Minicourse #5: Part B
1:00 PM – 3:00 PM Room 708, Meeting Room Level, Colorado Convention Center
Presenter: Martin Flashman, Humboldt State University

MAA Minicourse #4: Part B
1:00 PM – 3:00 PM Room 704, Meeting Room Level, Colorado Convention Center
Visualizing Multivariable Calculus & Differential Equations Using CalcPlot3D.
Presenters: Paul Seeburger, Monroe Community College, Monica VanDieren, Robert Morris University

AMS Contributed Paper Session on Algebra and Algebraic Geometry, I
1:00 PM – 5:40 PM Room 206, Meeting Room Level, Colorado Convention Center

1:00PM  Discrete Convexity and the Active Matroid Orders.
Bryan R. Gillespie, Colorado State University (1154-06-1495)

1:15PM  Commutative doubly-idempotent semirings determined by chains and by preorder forests.
Nataanel Alpay* and Peter Jipsen, Chapman University (1154-06-2234)

1:30PM  Axiomatisability of subdirectly irreducible members of congruence modular varieties generated by certain finite nilpotent algebras.
Josh T. Grice, University of South Carolina (1154-08-1993)

1:45PM  Topology is relevant (in discussing the complexity of ω-categorical CSPs).
Michael Kompatscher, Charles University Prague (1154-08-2030)

2:00PM  Distribution of Constant Terms of Irreducible Polynomials in \( \mathbb{Z}_p[x] \).
Sarah Cobb, Michelle Knox, Marcos Lopez*, Terry McDonald and Patrick Mitchell, Midwestern State University (1154-12-873)

2:15PM  When are a Polynomial’s Zeros all Real and Distinct?
Marc Chamberland, Grinnell College (1154-12-1297)
### Program of the Sessions – Friday, January 17 (cont’d.)

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
<th>Speaker Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:30PM</td>
<td>Binary Goppa Codes from Trace Polynomials. Preliminary report.</td>
<td>Room 202, Meeting Room Level, Colorado Convention Center</td>
<td>Eduardo A Sala-Ramirez*, University of Puerto Rico in Cayey, and Dylan G Cruz-Fonseca, University of Puerto Rico in Rio Piedras (1154-12-1306)</td>
</tr>
<tr>
<td>2:45PM</td>
<td>Arithmetic Galois Theory. Preliminary report.</td>
<td></td>
<td>Lucian Mit Ionescu, Illinois State University (1154-12-2837)</td>
</tr>
<tr>
<td>3:00PM</td>
<td>Gradations of Cyclic Rings and Homogeneity of their Nil and Jacobson Radicals. Preliminary report.</td>
<td></td>
<td>Mohammad Obiedat, Gallaudet University (1154-13-17)</td>
</tr>
<tr>
<td>3:30PM</td>
<td>On Betti numbers of toric algebras of certain bipartite graphs.</td>
<td></td>
<td>Rimpa Nandi*, Senior research scholar, Indian Institute of Technology, Kharagpur, and Ramakrishna Nanduri, Assistant Professor, Indian Institute of Technology, Kharagpur (1154-13-631)</td>
</tr>
<tr>
<td>3:45PM</td>
<td>On the Frobenius Complexity Sequence of Stanley-Reisner Rings. Preliminary report.</td>
<td></td>
<td>Irina Iliaaea, Georgia State University (1154-13-322)</td>
</tr>
<tr>
<td>4:00PM</td>
<td>Invariants of the symbolic powers of edge ideals.</td>
<td></td>
<td>Bidwan Chakraborty*, Senior Research Scholar, Indian Institute of Technology Kharagpur, and Mousumi Mandal, Assistant Professor, Indian Institute of Technology Kharagpur (1154-13-827)</td>
</tr>
<tr>
<td>4:30PM</td>
<td>When are permutation invariants Cohen-Macaulay over all fields?</td>
<td></td>
<td>Ben Blum-Smith*, NYU Center for Data Science, and Sophie Marques, Stellenbosch University (1154-13-1873)</td>
</tr>
<tr>
<td>4:45PM</td>
<td>On the inductive construction of rank 1, 2, and 3 valuations on ( K(x,y) ) and their associated structures. How to tell the torsion a tensor takes.</td>
<td></td>
<td>Reeve M. Garrett, The Ohio State University (1154-13-1912)</td>
</tr>
<tr>
<td>5:00PM</td>
<td>AMS Contributed Paper Session on Combinatorics and Graph Theory, II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:00PM - 4:55PM</td>
<td>Room 202, Meeting Room Level, Colorado Convention Center</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:00PM</td>
<td>Balanced spiders. Preliminary report.</td>
<td></td>
<td>Ravi Cho*, Tim Hsu and Ardak Kapbasov, Department of Mathematics and Statistics, San José State University (1154-05-973)</td>
</tr>
<tr>
<td>1:15PM</td>
<td>Cops and Robbers and the SURIEM REU Program. Preliminary report.</td>
<td></td>
<td>Robert W Bell, Michigan State University (1154-05-996)</td>
</tr>
<tr>
<td>1:30PM</td>
<td>Sum Index and Difference Index of Graphs. Preliminary report.</td>
<td></td>
<td>Rachel Zhang, Massachusetts Institute of Technology (1154-05-1358)</td>
</tr>
<tr>
<td>1:45PM</td>
<td>Extending Hansel’s Theorem to Hypergraphs.</td>
<td></td>
<td>Greg Churchill*, SUNY Oswego, and Brendan Nagle, University of South Florida (1154-05-1298)</td>
</tr>
<tr>
<td>2:00PM</td>
<td>Domination in direct products of complete graphs.</td>
<td></td>
<td>Harish Vemuri, Yale University (1154-05-1278)</td>
</tr>
<tr>
<td>2:15PM</td>
<td>Essential components in vector spaces over finite fields.</td>
<td></td>
<td>Zhenchao Ge* and Thay Hoang Lé, University of Mississippi (1154-05-1816)</td>
</tr>
<tr>
<td>2:30PM</td>
<td>The structure of 4-connected ( K_{2,\ell} )-minor-free graphs.</td>
<td></td>
<td>Mark Ellingham*, Vanderbilt University, J. Zachary Gaslowitz, Proof School, and Ryan Solava, Saint Mary’s College, Indiana (1154-05-1404)</td>
</tr>
<tr>
<td>3:00PM</td>
<td>Markov chain sampling for connected graph partitions.</td>
<td></td>
<td>Daryl R. DeFord, MIT - CSAIL (1154-05-1463)</td>
</tr>
<tr>
<td>3:15PM</td>
<td>Tight Bounds for the Split Domination Number of Regular and Nearly Regular Tournaments.</td>
<td></td>
<td>K. A. S. Factor, Marquette University, L. J. Langley and S. K. Merz*, University of the Pacific (1154-05-1470)</td>
</tr>
<tr>
<td>3:30PM</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Friday, January 17 – Program of the Sessions

3:30 PM – 5:25 PM Room 208, Meeting Room Level, Colorado Convention Center

1:00 PM
Special Sensitive maps in Measure Dynamical Systems of type $f^n \circ f^m \circ f_{p_{nu}}$ in uniform spaces.
Mauricio Andrés Díaz Raby, Universidad del Bio Bio (1154-37-517)

1:15 PM
Stability of a steady state in reaction diffusion systems arising in combustion theory in the one dimensional case.
Yuri Latushkin, University of Missouri, Columbia, and Xinyao Yang*, Xi'an Jiaotong-Liverpool University (1154-37-523)

1:30 PM
Attractor Reconstruction and Empirical Parameter Inference for Hydrogen-Oxygen Chemistry.
Abhishek Shivkumar*, Department of Mathematics, University of California, Berkeley, Rebecca Alexandra Lopez, Department of Mathematics, Marist College, Mykhaylo Mykolaiovich Malakhov, Department of Mathematics, Andrews University, and Brianna Fitzpatrick, Department of Mathematics, Carleton College (1154-37-749)

4:45 PM
A fractional nonlinear Schrödinger-Poisson system.
Michael E. Filippakis*, Department of Digital Systems, University of Piraeus, Greece, and Marilena Poulou, Department of Mathematics, National Technical University of Athens, Greece (1154-37-1425)

2:00 PM
Smooth localization of maps on non-smooth spaces. Applications and examples.
Genrich Belitskii, Ben-Gurion University of the Negev, and Victoria Rayskin*, Tufts University (1154-37-1834)

2:15 PM
Pressure metrics for Teichmüller spaces of punctured surfaces.
Lien-Yung Kao, The University of Chicago (1154-37-1604)

2:30 PM
Cantor sets arising from laminations on homothety surfaces.
Joshua P. Bowman, Pepperdine University (1154-37-2014)

2:45 PM
Inverse Magnetic Billiards: A Survey.
Sean Gasiorek, University of Sydney (1154-37-2022)

3:00 PM
Mechanically derived toxicant-mediated predator-prey model under Stoichiometric constraints.
Md Nazmul Hassan*, Blinn College, Bryan, Texas, and Angie Peace, Texas Tech University (1154-37-2173)

3:15 PM
(Relatively) Contractive Actions of Lattices and Lie Groups.
Darren Creutz, US Naval Academy (1154-37-2375)

3:30 PM
Data-Driven State Space Discovery of Physical and Chemical Systems.
Preliminary report.
Carlos M. Ortiz Marrero, Pacific Northwest National Laboratory (1154-37-2538)

3:45 PM
Infected Host-Feeding in Semi-Discrete Host-Parasitoid Population Dynamics.
Preliminary report.
Brooks Emerick, Kutztown University (1154-37-2706)

4:00 PM
A Perico, University of California, Santa Cruz (1154-37-2748)

4:15 PM
Comparison and machine classification of limit cycles from ODE and delayed oscillator models. Preliminary report.
Lauren Lazarus, Trinity College (1154-37-2754)

4:30 PM
Mass distribution and persistent periodicity in no-slip billiards.
Christopher L Cox, Tarleton State University (1154-37-2767)

4:45 PM
Parameterizing the canopy and the boundary of the connectedness locus of the IFS of two distinct affine maps.
Nicholas Mendler, University of San Francisco (1154-37-2788)
New Fractional-like Derivative with Dynamic Memory: Theory and Applications. Preliminary report. Udita N. Katugampola, Department of Mathematical Sciences, Florida Polytechnic University, Lakeland, FL 33805. (1154-45-2644)

Lyapunov Characterizations of String Stability of Interconnected Systems with Delays. Hasala Gallolu Kankanamalage, Roger Williams University (1154-93-2718)

AMS Contributed Paper Session on Mathematical Biology and Related Fields, I

Global analysis of a model of dendritic cell therapy for melanoma. Preliminary report. Lauren R Dickman, Evan Milliken and Yang Kuang, School of Mathematical and Statistical Sciences, Arizona State University (1154-92-116)


A mathematical model to investigate the risk and prevention of future Southern Pine Beetle infestations in East Texas. Preliminary report. A. Miller*, Sam Houston State University, Dept. of Mathematics and Statistics, C. King, Sam Houston State University, W. Godwin, J. Williams, Sam Houston State University, Dept. of Biological Sciences, W. Lutterschmidt, Sam Houston State University, Dept. of Program Biology, and J. Alford, Sam Houston State University, Dept. of Mathematics and Statistics (1154-92-2155)


Novel compartmental models of infectious disease transmission. Scott Greenhalgh*, Siena College, and Carly Rozins, University of California Berkeley (1154-92-964)

Break


Structural parameter identifiability in age-structured epidemic models. Preliminary report. Marissa Renardy*, Denise Kirschner and Marisa Eisenberg, University of Michigan (1154-92-750)

Transition Fronts of Monostable Lattice Differential Equations in Locally Spatially Inhomogeneous Patchy Environments: Existence and Non-Existence. Aijun Zhang*, University of Louisiana at Lafayette, and Erik S. Van Vleck, University of Kansas (1154-92-1479)

Building a Mathematical Model of the Merkel Cell. Preliminary report. Paulina Czarnecki*, University of Michigan, Jennifer Crodelle, Courant Institute of Mathematical Sciences, NYU, and Calina Copos, Courant Institute of Mathematical Sciences (1154-92-1481)
**Friday, January 17 – Program of the Sessions**

### AMS Contributed Paper Session on Mathematics Education

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 PM</td>
<td><strong>Object-Label-Order effect when learning from an inconsistent source.</strong></td>
<td>Timmy Ma, Dartmouth College</td>
</tr>
<tr>
<td>1:15 PM</td>
<td><strong>Successful and sustainable</strong></td>
<td>Audrey E Hendricks, University of Colorado Denver</td>
</tr>
<tr>
<td>1:30 PM</td>
<td><strong>The Design and Implementation of a Course in Mathematical Research and Communication.</strong></td>
<td>Chad Estabrooks*, USMA West Point, and David McArdle, University of Connecticut</td>
</tr>
<tr>
<td>1:45 PM</td>
<td><strong>College Algebra Students' Understanding of Rational Functions Using Computer-Aided-Instruction (CAI).</strong></td>
<td>Avijit Kar, Georgia State University</td>
</tr>
<tr>
<td>2:00 PM</td>
<td>Break</td>
<td></td>
</tr>
<tr>
<td>2:15 PM</td>
<td><strong>Email Correspondence: Reaching Out Individually for Student Success.</strong></td>
<td>Jasmine H. Hocutt, University of Alabama</td>
</tr>
<tr>
<td>2:30 PM</td>
<td><strong>Impacts of a cross-institutional undergraduate research experience workshop on student understanding of and self-efficacy for research.</strong></td>
<td>Megan Olivia Powell*, University of North Carolina Asheville, Angela Antonou, University of St. Francis, and Sara Liesman, Illinois State University</td>
</tr>
<tr>
<td>2:45 PM</td>
<td><strong>Two models for blended learning in mathematics courses using online content.</strong></td>
<td>Kristin M. Kurianski* and Jennifer French, Massachusetts Institute of Technology</td>
</tr>
</tbody>
</table>

### AMS Contributed Paper Session on Ordinary Differential Equations, Applications and Related Topics

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:00 PM</td>
<td><strong>Creating Community-Responsive Mathematical Outreach Programs.</strong></td>
<td>Brandy S Wiegers, Central Washington University</td>
</tr>
<tr>
<td>3:15 PM</td>
<td><strong>Investigating college algebra students’ current pre-requisite understandings and testing the effects of an alternative pre-requisite algebra curriculum: A mixed-methods study.</strong></td>
<td>Volkan Sevim, University of South Carolina Beaufort</td>
</tr>
<tr>
<td>3:30 PM</td>
<td><strong>Trends in pre-college advanced mathematics preparation and access for historically marginalized groups.</strong></td>
<td>Daniel Zaharopol, The Art of Problem Solving Initiative / Bridge to Enter Advanced Mathematics (BEAM)</td>
</tr>
<tr>
<td>3:45 PM</td>
<td><strong>Montana Math Circle.</strong></td>
<td></td>
</tr>
<tr>
<td>4:00 PM</td>
<td><strong>Creating Interactive Classrooms Using the Flipped Model with Supplemental Instructors.</strong></td>
<td>Rhonda D Fitzgerald* and Anne Fernando, Norfolk State University</td>
</tr>
<tr>
<td>4:15 PM</td>
<td><strong>Supportive environment in a mathematically rigorous co-requisite lab course ensures student success in the Introduction to Proofs.</strong></td>
<td>Ekaterina (Katya) Yurasovskaya, Seattle University</td>
</tr>
<tr>
<td>4:30 PM</td>
<td><strong>Alliance of Indigenous Math Circles (AIMC) as a study in network building.</strong></td>
<td>Tatiana Shubin*, San Jose State University, and Bob Klein, Ohio University</td>
</tr>
</tbody>
</table>

### AMS Contributed Paper Session on Ordinary Differential Equations, Applications and Related Topics

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 PM</td>
<td><strong>Effects of Excess Food-Nutrient Content on the Coexistence of Competing Consumers.</strong></td>
<td>Lale Asik* and Angela Peace, Department of Mathematics and Statistics, Texas Tech University</td>
</tr>
<tr>
<td>1:15 PM</td>
<td><strong>Some Epidemic Models on Time Scales.</strong></td>
<td>Gulsah Yeni* and Elvan Akin, Missouri University of Science and Technology</td>
</tr>
<tr>
<td>1:30 PM</td>
<td><strong>Mathematical Modeling of an Immune Checkpoint Inhibitor and Its Synergy with an Immunostimulant.</strong></td>
<td>Elpiniki Nikolopoulou, Arizona State University</td>
</tr>
<tr>
<td>Time</td>
<td>Session</td>
<td>Details</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1:45PM</td>
<td><strong>Generalized Monotone Method for Nonlinear Caputo Fractional Impulsive Differential Equations.</strong> Preliminary report.</td>
<td>Yunxiang Bai* and Aghalaya Vatsala, University of Louisiana at Lafayette (1154-34-891)</td>
</tr>
<tr>
<td>2:00PM</td>
<td><strong>Upper semi-continuous convergence of attractors for a Hop field-type lattice model.</strong></td>
<td>Basiru Usman*, Auburn University, Auburn AL, Xiaoying Han and Peter E. Kloeden, Auburn University, Auburn, AL (1154-34-1062)</td>
</tr>
<tr>
<td>2:30PM</td>
<td><strong>Modeling the interplay between hepatitis B virus (HBV) and hepatitis D virus (HDV) during anti-HDV treatment.</strong></td>
<td>Preliminary report.</td>
</tr>
<tr>
<td>2:45PM</td>
<td><strong>Optimal Control Treatment Analysis for the Predator-Prey Chemotherapy Model.</strong></td>
<td>Ismail Abdulrashid*, Auburn University, Hakim Ghazzai, Stevens Institute of Technology, Xiaoying Han, Auburn University, and Yehia Massoud, Stevens Institute of Technology (1154-34-1661)</td>
</tr>
<tr>
<td>3:00PM</td>
<td><strong>Mixed-mode oscillations as long transient dynamics in a predator-prey model with timescale separation.</strong></td>
<td>Susmita Sadhu, Georgia College and State University (1154-34-1832)</td>
</tr>
<tr>
<td>3:15PM</td>
<td><strong>Boundary Triples and Weyl m-functions for Powers of the Jacobi Differential Operator.</strong>  Preliminary report.</td>
<td>Dale Frymark* and Annemarie Luger, Stockholm University (1154-34-2032)</td>
</tr>
<tr>
<td>3:30PM</td>
<td><strong>Program- positional strategies for a Lotka-Volterra type cancer control model.</strong></td>
<td>Ellina Grigorieva*, Texas Woman’s University, and Evgenii Khallow, Lomonosov Moscow State University, Moscow, Russia (1154-49-1331)</td>
</tr>
<tr>
<td>3:45PM</td>
<td><strong>On the dynamics of certain classes of nonlinear discrete discontinuous population models.</strong></td>
<td>Vlajko L. Kocic, Xavier University of Louisiana (1154-34-1082)</td>
</tr>
<tr>
<td>4:00PM</td>
<td><strong>Solutions to a three point boundary value problem in nabla fractional calculus.</strong></td>
<td>Preliminary report.</td>
</tr>
</tbody>
</table>

**MAA Contributed Paper Session on Combining Technological Tools and Innovative Practices to Improve Student Learning Outcomes, II**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00PM</td>
<td><strong>Integrating technology and pedagogical strategies for learning and teaching calculus.</strong></td>
<td>Katiucsa C. B. Teixeira* and Eduardo V. O. Teixeira, University of Central Florida (1154-85-1739)</td>
</tr>
<tr>
<td>1:20PM</td>
<td><strong>Using traditional online content, innovative online assignments and back-to-basic pen-and-paper in class student projects to address the needs of a diverse precalculus body.</strong></td>
<td>Dan McGee*, Axel Brandt, Steven Wilkinson and Bethany Noblitt, Northern Kentucky University (1154-85-976)</td>
</tr>
<tr>
<td>1:40PM</td>
<td><strong>Flipping the Classroom: An updated approach.</strong></td>
<td>Matthew Jonathan Peeples, United States Naval Academy Preparatory School (1154-85-1664)</td>
</tr>
<tr>
<td>2:00PM</td>
<td><strong>Which One Doesn’t Belong? Examining Graphs with Dynamic Representations.</strong></td>
<td>Nina Bailey*, University of North Carolina - Charlotte, and Samuel D Reed, Middle Tennessee State University (1154-85-1762)</td>
</tr>
</tbody>
</table>
2:20PM  (1825)  Tasks to Foster Mathematical Creativity in Calculus I.  
Houssein El Turkey*, University of New Haven,  
Gulden Karakok, University of Northern Colorado,  
Gail Tang, University of La Verne,  
Paul Regier, Milos Savic, University of Oklahoma, and  
Emily Cilli-Turner, University of La Verne  
(1154-E5-736)  

MAA Contributed Paper Session on Inclusive Excellence for the Mathematical Sciences, II  
1:00 PM – 3:55 PM  Room 501, Meeting Room Level, Colorado Convention Center  
Organizers:  
Naomi Cameron, Lewis & Clark College  
Rachel DeCoste, Wheaton College  
Chris Goff, University of the Pacific  
Semra Kilic-Bahi, Colby-Sawyer College  

1:00PM  (1834)  An Interdisciplinary Approach to Inclusive Excellence. Preliminary report.  
Kerry M. Luse, Trinity Washington University (1154-F5-1892)  

1:20PM  (1835)  Backward Design and Creating a Supportive Culture in Precalculus and First-semester Calculus. Preliminary report.  
Jana Gevertz, Matthew Mizuhara, Susan Schmoyer* and Suriza van der Sandt, The College of New Jersey (1154-F5-1795)  

1:40PM  (1836)  Girls Tinker Academy: How a summer program in making tries to close the gap.  
Natalie LF Hobson, Sonoma State University (1154-F5-1636)  

Tatiana Shubin, Alliance of Indigenous Math Circles, San Jose State University,  
Bob Klein, Alliance of Indigenous Math Circles, Ohio University, and  
Amanda Serenevy*, Riverbend Community Math Center (1154-F5-1388)  

2:20PM  (1838)  The Young Scholars Research Experiences in Mathematics (YSREM) at University of Guam.  
Hyunju Oh, University of Guam (1154-F5-1065)  

James E. Hamblin, Shippensburg University (1154-F5-992)  

3:00PM  (1840)  Unpacking LGBTQIA: Experiences and supports for queer spectrum students in math. Preliminary report.  
Matthew K Voigt, San Diego State University & UC San Diego (1154-F5-975)  

Friday, January 17 – Program of the Sessions
Program of the Sessions – Friday, January 17 (cont’d.)

MAA Contributed Paper Session on Innovative and Effective Ways to Teach Linear Algebra

1:00 PM – 2:35 PM Room 507, Meeting Room Level, Colorado Convention Center
Organizers: Sepideh Stewart, University of Oklahoma
            Gil Strang, MIT
            David Strong, Pepperdine University
            Megan Wawro, Virginia Tech

1:00PM (1843) Principal component analysis and deep learning.
            Gilbert Strang, MIT (1154-H1-2842)

1:20PM (1844) Designing a computational linear algebra lab course using Google Colab.
            Preliminary report.
            Mark Hughes, Brigham Young University (1154-H1-1521)

1:40PM (1845) Combining Flipped Linear Algebra Using Open Educational Resources with Concept Questions a la Peer Instruction.
            Preliminary report.
            John Conrad Merkel, Oglethorpe University (1154-H1-1925)

2:00PM (1846) A Second Linear Algebra Course
            Emphasizing Data Analysis within a Jupyter Notebook Environment.
            David Austin and Paul E. Fishback*, Grand Valley State University (1154-H1-948)

2:20PM (1847) Teaching and learning Linear Algebra proofs.
            Sepideh Stewart, University of Oklahoma, Norman, Oklahoma (1154-H1-2512)

MAA Contributed Paper Session on Mathematics and Sports, II

1:00 PM – 2:35 PM Room 506, Meeting Room Level, Colorado Convention Center
Organizers: Diana Cheng, Towson University
            John David, Virginia Military Institute

1:00PM (1848) Jumping Circles: Developing fraction sense through kinesthetic activities.
            Carly Berry* and Diana S Cheng, Towson University (1154-L1-910)

1:20PM (1849) Envisioning possibilities: Visual analytics in figure skating.
            Janet Liu*, Microsoft, Garrett Lucash, Wayland, MA, and Diana S Cheng, Towson University, Towson, MD (1154-L1-45)

1:40PM (1850) Pythagorean Expectation As Predictor in Major League Baseball.
            Andrew B Perry, Springfield College (1154-L1-703)

2:00PM (1851) Preliminary report.
            Isabelle Pardew, Towson University (1154-L1-1468)

2:20PM (1852) Pitcher Effectiveness: A step towards in game analytics and pitcher evaluation.
            Chris Watkins*, Cyril Rakovski and Vincent Berardi, Chapman University (1154-L1-711)

MAA Contributed Paper Session on Mathematics and the Arts: in the Classroom and Beyond, III

1:00 PM – 2:55 PM Room 504, Meeting Room Level, Colorado Convention Center
Organizer: Douglas Norton, Villanova University

1:00PM (1853) Klein Concert: A Report from a Math-Musical Classroom Experience.
            Maria C. Mannone, Department of Mathematics and Informatics, University of Palermo, Italy (1154-K1-1438)

            Federico Favalli*, Universidad Nacional de Tres de Febrero (Buenos Aires), and Maria C. Mannone, Department of Mathematics and Informatics, University of Palermo (1154-K1-1812)

1:40PM (1855) Music, Mathematics, and Mr. Euler.
            Larry G. Blaine, Plymouth State University (1154-K1-1883)

2:00PM (1856) Resolving a Logical Inconsistency in a Framework to Model Musical Rhythms.
            Matthew Lehman, University of Massachusetts Boston (1154-K1-1522)

2:20PM (1857) Mathematics, Consistency, and Beethoven.
            Randall E. Cone, Salisbury University, University System of Maryland (1154-K1-944)

2:40PM (1858) Dancing the Quaternions.
            Karl H. Schaffer, De Anza College / MoveSpeakSpin (1154-K1-2585)

MAA General Contributed Paper Session on Analysis

1:00 PM – 5:40 PM Room 707, Meeting Room Level, Colorado Convention Center
Organizers: Cathy Erbes, Hiram College
            Holley Friedlander, Dickinson College
Steven McKay, Brigham Young University

1:15 PM Chordal Hausdorff Convergence and Quasihyperbolic Distance.
David Herron, Abigail Richard*, University of Cincinnati, and Marie Snipes, Kenyon College (1154-VM-2690)

1:30 PM Basis functions in time scales. Preliminary report.
Kirsten R Messer, Colorado State University - Global (1154-VM-1048)

1:45 PM An alternative definition of exponential functions in time scales using basis functions. Preliminary report.
Beth Schaubroeck, U. S. Air Force Academy (1154-VM-959)

2:00 PM Two Competitive Lotka-Volterra Systems with Nonlinear Competition.
Grant C. Wagner, James Madison University (1154-VM-2176)

2:15 PM Low Regularity Non-L\(^2\)\((\mathbb{R}^d)\) Local Solutions to the gMHD-\(\alpha\) system.
Lorenzo Riva, Creighton University (1154-VM-449)

2:30 PM Shape through sound.
Javad Namazi, FDU (1154-VM-1097)

2:45 PM Entire Functions, Entirely Discontinuous. Preliminary report.
Jeremiah A. Hocutt, University of Alabama (1154-VM-625)

3:00 PM Determining Values of Spectral \(\zeta\)-Functions for Sturm–Liouville Operators. Preliminary report.
Jonathan Stanfill*, Baylor University, Guglielmo Fucci, East Carolina University, Fritz Gesztesy and Klaus Kirsten, Baylor University (1154-VM-682)

3:15 PM Chain Recurrence in Graph Determined Hybrid Systems.
Kimberly D Ayers, Carroll College (1154-VM-244)

3:30 PM Fractional derivatives in one-sided weighted Sobolev spaces.
Mary Vaughan* and Pablo Raúl Stinga, Iowa State University (1154-VM-193)

3:45 PM Recent updates on Poincaré and Sobolev inequalities in the Monge-Ampère quasi-metric structure.
Min Ranabhat* and Diego Maldonado, Kansas State University (1154-VM-421)

4:00 PM Classifying solutions for an important functional equation in Complex Analysis.
Danqi Yin* and Brittany Miller, Coe College (1154-VM-2387)

4:15 PM Sendov conjecture for polar derivative of polynomials.
Ritu Dhankar* and Prasanna Kumar, Birla Institute of Technology and Science, Pilani K K Birla Goa Campus (1154-VM-34)

4:30 PM Quantum Bruhat Graphs, Asymptotics, and Undergraduate research.
Ryan Shiffer, Salisbury University (1154-VM-859)

4:45 PM A sequence of means and generalization.
Jessica N Gibson* and Roman Wong, Washington & Jefferson College (1154-VM-1112)

5:00 PM A heuristic derivation of the Boole summation formula.
Thomas J. Osler, Rowan University (1154-VM-2684)

5:15 PM Lower Semicontinuity and \(l^1\)-convergence of a Class of Linear Growth Functionals with \(L^1\) Data.
Thomas Wunderli, The American University of Sharjah (1154-VM-288)

5:30 PM Developments in the semi-local convergence of Newton's method.
Yauheniya Shivadok*, Ioannis K. Argyros and Samundra Regmi, Cameron University (1154-VM-390)

MAA General Contributed Paper Session on Other Topics

1:00 PM – 5:55 PM Room 710, Meeting Room Level, Colorado Convention Center

Organizers: Cathy Erbse, Hiram College, Holley Friedlander, Dickinson College, Steven McKay, Brigham Young University

1:00 PM The Topological Structure of a Family of Excellent Morse Functions.
Eugene Fiorini, Muhlenberg College, Bryan Walker*, Sewanee: The University of the South, Sabrina Traver, King’s College, Robert Argus, George Mason, Cristian Hernandez, Regis University, and Benjamin Nagle, Muhlenberg College (1154-VM-2382)

1:15 PM The Lake Wobegon Paradox.
C. Bryan Dawson, Union University (1154-VM-693)

1:30 PM Bifurcations of a discrete analog of the Bernoulli differential equation.
Chris Ahrendt, University of Wisconsin-Eau Claire (1154-VM-1110)

1:45 PM Lyapunov Inequalities for Discrete Fractional Nonlinear Boundary Value Problems. Preliminary report.
Areeba Ikram, Colorado School of Mines (1154-VM-2489)

2:00 PM Tree-penalized TSP: A hybrid objective function for linear data ordering.
Denis A. Aliyev*, Virginia Military Institute, and Craig Lee Zirbel, Bowling Green State University (1154-VM-1921)

2:15 PM Peakless Motzkin Paths with Marked Level Steps at Fixed Height.
Naiomi T Cameron, Spelman College, and Everett N Sullivan*, Virginia Tech (1154-VM-1131)

2:30 PM Color Space Mathematical Modeling.
Mohamed Allali, Chapman University (1154-VM-1863)
Program of the Sessions – Friday, January 17 (cont’d.)

2:45PM  Positional games and the probabilistic method. Preliminary report.
         Segun Victor Ofe, Sam Houston State University (1154-VV-2651)

3:00PM  Two dependent probabilistic chip-collecting games.
         Joshua Harrington, Department of Mathematics, Cedar Crest College,
         Kedar Karhadkar, Department of Mathematics, The Pennsylvania State University,
         Madeline Kohutka, Department of Mathematics, Cedar Crest College,
         Tessa Stevens*, Department of Mathematics, Applied Mathematics and Statistics,
         Case Western Reserve University, and Tony W. H. Wong, Department of Mathematics,
         Kutztown University of Pennsylvania (1154-VV-2643)

3:15PM  Break.

3:30PM  Steiner Algebras. Preliminary report.
         Benjamin R Prather, Florida State University (1154-VV-1923)

3:45PM  How often do two permutations meet in the minimal element?
         Adam J Hammett and James Ford McElroy*, Cedarville University (1154-VV-2309)

4:00PM  Maximally sized upward and downward closed P-free families.
         A Sophie Aiken, Colorado College (1154-VV-1674)

         Liljana Babinkostova, Boise State University, Robert J. Erbes, Idaho National Lab,
         William R. Myers, William Unger*, and William Unger*, Boise State University (1154-VV-2736)

4:30PM  "Will They or Won’t They?": Predictive Models of Student College Commitment Decisions Using Machine Learning
         Treena Basu, Ron Buckmire, Occidental College, Kanadpriya Basu, Snack Nation,
         and Nishu Lal, Occidental College (1154-VV-1047)

4:45PM  Convexity and star-shapedness of joint matricial range.
         Pan Shun Lau, University of Nevada, Reno (1154-VV-299)

5:00PM  Weak log-majorization of unital trace-preserving completely positive maps.
         Tin-Yau Tam, University of Nevada, Reno (1154-VV-868)

5:15PM  On maps preserving Lie products equal to a rank-one nilpotent.
         Victor Ginsburg*, Pennsylvania State University, Ricardo Velasquez, The University of Texas at Austin,
         and Hayden Julius, Kent State University (1154-VV-1855)

5:30PM  Utilizing Inquiry Based Learning to Prepare Urban High School Students for Success in College Mathematics.
         Preliminary report.
         Kenneth Horwitz*, Angela R Garretson and Bruce Bukiet, New Jersey Institute of Technology (1154-VV-2273)

5:45PM  Positioning, Navigation, and Timing
         Joseph J. Rushanan* and Andres Molina-Markham, The MITRE Corporation (1154-VV-1593)

MAA General Contributed Paper Session on Probability and Statistics

1:00 PM – 4:40 PM  Room 709, Meeting Room Level, Colorado Convention Center

Organizers: Cathy Erbes, Hiram College
            Holley Friedlander, Dickinson College
            Steven McKay, Brigham Young University

1:00PM  On the use of Bayesian quantile regression method to explore the historical trends in extreme precipitation and their connections with large-scale climate patterns over the contiguous USA.
         Bhikhari Tharu* and Nirajan Dhakal, Spelman College (1154-VT-1005)

1:15PM  Necessary sample sizes for specified closeness and confidence of matched data under the skew normal setting.
         Cong Wang*, Tonghui Wang, David Trafimow and Hunter A. Myuz, New Mexico State University (1154-VT-1046)

1:30PM  Bayesian Estimation on Cure Model for Right Censored Data. Preliminary report.
         Durga H Kutal*, Khyam N Paneru, and Nirajan Dhakal, Spelman College (1154-VT-1755)

1:45PM  Solving Statistical Estimation Problems with Algebraic Geometric Tools.
         Grant Lee Innerst*, Shippensburg University, and David J Kahle, Baylor University (1154-VT-1501)

2:00PM  Progress on bounding site percolation thresholds of Archimedean lattices. Preliminary report.
         John C. Wierman, Johns Hopkins University (1154-VT-250)

2:15PM  Clustering in Sparse Popularity Adjusted Stochastic Block Model.
         Majid Noroozi* and Marianna Pensky, University of Central Florida (1154-VT-612)

2:30PM  Break.
2:45PM  ▶ (1902)  Confidence intervals for the mean and a percentile based on zero-inflated lognormal data.
    Md Szajib Hasan*, Dixie State University, and Kalimuthu Krishnamoorthy, University of Louisiana at Lafayette (1154-1066)

3:00PM  ▶ (1903)  Lehmann ROC Regression for Longitudinal Data.
    Melissa Innerst*, Juniata College, and Jack D Tubbs, Baylor University (1154-1402)

    Ruth Burkharter, University of South Dakota (1154-2337)

3:30PM  ▶ (1905)  Inference on the difference of location parameters under Multivariate skew-normal setting. Preliminary report.
    Ziiwei Ma* and Tonghui Wang, New Mexico State University (1154-2090)

3:45PM  ▶ (1906)  Multiple Points of Fractional Brownian Motion in $R^d$.
    Mark Landry*, Michigan State University, Paige Peary, University of Arizona, and Cheuk-Yin Lee, Michigan State University (1154-1869)

4:00PM  ▶ (1907)  Accessible Analysis of Longitudinal Data with Linear Mixed Effects Models: There’s an App for That.
    Jessica Murphy*, Pitshou Nzazi Duki, Nicholas Weaver and Audrey Hendricks, University of Colorado Denver (1154-2117)

4:30PM  ▶ (1908)  Combining statistical literacy with real world data-skills: What should a first course in data science for computer science majors cover? Preliminary report.
    Josh Hiller* and Monica Morales-Hernandez, Adelphi University Department of Mathematics and Computer Science (1154-482)

**SIAM Minisymposium on Mathematics at the National Laboratories**

1:00PM – 6:00PM  Room 301, Meeting Room Level, Colorado Convention Center

Organizers:  Stephen J. Young, Pacific Northwest National Laboratory

  Timothy Doster, Pacific Northwest National Laboratory

  Tegan Emerson, Pacific Northwest National Laboratory

  Emilie Purvine, Pacific Northwest National Laboratory

1:00PM  ▶ (1909)  A Generalized Theory of Information to Improve Training and Predictions.
    Preliminary report.
    Jed A. Duersch*, Sandia National Laboratory, and Thomas A. Catanach, Sandia National Laboratories (1154-94-2558)

1:30PM  ▶ (1910)  Tuning Multigrid Methods with Robust Optimization.
    Matt Menickelly*, Argonne National Laboratory, Jed Brown, University of Colorado at Boulder, Yunhui He, University of Waterloo, Scott MacLachlan, Memorial University of Newfoundland, and Stefan Wild, Argonne National Laboratory (1154-90-1354)

2:00PM  ▶ (1911)  “Sintering” models and measurements: data assimilation for microstructure prediction of nylon component SLS additive manufacturing.
    William Rosenthal* and Francesca Grogan, Pacific Northwest National Laboratory (1154-62-2564)

2:30PM  ▶ (1912)  Generative training of quantum Boltzmann machines with hidden units.
    Preliminary report.
    Nathan Wiebe, Pacific Northwest National Laboratory (1154-68-1338)

3:00PM  ▶ (1913)  Recent mathematical developments for vehicle security, analyzing host logs, and other applications.
    Robert A Bridges, Oak Ridge National Laboratory (1154-90-961)

3:30PM  ▶ (1914)  Detecting anomalous changes in remote sensing imagery from different sensors.
    Amanda Ziemann*, Christopher X. Ren and James Theiler, Los Alamos National Laboratory (1154-86-2267)

4:00PM  ▶ (1915)  From Nanoporous Materials to Cosmology: Applied Topology at the National Labs.
    Dmitriy Morozov, Lawrence Berkeley National Laboratory (1154-55-1828)

    Brett A. Jefferson, Pacific Northwest National Laboratory (1154-55-2154)

5:00PM  ▶ (1917)  Panel Discussion: Mathematics at the National Laboratories.

**NAM Haynes-Granville-Browne Session of Presentations by Recent Doctoral Recipients**

1:00PM – 4:00PM  Room 605, Meeting Room Level, Colorado Convention Center

Organizers:  Naiomi Cameron, Spelman College

  Edray Goins, Pomona College

1:00PM  ▶ (1918)  Enumerations of Restricted Dumont Permutations.
    Opel Jones, Towson University (1154-05-2157)
1:45PM Lower bounds for induced poset saturation. Ryan R. Martin, Iowa State University, Heather C. Smith, Davidson College, and Shanise Walker*, University of Wisconsin-Eau Claire (1154-06-1056)

2:30PM Positive Definite Kernels, Harmonic Analysis, and Boundary Spaces: Drury-Arveson Theory, and Related. Aqeeb A Sabree, Xavier University (1154-46-2678)

3:15PM A New Regularization Term for Deep Neural Networks With Applications to Biological Data. Zerotti L Woods, Johns Hopkins Applied Physics Laboratory (1154-92-2145)

AMS-MAA Panel

1:00 PM – 2:20 PM Room 601, Meeting Room Level, Colorado Convention Center
Living Proof: Stories of Resilience Along the Mathematical Journey.
Organizers: Allison Henrich, Seattle University
Emille Lawrence, University of San Francisco
Matthew Pons, North Central College
David Taylor, Roanoke College
Panelists: Allison Henrich, Seattle University
Emille Lawrence, University of San Francisco
Matthew Pons, North Central College
Candice Price, California State University, Chico
Alicia Prieto-Langarica, Youngstown State University
Robin Wilson, California State Polytechnic University, Pomona

Project NExT

1:00 PM – 2:15 PM Mile High Ballroom 4d-4f, Ballroom Level, Colorado Convention Center
Fostering An Equitable Classroom.
Organizers: Heather Brooks, University of California Los Angeles
Christina Edholm, Scripps College
Ryan Moruzzi, Ithaca College
Mark Weaver, Elon University

MAA Contributed Paper Session on Research in Undergraduate Mathematics Education (RUME), III

1:20PM – 5:35PM Room 505, Meeting Room Level, Colorado Convention Center
Organizers: Nicole Engelke Infante, West Virginia University
Shiv Smith Karunakaran, Michigan State University
Megan Wawro, Virginia Tech

1:20PM Calculus Students’ Understandings of Graphical Representations of Functions and Differences of Outputs. Preliminary report.
Benjamin David Sencindiver, Colorado State University (1154-NS-2691)

1:40PM Students’ meanings for the Derivative at a Point in the context of Linear Approximation.
Franklin H Yu, Arizona State University (1154-NS-2389)

2:00PM Students’ Non-attendance to the Mathematical Meanings of the Symbols and their Common Errors in Calculus Courses. Preliminary report.
Kedar M Nepal*, Mercer University, Krishna Pokharel, Young Harris College, Deepak Basyal, University of Wisconsin-Washington County, Deependra Banjade, Coastal Carolina University, and Manoj Lamichhane, Florida Polytechnic University (1154-NS-1492)

2:20PM Distinctions in Undergraduate Students’ Interpretations of Differences from Calculus Statements in the Graphical Register.
Erika David Parr, Rhodes College (1154-NS-2475)

2:40PM Students’ Gaze Patterns and In-the-Moment Shape Thinking.
Wesley K. Martsching, University of Northern Colorado (1154-NS-2625)

3:00PM Trajectory for business and marginal functions.
Ralph E. Chikhany, Washington State University, Pullman, WA (1154-NS-912)

3:20PM A conceptual analysis of students’ abstracted structural reasoning.
Yufeng Ying* and Kevin C Moore, University of Georgia (1154-NS-1484)

3:40PM Examining area of a rectangular region with area-unit comparison. Preliminary report.
Sayonita Ghosh Hajra* and Yajenny Pacheco Enamorado, California State University, Sacramento (1154-NS-599)

4:00PM Investigating Prospective Secondary Mathematics Teachers’ Evolving Function Concept Images.
Janessa M Beach, The University of Texas at Arlington (1154-NS-981)
Variation, Covariation, and Conceptual or Experiential Time.

Kevin C. Moore, University of Georgia (1154-N5-152)

Understanding students’ uses of dynamic geometry environments in screen cast presentation.

Younggon Bae, University of Texas Rio Grande Valley (1154-N5-1822)


Patricio G Herbst, Irma E. Stevens*, Amanda M. Milewski, Michael G Ion and Inah Ko, University of Michigan (1154-N5-2080)

Using autoethnographies in qualitative research concerning the evolution of preservice mathematics teachers’ professional identity.

William Hall*, Washington State University, and Ashley Whitehead, Appalachian State University (1154-N5-1630)

AMS Special Session on Recent Trends in Semigroup Theory

1:30 PM – 5:50 PM Room 712, Meeting Room Level, Colorado Convention Center

Organizers: Michael Kinyon, University of Denver

Ben Steinberg, City College of New York

Bands and symmetry.

Francis J Pastijn, Marquette University, Milwaukee, Wisconsin (1154-20-1675)

Graph inverse semigroups and Leavitt path algebras. Preliminary report.

John C Meakin*, Department of Mathematics, University of Nebraska-Lincoln, and Zhengpan Wang, Southwest University, China (1154-20-438)

Maximal Commutative Subsemigroups of a Finite Semigroup.

Janusz Konieczny, University of Mary Washington, Fredericksburg, Virginia (1154-20-572)

Topological Transformation Monoids.

Zachary Messy, University of Colorado, Colorado Springs, James D. Mitchell, University of St Andrews, and Yann H. Péresse, University of Hertfordshire (1154-20-92)

On inverse hulls of Markov subshifts. Preliminary report.

David Milan*, The University of Texas at Tyler, Aria Beaupré, Harvey Mudd College, Anthony Dickson, Youngstown State University, and Christin Sum, California State University-Long Beach (1154-20-874)

A generalization of Wilf’s Conjecture.

Michael DiPasquale, Colorado State University (1154-13-840)

Counting the number of numerical semigroups using polytopes.

Hayan Nam*, Iowa State University, and Nathan Kaplan, University of California, Irvine (1154-05-1881)


Robert D Gray, University of East Anglia, and Benjamin Steinberg*, The City College of New York (1154-20-1169)

Conjugacy and the center of inverse monoids.

Michael Kinyon, University of Denver (1154-20-841)

Representation theorems for exchangeable structures: a computability-theoretic perspective.

Cameron E. Freer, Massachusetts Institute of Technology (1154-03-1223)

A Call to Action–Grassroots Advocacy for Our Profession

Organizers: Francis Su, Harvey Mudd College

Michael Vogelius, Rutgers, The State University of New Jersey

Suzanne Weekes, Worcester Polytechnic Institute

Moderator: Francis Su, Harvey Mudd College

Panelists: Kira Hamman, Penn State University

James Ricci, Daemen College

Anthony Várilly-Alvarado, Rice University

State Director of Constituent Affairs, Office of Senator Michael Bennet (CO-D)
### Presentations by MAA Teaching Award Recipients

**2:30 PM – 3:40 PM**  
Four Seasons Ballroom 1, Ballroom Level, Colorado Convention Center  

**Organizers:** Michael Dorff, Brigham Young University  
James Sellers, University of Minnesota-Duluth  

1944—Ardila-Mantilla, F.— The joyful community practice of doing mathematics.  
Federico Ardila-Mantilla, San Francisco State University (1154-A0-2162)  

1945—Tomforde, M.— Lessons Learned from Lessons Taught.  
Mark Tomforde, University of Houston (1154-A0-1824)  

1946—Weekes, S. L.— Taking your place, making more space, and keeping it real.  
Suzanne L Weekes, Worcester Polytechnic Institute (1154-A0-108)  

### MAA Contributed Paper Session on Scholarship on Teaching and Learning Statistics

**3:00 PM – 4:55 PM**  
Room 503, Meeting Room Level, Colorado Convention Center  

**Organizer:** Lisa Carnell, High Point University  

**3:00 PM**  
*Videos Lectures to Enhance Student Learning and Performance in an Online Elementary Statistics Course.* Preliminary report.  
Cathy M. Frey, Norwich University (1154-P1-1802)  

**3:20 PM**  
*SOTL- driven evolution of a university probability course.*  
J. Todd Lee, Elon University (1154-P1-2311)  

**3:40 PM**  
*Improving Student Ownership in Introductory Statistics Class through a Project-Based Approach.*  
Vinoth Kumar Chellamuthu, Dixie State University, Saint George, Utah (1154-P1-1273)  

**4:00 PM**  
*Modeling and Statistical Research with R.*  
Leon Kaganovskiy, Touro College (1154-P1-277)  

**4:20 PM**  
*Using GeoGebra for Statistics.*  
Heather Pierce, Emmanuel College (1154-P1-2587)  

**4:40 PM**  
*Study of Student Performance and Perceptions in Inverted Introductory Statistics.*  
Reza O. Abbasiyan*, Texas Lutheran University, Dept of Math and CS, and Michael L Czuchry, Texas Lutheran University, Department of Psychology (1154-P1-416)  

### ASL Contributed Paper Session

**3:00 PM – 4:50 PM**  
Room 302, Meeting Room Level, Colorado Convention Center  

**3:00 PM**  
*Local Hanf Numbers, Kurepa Trees, and Limit Characterizable Cardinals.*  
Ioannis Souldatos, University of Detroit Mercy (1154-03-897)  

**3:30 PM**  
*An introduction to HT-fields.*  
Elliot Kaplan, University of Illinois at Urbana-Champaign (1154-03-1435)  

**4:00 PM**  
*Companionability Characterization for the Expansion of an O-minimal Theory by a Dense Subgroup.*  
Alexi T Block Gorman, University of Illinois at Urbana-Champaign (1154-03-1436)  

**4:30 PM**  
*Metalogical Extensions. Preliminary report.*  
Joachim Mueller-Theys, Heidelberg, Germany (1154-03-1536)  

### A Town Hall with the AMS Executive Director about the Future of the Joint Mathematics Meetings.

**3:00 PM – 4:00 PM**  
Room 201, Meeting Room Level, Colorado Convention Center  

**Organizers:** Dan Margalit, Georgia Institute of Technology  
Irina Mitrea, Temple University  

### MAA Contributed Paper Session on Quantitative Literacy and Social Justice: An Ongoing Dialogue, II

**3:20 PM – 4:15 PM**  
Room 507, Meeting Room Level, Colorado Convention Center  

**Organizers:**  
Mark A. Branson, Stevenson University  
Catherine Crockett, Point Loma University  
Jason Douma, University of Sioux Falls  
Gizem Karaali, Ponaoma College  
Victor Piercey, Ferris State University  
Samuel L. Tunstall, Trinity University  

**3:20 PM**  
*Teaching Social Justice and Responsibility through a Quantitative Reasoning Framework in Two Classroom Modules.*  
Anne E. Yust*, Debasmita Basu, Eugene Lang College of Liberal Arts at The New School, and Carol Overby, Parsons School of Design at The New School (1154-M1-2521)
3:40 PM  
Quantitative Literacy for Pre-service Elementary Teachers in a Remedial Pilot Program. Preliminary report.
Maria G Fung, Worcester State University (1154-M1-888)

4:00 PM  
Samuel Luke Tunstall*, Trinity University, Victor Piercey, Ferris State University, Gizem Karaali, Pomona College, Catherine Crockett, Point Loma University, Mark A Branson, Stevenson University, and Jason Douma, University of Sioux Falls (1154-M1-2809)

Project NExT
4:00 PM - 5:15 PM  
Mile High Ballroom 4d-4f, Ballroom Level, Colorado Convention Center
NSF Proposal Writing Helpful Hints and Fatal Flaws.

Presenters:  
Karen Keene, Division of Undergraduate Education, National Science Foundation
Sandra Richardson, Division of Undergraduate Education, National Science Foundation
Talitha Washington, Division of Undergraduate Education, National Science Foundation
Lee Zia, Division of Undergraduate Education, National Science Foundation

MAA Student Poster Session
4:30 PM - 6:00 PM  
Hall D, Exhibit Level, Colorado Convention Center

AMS Congressional Fellowship Session
4:30 PM - 6:30 PM  
Room 203, Meeting Room Level, Colorado Convention Center
Organizer:  
Karen Saxe, AMS
Speakers:  
Lucia Simonelli, AMS Congressional Fellow 2019-20

SIGMAA on Business, Industry, and Government (BIG SIGMAA) Business Meeting
4:30 PM - 5:15 PM  
Room 506, Meeting Room Level, Colorado Convention Center

AWM Workshop: Poster Presentations by Women Graduate Students and Reception
5:00 PM - 6:15 PM  
Upper Lobby D, Exhibit Level, Colorado Convention Center
Organizers:  
Loredana Lanzani, Syracuse University

Radmila Sazdanovic, North Carolina State University
Yusu Wang, Ohio State University
Liz Vivas, Ohio State University

5:00 PM  
Theoretical justification and error analysis for slender body theory.
Laurel A Ohm, University of Minnesota

5:00 PM  
Area and Partial Length Spectrum Data.
Noelle Sawyer, Wesleyan University

5:00 PM  
Extending fibrations of knot complements to ribbon disk complements.
Maggie Miller, Princeton University

5:00 PM  
Exponential Domination on $C_n\Box P_k$ and infinite grids.
Faisal Min Mahfoodh, University of Minnesota, Bo Peng, Carleton College, Elizabeth Sprangel* and Michael Young, Iowa State University

5:00 PM  
Lattice Polytopes arising from Schur Polynomials and Symmetric Grothendieck Polynomials.
Margaret Bayer, University of Kansas, Bennet Goeckner, University of Washington, Su Ji Hong, University of Nebraska, Tyrrell McAllister, University of Wyoming, McCabe Olsen, Ohio State University, Casey Pickney, Colorado State University, Martha Yip, University of Kentucky, Semin Yoo, University of Rochester, and Juliane Vega*, University of Kentucky

5:00 PM  
Strictly $n$-regular Hermitian lattices.
Freda Li, Wesleyan University

5:00 PM  
Self-organized division of labor leads to behavioral contagion in mixed social groups.
Mari Kawakatsu*, Program in Applied and Computational Mathematics, Princeton University, Christopher K. Tokita, Department of Ecology and Evolutionary Biology, Princeton University, Yuko Ulrich, Department of Ecology and Evolution, University of Lausanne, Vikram Chandra, Jonathan Saragosti, Daniel J. C. Kronauer, Laboratory of Social Evolution and Behavior, The Rockefeller University, and Corina E. Tarnita, Department of Ecology and Evolutionary Biology, Princeton University

5:00 PM  
Sketching and Clustering Metric Measure Spaces.
Facundo Memoli, The Ohio State University, Anastasios Sidiropoulos, University of Illinois at Chicago, and Kritika Singhal*, The Ohio State University

5:00 PM  
Classification on Planar Polygonal Complexes. Preliminary report.
Thaniththa Kowan, Florida State University
Multiplicities of Schubert varieties in the symplectic flag varieties.

David Anderson, The Ohio State University, Takeshi Ikeda, Okayama University of Science, Minyoung Jeon*, The Ohio State University, and Ryotaro Kawago, Okayama University of Science

Projective cases for the restriction of the oscillator representation to dual pairs.

Sabine Jessica Lang, University of Utah

Fractional derivatives and Laplacians in one and two-sided weighted Sobolev spaces.

Mary Vaughan* and Pablo Raúl Stinga, Iowa State University

Unified Topological and Geometric Characterization of Genomic Networks Underlying Complex Traits in Genome-wide Association Studies.

Emily T Winn* and Lorin Crawford, Brown University

Semi-Ample Asymptotic Syzygies.

Juliette Bruce, University of Wisconsin-Madison

Stoichiometric Knife-Edge Model on Discrete Time Scale.

Lale Asik*, Department of Mathematics and Statistics/Texas Tech University, Ming Chen, School of Science/Dalian Maritime University, and Angela Peace, Department of Mathematics and Statistics/Texas Tech University

Smallness properties and locally complete intersections.

Janina C. Letz, University of Utah

Counterexamples for Cohen-Macaulayness of Lattice Ideals.

Aleksandra Sobieska* and Laura Felicia Matussevich, Texas A&M University

Stability deterioration of diffuse optical tomography in the Bayesian framework.

Kit Newton* and Qin Li, University of Wisconsin-Madison

Quantitative Properties of Ideals arising from Hierarchical Models.

Aida Maraj, University of Kentucky

Panelists: Stuart Klugman, Society of Actuaries
Ken Williams, Casualty Actuary Society

AMS Special Presentation

5:15 PM – 6:45 PM Room 207, Meeting Room Level, Colorado Convention Center

World Premiere of George Csicsery’s film "Secrets of the Surface: The Mathematical Vision of Maryam Mirzakhani."

Organizer: David Eisenbud, Mathematical Sciences Research Institute

Panelists: Jayadev Athreya, University of Washington
Héline Barcelo, Mathematical Sciences Research Institute
George Csicsery, Zala Films
Erica Klarreich, Mathematician, Journalist, and Narrator of the film
Tatiana Toro, University of Washington

SIGMAA on Business, Industry, and Government (BIG SIGMAA) Reception

5:15 PM – 6:00 PM Room 506, Meeting Room Level, Colorado Convention Center

Organizers: Bori Mazzag, Humboldt State University
Tim Comar, Benedictine University
Hannah Highlander, University of Portland

SIGMAA on the Philosophy of Mathematics (POM SIGMAA) Reception

5:30 PM – 6:00 PM Room 502, Meeting Room Level, Colorado Convention Center

SIGMAA on Mathematics Instruction Using the Web (WEB SIGMAA) Reception

5:30 PM – 6:00 PM Room 502, Meeting Room Level, Colorado Convention Center

SIGMAA on the Philosophy of Mathematics (POM SIGMAA) Business Meeting

6:00 PM – 6:15 PM Room 504, Meeting Room Level, Colorado Convention Center

Organizer: Bonnie Gold, Monmouth University
### SIGMAA on Statistics Education (SIGMAA StatEd) Reception
6:00 PM – 6:30 PM  
Room 501, Meeting Room
Level, Colorado Convention Center

### SIGMAA on Mathematics Instruction Using the Web (WEB SIGMAA) Guest Speaker
6:00 PM – 6:50 PM  
Room 502, Meeting Room
Level, Colorado Convention Center
Organizer: Paul Seeburger, Monroe Community College

#### (1979)
The future of textbooks.
Matthew Boelkins, Grand Valley State University (1154-A0-2323)

### Mathematically Bent Theater
6:00 PM – 7:00 PM  
Four Seasons Ballroom 1, Ballroom Level, Colorado Convention Center
Performed by Colin Adams and the Mobiusbandaid Players.
Organizer: Colin Adams, Williams College

### AMS Mathematical Reviews Reception
6:00 PM – 7:00 PM  
Agate, 3rd Floor, Hyatt Regency Denver

### SIGMAA on the Philosophy of Mathematics (POM SIGMAA) Guest Speaker
6:15 PM – 7:05 PM  
Room 504, Meeting Room
Level, Colorado Convention Center
Organizer: Bonnie Gold, Monmouth University

#### (1980)
Possible and impossible infinities.
Michael Huemer, University of Colorado-Boulder (1154-A0-76)

### SIGMAA on Statistics Education (SIGMAA StatEd) Business Meeting
6:30 PM – 7:15 PM  
Room 501, Meeting Room
Level, Colorado Convention Center

### MAA Special Presentation
7:00 PM – 8:30 PM  
Room 503, Meeting Room
Level, Colorado Convention Center
Poetry Reading
Organizers: Gizem Karaali, Pomona College  
Lawrence M. Lesser, University of Texas El Paso  
Douglas Norton, Villanova University

### SIGMAA on Statistics Education (SIGMAA StatEd) Guest Speaker
7:20 PM – 8:10 PM  
Room 501, Meeting Room
Level, Colorado Convention Center
Organizer: Lisa Carnell, High Point University

#### (1981)
The importance of statisticians in a development-driven world.
Trevor Patch, Baseball Research and Development with the Colorado Rockies (1154-A0-99)

### NAM Cox-Talbot Address
7:45 PM – 8:35 PM  
Centennial Ballroom A, B, C, 3rd Floor, Hyatt Regency Denver
(1982) Bridging the Gaps in Undergraduate Mathematics Education.
Roselyn Williams, Florida A&M University (1154-97-2817)

### Backgammon!
8:00 PM – 10:00 PM  
Centennial Ballroom D, 3rd Floor, Hyatt Regency Denver
Learn to play backgammon from expert players.
Organizers: Arthur Benjamin, Harvey Mudd College  
Jason Lee, Montgomery College

### Projext NExT Reception
8:00 PM – 10:00 PM  
Capitol Ballroom 1, 2, 3, 4th Floor, Hyatt Regency Denver
8:00—10:00—All Project NExT Fellows, consultants, and other friends of Project NExT are invited.
Organizers: Julie Barnes, Western Carolina University  
Alisa Crans, Loyola Marymount University  
Matt DeLong, Marian University  
David Kung, St. Mary’s College of Maryland  
Alicia Prieto Langarica, Youngstown State University

### Saturday, January 18

#### Joint Meetings Registration
7:30 AM – 1:00 PM  
Lobby C, Meeting Room
Level, Colorado Convention Center

#### Email Center
7:30 AM – 1:00 PM  
Lobby C, Meeting Room
Level, Colorado Convention Center
AMS-MAA-SIAM Special Session on Research in Mathematics by Undergraduates and Students in Post-Baccalaureate Programs, IV

8:00 AM – 11:50 AM Room 210/212, Meeting Room Level, Colorado Convention Center

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

8:00 AM Particle Swarm Optimization-Based Source Seeking with Obstacle Avoidance. Jillian Cannons, Jeremy J. Lin* and Thuy Lu, California State Polytechnic University, Pomona (1154-90-582)

8:30 AM On the Knotting Probability of Random Equilateral Hexagons. Clara Buck*, Iowa State University, Sean Gallagher, Oakland, California, and Aniruddha Nadiga, University of Glasgow (1154-24-2465)

9:00 AM An Invariant of p-colorable Knots. Olivia Del Guercio*, Elise Catania, Jack Kendrick, Hana Sambora and Sarangoo Chimjee, Smith College (1154-57-2226)

9:30 AM Invariants of Z-linear quasigroups. Ariane Alexandrescu, Christine Cho, Daryl Gillentine, Allison Quintana* and Marium Tapal, Smith College (1154-20-2649)

10:00 AM Statistical analysis of jackal skull length. Preliminary report. Marisa Blackman, Smith College (1154-62-2790)


11:00 AM Exploring Preference Orderings Through Discrete Geometry. Preliminary report. Alvaro Carbonero*, University of Nevada, Las Vegas, Beth Anne Castellano, Lafayette College, Charles Kulick*, University of Scranton, and Karie Schmitz, Truman State University (1154-52-97)


AMS-MAA Special Session on History of Mathematics, II

8:00 AM – 11:50 AM Room 102, Meeting Room Level, Colorado Convention Center

Organizers: Jemma Lorenat, Pitzer College
Sloan Despeaux, Western Carolina University
Daniel Otero, Xavier University
Adrian Rice, Randolph-Macon College

AMS-SIAM Special Session on Random Matrices and Integrable Systems, I (a joint session with the SIAM Minisymposium on the same topic)

8:00 AM – 11:50 AM Room 301, Meeting Room Level, Colorado Convention Center

Organizers: Ken McLaughlin, Colorado State University
Sean O’Rourke*, University of Colorado Boulder

8:00 AM The point processes at turning points of large lozenge tilings. Sevak Mkrtchyan, University of Rochester (1154-60-775)
A deformation of the Tracy-Widom GOE distribution. Preliminary report.
Karl Liechty, DePaul University (1154-60-2433)

Ellipsoidal Billiards and Chebyshev-type polynomials.
Vladimir Dragovic, The University of Texas at Dallas (1154-37-470)

Large deviations and one-sided scaling limit of randomized box-ball system.
Atsuo Kuniba, University of Tokyo, Hanbaek Lyu*, University of California, Los Angeles, and Masato Okado, Osaka City University (1154-05-1628)

Universality for Lozenge Tiling Local Statistics.
Amol Aggarwal, Harvard University (1154-60-672)

A Riemann-Hilbert approach to asymptotic analysis of Toeplitz+Hankel determinants.
Roozbeh Charakhloo*, Colorado State University, and Alexander Its, Indiana University Purdue University Indianapolis (1154-30-723)

AMS-AWM Special Session on Mathematical and Computational Research in Data Science, II

9:00 AM – 11:50 AM Room 407, Meeting Room Level, Colorado Convention Center
Organizers: Linda Ness, DIMACS, Rutgers University
F. Patricia Medina, Yeshiva University
Kathryn Leonard, Occidental College

Highly Likely Clusterable Data With No Cluster.
Mireille Boutin, Purdue University (1154-68-398)

Topology and Hypergraphs for Biological Data.

Marilyn Vazquez*, Mathematical Biosciences Institute (MBI), Jeova Farias, Brown University, and Pedro Felzenszwalb, Brown University (1154-00-1182)

Exact Cluster Recovery via Classical Multidimensional Scaling.
Anna Little*, Michigan State University, Qiang Sun, University of Toronto, and Yuying Xie, Michigan State University (1154-62-1270)

Iterative Hard Thresholding for Low CP-rank Tensors.
Rachel Grotheer, Goucher College, Shuang Li, Colorado School of Mines, Anna Ma*, University of California, Irvine, Deanna Needell, University of California, Los Angeles, and Jing Qin, University of Kentucky (1154-15-1224)

Longevity of User Anonymity.

Analysis of Simulated Crowd Flow Exit Data: Visualization, Panic Detection, and Exit Time Convergence, Attribution and Estimation.
Anna Grim, Brown University, Alona Kryschenko*, California State University of Channel Islands, Linda Ness, DIMAC, Rutgers University, Patricia Medina, Yeshiva University, Boris Iskra, Randy Paffenroth, Worcester Polytechnic Institute, Sui Tang, Johns Hopkins University, Megan Owen, Lehman College, CUNY, and Melissa Ngamini, Morehouse College (1154-62-1615)

AMS Special Session on Algebraic Cycles in Arithmetic and Geometry

8:00 AM – 11:50 AM Room 402, Meeting Room Level, Colorado Convention Center
Organizers: Jeff Achter, Colorado State University
Sebastian Casalaina-Martin, University of Colorado Boulder

On the moduli space of pairs consisting of a cubic threefold and a hyperplane.
Radu Laza, Stony Brook University, Gregory Pearlstein, Texas A&M University, and Zheng Zhang*, University of Colorado (1154-14-1513)

Algebraicity of Hodge classes via algebraic Hecke characters. Preliminary report.
Laure Flapan*, Massachusetts Institute of Technology, and Jaclyn Lang, Université Paris 13 (1154-14-1387)
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
</table>
| 9:00 AM | Modularity of generating series of cycles on orthogonal Shimura varieties. Preliminary report.  
Kerthi S Madapusi Pera, Boston College (1154-11-1956) |
| 9:30 AM | Specialization of cycles at conifold points.  
Matt Kerr, Washington University in St. Louis (1154-14-1703) |
| 10:00 AM | Cycle class maps and birational invariants.  
Brendan Hassett*, ICERM/Brown University, and Yuri Tschinkel, Courant Institute, NYU and Simons Foundation (1154-14-764) |
| 10:30 AM | Zero-cycles over arithmetic fields. Preliminary report.  
Evangelia Gazaki, University of Virginia (1154-14-1250) |
| 11:00 AM | Rational points and derived equivalence.  
Katrina Honigs, University of Oregon (1154-14-1050) |
| 11:30 AM | Moduli spaces of sheaves on surfaces.  
Sarah Frei, Rice University (1154-14-1487) |
| 10:30 AM | On the complexity of cusped non-hyperbolic.  
Robert C Haraway, III* and Neil R Hoffman, Oklahoma State University (1154-57-1139) |
| 11:00 AM | Categorification of the Kauffman Bracket skein module of the projective space and lens spaces.  
Rhea Palak Bakshi* and Józef H. Przytycki, The George Washington University (1154-57-1750) |
| 11:30 AM | Computing torsion of Khovanov homology.  
Radmila Sazdanovic*, NC State University, Alex Chandler, University of Vienna, Austria, Adam Lowrance, Vassar College, and Victor Summers, University of South Carolina Upstate (1154-57-2276) |

**AMS Special Session on Arithmetic Dynamics, III (Associated with AMS Retiring Presidential Address Kenneth A. Ribet)**

8:00 AM – 11:50 AM Room 303, Meeting Room Level, Colorado Convention Center

Organizers: Rafe Jones, Carleton College  
Nicole R. Looper, Cambridge University and Brown University  
Joseph H. Silverman, Brown University

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
</table>
| 8:00 AM | The inverse problem for arboreal Galois representations of index two.  
Andrea Ferraguti*, Instituto de Ciencias Matemáticas, Carlo Pagano, Max Planck Institute for Mathematics, and Daniele Casazza, Instituto de Ciencias Matemáticas (1154-11-395) |
| 8:30 AM | Higher arithmetic degrees of rational maps. Preliminary report.  
Nguyen-Bac Dang, Stony Brook University, Dragos Chioica, University of British Columbia, Fei Hu, University of Waterloo, John Lesieutre*, Pennsylvania State University, and Matthew Satriano, University of Waterloo (1154-14-831) |
| 9:00 AM | New types of heights with connections to the Batyrev-Manin and Malle Conjectures.  
Jordan Ellenberg, University of Wisconsin-Madison, Matthew Satriano*, University of Waterloo, and David Zureick-Brown, Emory University (1154-11-123) |
| 9:30 AM | On Kawaguchi-Silverman conjecture for endomorphisms of rationally connected varieties.  
Yohsuke Matsuzawa, Brown University (1154-14-1622) |
| 10:00 AM | Automorphism loci for endomorphisms of  
$p^{\ell}$. Preliminary report.  
Benjamin Hutz, Saint Louis University (1154-37-1621) |
10:30AM Arboreal Galois representations of PCF quadratic polynomials. Preliminary report. Robert L Benedetto, Amherst College, Dragos Ghoica, Jamie Juul*, University of British Columbia, and Thomas Tucker, University of Rochester (1154-11-1924)

11:00AM Algebraic preperiodic points of entire transcendental functions. Preliminary report. David Krumm*, Reed College, Diego Marques, Universidade de Brasília, and Carlos Gustavo Moreira, Instituto de Matemática Pura e Aplicada (1154-37-818)


AMS Special Session on Computational Biomedicine

8:00 AM – 11:50 AM Room 112, Meeting Room Level, Colorado Convention Center

Organizers: Nek Valous, National Center for Tumor Diseases Heidelberg, Germany Cancer Research Center

Niels Halama, National Center for Tumor Diseases Heidelberg, German Cancer Research Center

8:00AM Systematic exploration strategies in heterogeneous biological and medical datasets for cancer therapy: from image analysis to multi-agent modelling. Niels Halama*, Department of Translational Immunotherapy, German Cancer Research Center (DKFZ), Pornpinmol Charoenpong, National Center for Tumor Diseases (NCT), Heidelberg, Germany, Nek Valous and Rodrigo Rojas Moraleda, German Cancer Research Center (DKFZ), Heidelberg, Germany (1154-37-668)

8:30AM Mathematical model of broadly reactive plasma cell production. Preliminary report. Lauren M Childs*, Department of Mathematics, Virginia Tech, Blacksburg, VA, Samantha Erwin, Population Health and Pathobiology, North Carolina State University, Raleigh, NC, and Stanca M Ciupe, Department of Mathematics, Virginia Tech, Blacksburg, VA (1154-92-1162)

9:00AM Learning from prostate-specific antigen dynamics early during androgen deprivation to predict subsequent individual responses. Renee Brady and Heiko Enderling*, Integrated Mathematical Oncology, H. Lee Moffitt Cancer Center (1154-92-392)

9:30AM Exploring agent-based models of complex multicellular cancer systems with HPC. Paul Macklin, Indiana University (1154-92-2146)

10:00AM A system biology approach for understanding sex differences in hypertension. Anita Layton, University of Waterloo (1154-92-608)

10:30AM Detection and segmentation of capillary structures in biomedical images based on a computational topology framework. Rodrigo Rojas Moraleda*, National Center for Tumor Diseases Heidelberg, German Cancer Research Center (DKFZ), Bénédicte Lenoir, German Cancer Research Center (DKFZ), Wei Xiong, Institute for Theoretical Physics, University Heidelberg, Nektarios A. Valous, National Center for Tumor Diseases Heidelberg, German Cancer Research Center (DKFZ), and Niels Halama, Department of Translational Immunotherapy, German Cancer Research Center (DKFZ) (1154-68-1859)

11:00AM Identifying critical pathways for ferroptosis using a systems approach. Anna Konstorum*, Center for Computing Sciences, Institute for Defense Analyses; Center for Quantitative Medicine, UConn Health, Suzy V. Torti, Frank M. Torti, Department of Molecular Biology and Biophysics, UConn Health, and Reinhard C. Laubenbacher, Center for Quantitative Medicine, UConn Health; Jackson Laboratory for Genomic Medicine (1154-68-404)

11:30AM Mathematical models of adoptive cell transfer approach for cancer immunotherapy. Preliminary report. Feng Fu, Dartmouth College (1154-37-365)

AMS Special Session on Differential and Difference Equations in Biological Dynamics

8:00 AM – 11:50 AM Room 107, Meeting Room Level, Colorado Convention Center

Organizers: Xiang-Sheng Wang, University of Louisiana at Lafayette

Aijun Zhang, University of Louisiana at Lafayette
Program of the Sessions – Saturday, January 18 (cont’d.)

8:00AM – 11:40 AM Room 109, Meeting Room Level, Colorado Convention Center

AMS Special Session on Evolution

8:00 AM – 11:40 AM

Organizers: Chris McCarthy, Borough of Manhattan Community College CUNY

Johannes Hamilton, Borough of Manhattan Community College CUNY

8:00AM (2043) An exact bifurcation diagram for a reaction diffusion equation arising in population dynamics.
Jerome Goddard, Auburn University - Montgomery, Quinn Morris, Appalachian State University, Stephen Robinson, Wake Forest University, and Ratnasingham Shivaji*, University of North Carolina at Greensboro (1154-35-505)

8:30AM (2044) Global dynamics of the diffusive Lotka-Volterra competition model with stage structure.
Shanshan Chen, Harbin Institute of Technology, and Junping Shi*, College of William & Mary (1154-92-1316)

9:00AM (2045) Disease Emergence and Persistence in a Multi-Patch Stochastic Epidemic Model with Demographic, Environmental and Periodic Variability.
Kaniz Fatema Nipa*, Texas Tech University, Lubbock, TX-79409, and Linda J.S. Allen, Texas Tech University, Lubbock, Texas. (1154-92-1657)

9:30AM (2046) Survival or extinction: difference equation models of evolutionary adaptation. Preliminary report.
Jim Michael Cushing, Department of Mathematics, Interdisciplinary Program in Applied Mathematics, University of Arizona (1154-92-1006)

10:00AM (2047) Sensitivity equations for measure-valued solutions to transport equations.
Azmy S. Ackleh*, University of Louisiana at Lafayette, Nicolas Saintier, University of Buenos Aires, and Jakub Skrzeczowski, Institute of Applied Mathematics and Mechanics, Warsaw, Poland (1154-35-785)

10:30AM (2048) Population Dynamics in River Networks.
Yu Jin, University of Nebraska-Lincoln (1154-92-1184)

11:00AM (2049) Optimal Control of the Flow Rate in a PDE Model of an Invasive Species in a River. Preliminary report.
Suzanne Lenhart, University of Tennessee (1154-92-502)

Jun Liu, Southern Illinois University Edwardsville, and Xiang-Sheng Wang*, University of Louisiana at Lafayette (1154-92-277)

AMS Special Session on Fractal Geometry, Dynamical Systems, and Applications, I

8:00 AM – 11:50 AM Room 111, Meeting Room Level, Colorado Convention Center

AMS Special Session on Fractal Geometry, Dynamical Systems, and Applications, I

8:00AM (2051) Quasispecies and error catastrophe.
Chris McCarthy* and Johannes Hamilton, Borough of Manhattan Community College City University of New York (1154-92-1617)

8:30AM (2052) Split-quaternions and diverging mechanisms of biologic evolution.
Garri Davydyan, Ottawa, Ontario (1154-92-178)

9:00AM (2053) Group Selection.
Burt Simon, Department of Mathematical and Statistical Sciences, University of Colorado Denver (1154-92-135)

9:30AM (2054) How Good is the \( \chi^2 \) Goodness-of-Fit test? Revisiting a controversy from the birth of modern statistics and genetics.
Daniel Fairbanks* and Bob Palais, Valley University (1154-92-319)

10:30AM (2055) Fractionation after whole genome doubling.
David Sankoff, University of Ottawa (1154-92-223)

11:00AM (2056) Ecology and evolution in control and cure of metastatic cancers.
Robert Gatenby, Moffitt Cancer Center (1154-92-249)

Organizers: Andrea Arauza Rivera, California State University, East Bay Robert Niemeyer, Metropolitan State University John Rock, California State Polytechnic University, Pomona

8:00AM (2057) Local Fractal Zeta Functions. Preliminary report.
Alexander M Henderson, University of California Riverside (1154-28-739)

8:30AM (2058) The wild, elusive singularities of the \( T \)-fractal surface, Part I.

9:00AM (2059) The wild, elusive singularities of the \( T \)-fractal surface, Part II.
Charles C. Johnson*, Bucknell University, and Robert G. Niemeyer, Metropolitan State University of Denver (1154-37-2007)

Benjamin Steinhurst, McDaniel College (1154-34-1603)
10:00 AM – 11:40 AM Room 304, Meeting Room Level, Colorado Convention Center

AMS Special Session on Mathematical Aspects of Conformal Field Theory, I

8:00 AM – 11:50 AM Room 106, Meeting Room Level, Colorado Convention Center

Organizers: Shashank Kanade, University of Denver
Andrew Linshaw, University of Denver
Robert McRae, Vanderbilt University

10:00 AM – NOON Room 406, Meeting Room Level, Colorado Convention Center

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

8:00 AM – NOON Room 406, Meeting Room Level, Colorado Convention Center

Organizers: Patrick Ion, IMK T & University of Michigan

10:00 AM – 11:40 AM Room 304, Meeting Room Level, Colorado Convention Center

AMS Special Session on Interfaces Between PDEs and Geometric Measure Theory, III (Associated with AMS Maryam Mirzakhani Invited Address Tatiana Toro)

8:00 AM – 11:40 AM Room 304, Meeting Room Level, Colorado Convention Center

Organizers: Robin Neumayer, Institute for Advanced Study
Zihui Zhao, Institute for Advanced Study

8:00 AM
(2061)
A local-to-global technique for inequalities in spaces of functions.
Fernando Lopez-Garcia, Department of Mathematics and Statistics, Cal Poly Pomona (1154-26-1301)

10:30 AM
(2062)
Partial marked length spectrum rigidity for negatively curved surfaces. Preliminary report.
Noelle Sawyer, Wesleyan University (1154-53-1260)

11:00 AM
(2063)
Optimal Quantization.
Robin Neumayer (2070)

11:30 AM
(2064)
Michel L. Lapidus, University of California, Riverside, Machiel van Frankenhuijsen, Utah Valley University, and Edward K. Voskanian*, The College of New Jersey (1154-11-1180)

AMS Special Session on Interfaces Between PDEs and Geometric Measure Theory, III (Associated with AMS Maryam Mirzakhani Invited Address Tatiana Toro)

8:00 AM – 11:40 AM Room 304, Meeting Room Level, Colorado Convention Center

Organizers: Robin Neumayer, Institute for Advanced Study
Zihui Zhao, Institute for Advanced Study

8:00 AM
(2065)
A local vs nonlocal segregation model.
Stefania Patrizii and Luis Caffarelli, UT Austin (1154-35-2432)

9:00 AM
(2066)
Relative isoperimetric inequality outside a convex set.
Brian Krummel, Purdue University (1154-49-2355)

9:30 AM
(2067)
Cornelia Mihaila, University of Chicago (1154-49-2437)

10:00 AM
(2068)
Regularity of almost minimizers with free boundary.
Guy David, Universite Paris-Sud, Max Engelstein, MIT, Mariana Smit Vega Garcia*, Western Washington University, and Tatiana Toro, University of Washington (1154-35-521)

10:30 AM
(2069)
Minimizers of strictly convex functionals. Connor Mooney, UC Irvine (1154-35-782)

11:00 AM
(2070)
Minimizers for the thin one-phase problem. Preliminary report.
Yannick Sire, Johns Hopkins University (1154-35-314)
Program of the Sessions – Saturday, January 18 (cont’d.)

AMS Special Session on Partition Theory and q-Series

8:00 AM – 11:50 AM Room 104, Meeting Room Level, Colorado Convention Center

Organizers: Madeline Locus Dawsey, The University of Texas at Tyler

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker(s)</th>
<th>Institution(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00AM</td>
<td>Ranks for n-marked Durfee symbols and quantum modular forms.</td>
<td>Amanda Folsom*, Amherst College, Min-Joo Jang, The University of Hong Kong, Sam Kimport, Stanford University, and Holly Swisher, Oregon State University (1154-11-833)</td>
</tr>
<tr>
<td>8:30AM</td>
<td>An analogue of k-marked Durfee symbols for strongly unimodal sequences.</td>
<td>Preliminary report. Savana Ammons, Harvey Mudd College, Young Jin Kim, Reed College, Laura Seaberg, Haverford College, and Holly Swisher*, Oregon State University (1154-11-871)</td>
</tr>
<tr>
<td>9:00AM</td>
<td>A Novel Generalization of Partitions with Parts Separated by Parity.</td>
<td>Preliminary report. Hannah E Burson*, University of Illinois at Urbana-Champaign, and Dennis Eichhorn, University of California, Irvine (1154-05-1254)</td>
</tr>
<tr>
<td>10:00AM</td>
<td>Partitions and characters of symmetric groups. Preliminary report.</td>
<td>Amita Malik, Rutgers University, New Brunswick (1154-11-1208)</td>
</tr>
<tr>
<td>10:30AM</td>
<td>Partitions and a conjecture of John Thompson.</td>
<td>Madeline Locus Dawsey, University of Texas at Tyler, Ken Ono, University of Virginia, and Ian Wagner*, Vanderbilt University (1154-11-830)</td>
</tr>
<tr>
<td>11:00AM</td>
<td>Index of seaweed algebras and integer partitions.</td>
<td>Ae Ja Yee, Penn State University (1154-05-1117)</td>
</tr>
<tr>
<td>11:30AM</td>
<td>Analysis and combinatorics of partition zeta functions.</td>
<td>Robert Schneider*, University of Georgia, and Andrew V. Sills, Georgia Southern University (1154-11-2606)</td>
</tr>
</tbody>
</table>

AMS Special Session on Recent Advances in Time-Stepping Methods for Ocean Modeling

8:00 AM – 11:50 AM Room 113, Meeting Room Level, Colorado Convention Center

Organizers: Sara Calandrini, Florida State University
Konstantin Pieper, Florida State University
Max Gunzburger, Florida State University

8:00 AM Efficient algorithm for simulating ensembles of parameterized flow problems.
Zhu Wang, University of South Carolina (1154-65-478)

8:30 AM Localized exponential time differencing methods for shallow water equations: algorithms and numerical investigations.
Preliminary report.
Xucheng Meng, Department of Mathematics, University of South Carolina, USA, Thi-Thao-Phuang Hoang, Department of Mathematics and Statistics, Auburn University, USA, Lili Ju* and Zhu Wang, Department of Mathematics, University of South Carolina, USA (1154-65-758)

9:00 AM Conservative Explicit Local Time-Stepping Schemes for the Shallow Water Equations.
Thi-Thao-Phuang Hoang*, Department of Mathematics and Statistics, Auburn University, Wei Leng, Chinese Academy of Sciences, Beijing, China, Lili Ju, Zhu Wang, Department of Mathematics, University of South Carolina, and Konstantin Pieper, Department of Scientific Computing, Florida State University (1154-65-643)

9:30 AM Exponential time differencing for mimetic multilayer ocean models.
Konstantin Pieper*, Oak Ridge National Laboratory, K. Chad Sockwell, Sandia National Laboratory, and Max Gunzburger, Florida State University (1154-65-1851)

10:00 AM Mass Conserving, Hamiltonian-Structure-Preserving Reduced Order Modeling for the Rotating Shallow Water Equations.
K Chad Sockwell*, Sandia National Laboratories, Konstantin Pieper, Oak Ridge National Laboratory, and Max Gunzburger, Florida State University (1154-76-1590)

10:30 AM Exponential Time Differencing for the Tracer Equations Appearing in Ocean Models.
Sara Calandrini*, Max Gunzburger, Florida State University, and Konstantin Pieper, Oak Ridge National Laboratory (1154-35-1415)

11:00 AM Time-stepping Method for Primitive Equations Modeling the Geophysical Flows In Presence of Topography.
Yining Cao, Chuck Jia* and Roger Temam, Indiana University Bloomington (1154-76-1607)

11:30 AM New Developments in Exponential Integration for Large Scale Stiff Systems.
Tommaso Buvali*, University of California, Merced, Stéphane Gaudreault, Recherche en prévision numérique atmosphérique, Environnement et Changement climatique Canada, and Maya Tokman, University of California, Merced (1154-65-2634)

AMS Special Session on Representations of Finite Groups and Related Structures, I

8:00 AM – 11:40 AM Room 103, Meeting Room Level, Colorado Convention Center
Organizers: Mandi Schaeffer Fry, Metropolitan State University of Denver, Nat Thiem, University of Colorado Boulder

8:00 AM The Benson - Symonds invariant for Permutation modules.
Aparna Upadhyay, University at Buffalo, SUNY (1154-20-801)

8:30 AM On the diameter of blocks of solvable groups.
J.P. Cossey, University of Akron (1154-20-617)

9:00 AM Finite groups with the CUT property.
Stephen Trefethen, College of William & Mary (1154-20-2049)

9:30 AM GVZ-groups.
Shawn T. Burkett* and Mark L. Lewis, Kent State University (1154-20-1569)

10:00 AM Galois group action on Lusztig parameters.
Bhama Srinivasan, University of Illinois at Chicago, and C. Ryan Vinroot*, College of William and Mary (1154-20-1193)

10:30 AM Finding finite representations of finitely presented groups. Preliminary report.
Heiko Dietrich, Monash University, and Alexander Hulpke*, Colorado State University (1154-20-755)

11:00 AM p-permutation equivalences and auto-equivalences.
Robert Boltje*, University of California Santa Cruz, and Philipp Perekplitsky, San Jose, California (1154-20-1393)

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

8:00 AM – 11:50 AM Room 102, Meeting Room Level, Colorado Convention Center
Organizers: Steve Butler, Iowa State University, Michael Ferrara, University of Colorado Denver, Jeremy Martin, University of Kansas
## Program of the Sessions – Saturday, January 18 (cont’d.)

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
</table>
| 8:00 AM | **A positivity phenomenon in Elser’s Gaussian-cluster percolation model.**  
Galen Dorpelen-Barry, University of Minnesota, Cyrus Hettle, Georgia Institute of Technology, David Livingston, University of Wyoming, Jeremy Martin, University of Kansas, George Nasr, University of Nebraska-Lincoln, Julianne Vega*, University of Kentucky, and Hays Whlatch, Gonzaga University (1154-05-641) |
| 8:30 AM | **Antimagic orientations of graphs with large maximum degree.**            
Donglei Yang, Shandong University, Joshua Carlson, Williams College, Andrew Owens, Widener University, K E Perry, Soka University of America, Inne Singgih*, University of South Carolina, Zi-Xia Song, University of Central Florida, Fangfeng Zhang, Nanjing University, and Xiaohong Zhang, University of Manitoba (1154-05-423) |
| 9:00 AM | **Intersections, circuits, and colorability of line segments.**            
Boris Brimkov, Rice University, Jesse Geneson, Iowa State University, Alatea Jensen*, Susquehanna University, Jordan Miller, Washington State University, and Pouria Salehi Nowbandegani, Vanderbilt University (1154-05-413) |
| 9:30 AM | **Lower Bounds on Discrepancy of Random Hypergraphs.** Preliminary report.  
Calum MacRury*, University of Toronto, Department of Computer Science, Tomáš Masařík, University of Warsaw, Xavier Pérez-Giménez, University of Nebraska-Lincoln, and Leilani Pai, University of Nebraska-Lincoln (1154-05-1654) |
| 10:00 AM | **Universal partial words.**                                               
Bennet Goecckner, University of Washington, Corbin Groothuis, University of Nebraska, Cyrus Hettle, Georgia Institute of Technology, Brian Kell, Google, Pamela Kirkpatrick, The Ellis School, Rachel Kirsch*, London School of Economics, and Ryan Solava, Saint Mary’s College (1154-05-1632) |
| 10:30 AM | **On difference graphs and the local dimension of posets.**               
Jinha Kim, Seoul National University, Ryan R Martin, Iowa State University, Tomáš Masařík, Charles University, Warren Shull, Emory University, Heather C Smith, Davidson College, Andrew Uzzell, Grinnell College, and Zhiyu Wang*, University of South Carolina (1154-06-1231) |
| 11:00 AM | **Catching Robbers Quickly and Efficiently.**                            
Anthony Bonato, Ryerson University, Jane Breen, University of Ontario Institute of Technology, Boris Brimkov, Slippery Rock University, Joshua Carlson, Williams College, Sean English*, University of Illinois Urbana-Champaign, Jesse Geneson, Leslie Hogben, Iowa State University, K E Perry, Soka University of America, and Carolyn Reinhart, Iowa State University (1154-05-498) |
| 11:30 AM | **Uniquely Sorted Permutations and Fertility Numbers.**                  
Colin Defant*, Princeton University, Michael Engen, University of Florida, and Jordan A Miller, Washington State University (1154-05-169) |

### AMS Special Session on Riemannian Foliations and Applications

**8:00 AM – 11:50 AM Room 105, Meeting Room Level, Colorado Convention Center**

Organizers: Igor Prokhorenkov, Texas Christian University  
Ken Richardson, Texas Christian University

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
</tr>
</thead>
</table>
| 8:00 AM | **New cohomological invariants of foliations.**                      
Georges Habib, Lebanese University, and Ken Richardson*, Texas Christian University (1154-58-1121) |
| 8:30 AM | **Basic Dolbeault cohomology on a transverse Kähler foliation.** Preliminary report.  
S. D. Jung*, Jeju National University, and K. Richardson, Texas Christian University (1154-53-336) |
| 9:00 AM | **Classification of weak solenoids.**                                
Steven Hurder, University of Illinois at Chicago (1154-58-629) |
| 9:30 AM | **Leaves with non-trivial holonomy in laminations.**                 
Olga Lukina, University of Vienna (1154-37-216) |
| 10:00 AM | **Laplacian algebras and singular Riemannian foliations in spheres.**  
Marco Radeschi, University of Notre Dame (1154-53-229) |
| 10:30 AM | **On Mean curvature flow of Singular Riemannian foliations: Non compact cases.**  
Marcos M. Alexandrino, Universidade de Sao Paulo (1154-53-1796) |
| 11:00 AM | **The boundary conjecture for Alexandrov leaf spaces.**               
Karsten Grove*, Department of Mathematics, University of Notre Dame, Adam Moreno and Peter Petersen, Department of Mathematics, UCLA (1154-53-527) |
AMS Special Session on The Mathematics of Social Justice

8:00 AM – 11:40 AM Room 403, Meeting Room Level, Colorado Convention Center

Organizers: Andrea Arauza Rivera, California State University, East Bay
Paige Helms, University of Washington
Ryan Moruzzi, Ithaca College
Robin Wilson, California Poly Pomona

8:00 AM The Data to Policy Project: A Framework for Social Justice Advocacy in Mathematics Education
Shea Swauger*, Michael Ferrara, Dennis DeBay, Diane Fritz and Matthew Mariner, University of Colorado Denver (1154-97-1961)

9:00 AM Analysis of partisan gerrymandering tools in advance of the US 2020 census. Preliminary report.
Marion Campisi*†, Thomas C Ratliff, Wheaton College, and Ellen Veomett, Saint Mary’s College of California (1154-91-98)

9:30 AM Diversity through a data science lens.
Heya Swauger*, Dennis DeBay, Brian P Katz, Smith College (1154-97-388)

10:00 AM Improving Equity and Access in Mathematics Curricula.
Brian J Winkel, SIMIODE, Washington College, and Therese Shelton, University of San Francisco (1154-00-1638)

Emille Lawrence, University of Southern California, Irvine (1154-00-1996)

11:00 AM Collaboration Session

AMS Special Session on Wall to Wall Modeling Activities in Differential Equations Courses

8:00 AM – 11:50 AM Room 108, Meeting Room Level, Colorado Convention Center

Organizers: Janet Fierson, La Salle University
Diane Fritz, Saint Mary’s College, and Therese Shelton, Southwestern University
Brian Winkel, SIMIODE

8:00 AM Eye Surgery Problems, Dry Ice Does a Job, and How Water Cooling while Room Heats Up – Modeling with Differential Equations.
Brian J Winkel, Director, SIMIODE, Cornwall NY USA (1154-34-1655)

8:30 AM Thanos Population Dynamics.
Sarah Patterson*, Blain Patterson, Virginia Military Institute (1154-97-453)
### MAA Invited Paper Session on Modernizing the Introductory Statistics Course

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 AM – 10:50 AM</td>
<td>Room 610/612, Meeting Room Level, Colorado Convention Center</td>
</tr>
<tr>
<td><strong>Organizers:</strong></td>
<td>Lisa Carnell, High Point University</td>
</tr>
<tr>
<td></td>
<td>Alana Unfried, California State University, Monterey Bay</td>
</tr>
<tr>
<td>8:00 AM</td>
<td>GAISE 2016 in action. (2148) Beverly Wood, Embry-Riddle Aeronautical University (1154-AE-2849)</td>
</tr>
<tr>
<td>8:30 AM</td>
<td>How technology facilitates modernizing intro stats. (2149) Patti Frazer Lock, St. Lawrence University (1154-AE-2850)</td>
</tr>
<tr>
<td>9:00 AM</td>
<td>Statistical inference via data science: A “tidy” approach. (2150) Albert Y. Kim, Smith College (1154-AE-2851)</td>
</tr>
<tr>
<td>9:30 AM</td>
<td>Stats for data science. (2151) Daniel Kaplan, Macalester College (1154-AE-2852)</td>
</tr>
<tr>
<td>10:00 AM</td>
<td>The p-value: Replacing 0.05 with understanding. (2152) Kari Lock Morgan, Pennsylvania State University (1154-AE-2853)</td>
</tr>
<tr>
<td>10:30 AM</td>
<td>Conceptual approaches to teaching multivariable statistical thinking: Using simulation methods and visualization. (2153) Beth Chance, Cal Poly – San Luis Obispo (1154-AE-2854)</td>
</tr>
</tbody>
</table>

### AMS Contributed Paper Session on Algebra and Algebraic Geometry, II

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 AM – 11:10 AM</td>
<td>Room 206, Meeting Room Level, Colorado Convention Center</td>
</tr>
<tr>
<td>8:00 AM</td>
<td>Equal characteristic deformations of Artin-Schreier-Witt covers. (2154) John F McClain, University of New Hampshire (1154-97-2627)</td>
</tr>
<tr>
<td>8:15 AM</td>
<td>Scrollar Invariants of Tropical Curves. (2155) Jennifer A Czocher* and Elizabeth Roan, Texas State University (1154-97-1476)</td>
</tr>
<tr>
<td>8:45 AM</td>
<td>Differential graded algebra over quotients of skew polynomial rings by normal elements. (2157) Daniel Bossaler, Eau Claire, and Daniel Bossaler, John Carrol University (1154-14-615)</td>
</tr>
<tr>
<td>9:00 AM</td>
<td>A Generalization of Exchange Rings. (2158) Feroz Siddiquie*, University of Wisconsin Eau Claire, and Daniel Bossaler, John Carrol University (1154-14-615)</td>
</tr>
<tr>
<td>9:30 AM</td>
<td>On Copure-injectively Poor Modules. (2159) Sultan Eylem Toksoy, Hacettepe University (1154-16-675)</td>
</tr>
<tr>
<td>9:45 AM</td>
<td>An ideal analogue to the property ( \text{lcm}(a, b) \ast \text{gcf}(a, b) = ab ) for Leavitt path algebras. (2160) Rebin A. Muhammad*, Ohio University (1154-16-1932)</td>
</tr>
<tr>
<td>10:00 AM</td>
<td>Heap cohomology and ternary self-distributive cohomology. (2161) Sergio Lopez-Permouth, Ohio University (1154-16-1932)</td>
</tr>
<tr>
<td>10:15 AM</td>
<td>Truncated Quantum Drinfeld Hecke Algebras and Hochschild Cohomology. (2162) Beth Chance, Cal Poly – San Luis Obispo (1154-AE-2854)</td>
</tr>
<tr>
<td>10:30 AM</td>
<td>Lie Orbifold Algebras for Doubled Reflection Representations of the Symmetric Group. (2163) Beth Chance, Cal Poly – San Luis Obispo (1154-AE-2854)</td>
</tr>
<tr>
<td>10:45 AM</td>
<td>On Two-Value Graph Algebras. (2164) Beth Chance, Cal Poly – San Luis Obispo (1154-AE-2854)</td>
</tr>
</tbody>
</table>
11:00AM Classification of Low Dimensional Complex Nilpotent Leibniz Algebras. Ismail Demir, Ministry of National Education of Turkey (1154-17-522)

AMS Contributed Paper Session on Combinatorics and Graph Theory, III

8:00 AM – 11:25 AM Room 202, Meeting Room Level, Colorado Convention Center

8:00AM Kantorovich Duality and Signature Balance for Generalized Signed Graphs. Sawyer Jack Robertson* and Javier Alejandro Chávez-Domínguez, University of Oklahoma (1154-18-272)

8:15AM Two dependent probabilistic chip-collecting games. Joshua Harrington, Cedar Crest College, Kedar Karhadkar*, The Pennsylvania State University, Madeline Kohutka, Cedar Crest College, Tessa Stevens, Case Western Reserve University, and Tony Wong, Kutztown University of Pennsylvania (1154-18-866)

8:30AM Some convergence of random characteristic polynomials to random permutations and its applications. Hayan Nam*, Iowa State University, Gilyoung Cheong, University of Michigan, and Myungjun Yu, Korea Institute for Advanced Study (1154-18-1928)

8:45AM Some Codes and Designs Related to Mathieu Group M24. Vincent N. Marani*, Lucy Chikamai W and Shem O. Aywa, Kibabii University (1154-22-2208)

9:00AM Group actions on Stanley-Reisner rings and Stanley rings. Ashleigh Adams, University of Minnesota, Twin Cities (1154-18-1948)


9:30AM Cosine distance on lifted polynomials. Fatmanur Gursoy, Dogus University, and Elif Segah Oztas*, Karamanoglu Mehmetbey University (1154-20-2208)

9:45AM Minimally Non-Asymmetric Graphs. Darren A. Narayan* and Brendan Rooney, Rochester Institute of Technology (1154-20-2035)

10:00AM Dyadic matroids with spanning cliques. Ben Clark, Louisiana State University, Kevin Grace*, University of Bristol, James Oxley and Stefan H.M. van Zwam, Louisiana State University (1154-20-2071)

10:15AM Modified Erdős-Ginzburg-Ziv Constants for \(\mathbb{Z}/m\mathbb{Z}\times\mathbb{Z}/m\mathbb{Z}\). Trajan Hammonds, Carnegie Mellon University (1154-20-2136)

10:30AM Minimum coprime graph labelings. Catherine Lee, Yale University (1154-20-2078)

10:45AM Pattern Avoidance in Rooted Forests. Swapnil Garg and Alan Peng*, MIT (1154-20-2167)

AMS Contributed Paper Session on Experimental Mathematics and Numerical Analysis, I

8:00 AM – 11:10 AM Room 208, Meeting Room Level, Colorado Convention Center

8:00AM Numerical solutions of the backward heat equation with time-dependent variable coefficient. Preliminary report. Vanji Cheruvu* and Sujeewa Hapuarachchi, The University of Toledo (1154-20-2730)

8:15AM Optimizing Flappy Bird Flight Paths. Thomas J. Clark*, Dordt University, and Anil B. Venkatesh, Adelphi University (1154-19-1902)

8:30AM An Algorithm to Segment Noisy Medical Images. Youssef Qranfal, Wentworth Institute of Technology (1154-19-1952)

8:45AM Optimal allocation in annual plants with non-linear utility functions. Sergiy Koskin, University of Houston-Downtown, Cameron Spiess, Keene State, and Zachary Zalles*, Rice University (1154-19-1467)

9:00AM Discrete Approximation of a Controlled Sweeping Process over polyhedral sets with perturbations. Tan Cao, Department of Applied Mathematics and Statistics, State University of New York, Korea, Giovanni Colombo, Dipartimento di Matematica Pura e Applicata, Università di Padova, Boris Mordukhovich and Dao Nguyen*, Department of Mathematics, Wayne State University (1154-19-339)

9:15AM A Hybrid Multivariate Root-finding Method For Smooth Functions. Lukas C. Erekson*, Suzanna Stephenson, Daniel Christensen, Natalie Larsen and Tyler Jarvis, Brigham Young University (1154-20-2617)
9:30 AM  Discontinuous Galerkin Finite Element Schemes for Diffuse Interface Models.  
Andreas C Aristotelous, West Chester University of Pennsylvania (1154-65-2454)  
James V Lambers, The University of Southern Mississippi (1154-65-2408)  
10:00 AM  Reconstructing the Diffusion Coefficient for Diffuse Optical Tomography Problems Using A Variationally Constrained Nonlinear Optimization Framework. Preliminary report.  
Thowhida Akhter*, Colorado State University, Shyla Kupis and Taufiqur Khan, Clemson University (1154-65-2372)  
10:15 AM  The AAA algorithm for parametric dynamical systems.  
Andrea Carracedo Rodriguez* and Serkan Gugercin, Virginia Tech (1154-65-2077)  
10:30 AM  A hybrid approach combining analytical and iterative regularization methods for Electrical Impedance Tomography. Preliminary report.  
Sanwar Ahmad*, Colorado State University, and Taufiqur Khan, Clemson University (1154-65-2361)  
10:45 AM  Image reconstruction via edge-masked regularization.  
Victor Churchill, Dartmouth College (1154-65-2254)  
11:00 AM  Development of a Wavelet-Based Parameter Representation to Improve Solutions to the Electrical Impedance Tomography Inverse Problem. Preliminary report.  
Shyla Rae Kupis* and Taufiqur R Khan, Clemson University (1154-65-1749)  

AMS Contributed Paper Session on Mathematical Biology and Related Fields, II

8:00 AM – 11:25 AM  Room 204, Meeting Room Level, Colorado Convention Center  
8:00 AM  The Role of Utility in the Optimal Allocation Strategy of Annual Plants.  
Marianne C DeBrito, University of Michigan - Ann Arbor, and Nicolas Toumbourou*, Marist College (1154-92-1933)  
8:15 AM  Application of anomaly detection tools to mice telemetry data to infer health state.  
Manuchehr Aminian*, Colorado State University, Helene Andrews-Polymenis, David Threadgill, Texas A&M University, and Michael Kirkby, Colorado State University (1154-92-1963)  
8:30 AM  Modeling HIV-1 Infection in the Brain.  
Colin T. Barker*, University of Missouri-Kansas City, and Naveen K. Vaidya, San Diego State University (1154-92-1973)  
8:45 AM  Analysis of the Seasonal Threshold Number Calculation for Malaria. Preliminary report.  
Katharine Gurski, Howard University (1154-92-2093)  
9:00 AM  Ebola: Impact of hospital’s admission policy in an overwhelmed scenario.  
Zahid Mondal Hasan, University of Texas at Arlington (1154-92-1982)  
9:15 AM  Estimating the age of red blood cells through mathematical simulation: a validated, population dynamics approach.  
Brody H Foy* and John M Higgins, Harvard Medical School & Massachusetts General Hospital (1154-92-2118)  
9:30 AM  Ecology and Infectious Disease on Large Metapopulation Graphs.  
Daniel B Cooney, Princeton University (1154-92-2133)  
9:45 AM  A saddle point phytoplankton bloom mechanism in a reaction-diffusion NPZ model. Preliminary report.  
Seth T Cowall*, Mercer University, Matthew J Oliver and L Pamela Cook, University of Delaware (1154-92-2248)  
10:00 AM  Study of the recovery of nesting bald eagle population in New Jersey by statistical and mathematical models. Preliminary report.  
Baoling Ma* and Megan A McGee, Millersville University of Pennsylvania (1154-92-2384)  
10:15 AM  The number of pollinators really drives the stability of a stoichiometric plant-pollinator-herbivore model.  
Dilini Fonseka* and Angela Peace, Texas Tech University (1154-92-2395)  
10:30 AM  Analyzing the Effects of Observation functions in Nonlinear filtering for the SIR model.  
Leah Mitchell* and Andrea Arnold, Worcester Polytechnic Institute (1154-92-2142)  
10:45 AM  Reduced Order Modeling in Analyzing the Dynamics of a Spatio-Temporal Stoichiometric Producer-Grazer System.  
Md Masud Rana*, K. R. Long and Angela Peace, Texas Tech University (1154-92-2398)  
11:00 AM  Multiscale Registration-Based Image Segmentation. Preliminary report.  
Dana Paquin*, Brady Berg, Conor Carroll, Weston Grewe, Brian Knight and Tuyen Pham, California Polytechnic State University (1154-92-2434)  
11:15 AM  Optimal water flow through plants and the segmentation hypothesis.  
Jeffae Schroff*, Sergiy Koskin and Michael Tobin, University of Houston-Downtown (1154-92-2450)
### AMS Contributed Paper Session on Number Theory, I

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
<th>Institution(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 AM</td>
<td>On Convergent of Some Infinite Series Involving Fibonacci Numbers and Identities. Preliminary report.</td>
<td>Mohammad K. Azarian, University of Evansville</td>
<td>(1154-11-246)</td>
</tr>
<tr>
<td>8:15 AM</td>
<td>Primes in Lucas sequences. Preliminary report.</td>
<td>John Greene* and Mark Broderius, University of Minnesota Duluth</td>
<td>(1154-11-406)</td>
</tr>
<tr>
<td>8:30 AM</td>
<td>Linnik’s large sieve and the $L^1$ norm of exponential sums. Preliminary report.</td>
<td>Emily Eckels, Emory University, Steven Jin*, University of Maryland, College Park, Andrew Ledoan, University of Tennessee at Chattanooga, and Brian Tobin, Harvard University</td>
<td>(1154-11-458)</td>
</tr>
<tr>
<td>8:45 AM</td>
<td>Lagrange spectra and intrinsic Diophantine approximation of spheres. Preliminary report.</td>
<td>Byungchul Cha*, Muhlenberg College, and Dong Han Kim, Dongguk University</td>
<td>(1154-11-729)</td>
</tr>
<tr>
<td>9:00 AM</td>
<td>Creating Several Infinite Classes of Mock and Quantum Modular Forms.</td>
<td>Allison Arnold-Roksandich, Boise State University</td>
<td>(1154-11-578)</td>
</tr>
<tr>
<td>9:15 AM</td>
<td>Gleason-type polynomials for rational maps. Preliminary report.</td>
<td>Minsik Han, Brown University</td>
<td>(1154-11-127)</td>
</tr>
<tr>
<td>9:30 AM</td>
<td>Non-vanishing of the Derivative of $L$-Functions at the Central Point.</td>
<td>Matthew Dolan Jobrack, Washington State University</td>
<td>(1154-11-1158)</td>
</tr>
<tr>
<td>9:45 AM</td>
<td>A gold version of Dirichlet’s bronze approximation theorem.</td>
<td>Andrew Simoson, King University</td>
<td>(1154-11-1168)</td>
</tr>
<tr>
<td>10:00 AM</td>
<td>Universal sums of generalized $m$-gonal numbers.</td>
<td>Ben Kane, University of Hong Kong, and Jingbo Liu*, Texas A&amp;M University-San Antonio</td>
<td>(1154-11-1205)</td>
</tr>
<tr>
<td>10:15 AM</td>
<td>Rational points on hyperelliptic curves. Preliminary report.</td>
<td>Levent Alpoge, Princeton University</td>
<td>(1154-11-1214)</td>
</tr>
<tr>
<td>10:30 AM</td>
<td>Summing $\mu(n)$: a faster elementary algorithm.</td>
<td>Lola Thompson*, Oberlin College and Max Planck Institute for Mathematics, and Harald Andres Helfgott, University of Goettingen and CNRS</td>
<td>(1154-11-2358)</td>
</tr>
<tr>
<td>10:45 AM</td>
<td>On partitions into squares of distinct integers whose reciprocals sum to 1.</td>
<td>Max A Alekseyev, George Washington University</td>
<td>(1154-11-1242)</td>
</tr>
<tr>
<td>11:00 AM</td>
<td>Differential equations of infinite order and the zeta function.</td>
<td>Bernardo Blanco Prado*, University of Minnesota, and Kim Klinger-Logan, Kansas State University</td>
<td>(1154-11-1440)</td>
</tr>
</tbody>
</table>

### MAA Contributed Paper Session on Active Learning in Introductory Courses: Insights from Math Departments in the Process of Change, II

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
<th>Institution(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 AM</td>
<td>Shifting the Culture: Actively Engaging Students in Introductory Service Courses.</td>
<td>Lisa Driskell* and Traci Friedman, Colorado Mesa University</td>
<td>(1154-A5-2773)</td>
</tr>
<tr>
<td>8:30 AM</td>
<td>Activating Calculus to Command the Seas: Reflecting on ten years of active and inquiry-based learning at the US Naval Academy.</td>
<td>Megan E Selbach-Allen*, Stanford University, and Amy Ksir, US Naval Academy</td>
<td>(1154-A5-2803)</td>
</tr>
<tr>
<td>8:40 AM</td>
<td>Calculus II Course Redesign: Supporting Faculty in Pedagogical Change.</td>
<td>Rebecca Swanson*, Debra Carney, Megan Sanders, Samuel Spiegel and Ariana Vasquez, Colorado School of Mines</td>
<td>(1154-A5-2791)</td>
</tr>
<tr>
<td>9:00 AM</td>
<td>Teaching TRIOs: A Peer Observation Model for Sharing Teaching Practice and Initiating Department Change.</td>
<td>Sarah K. Bleiler-Baxter*, Jeremy F. Strayer and Jordan E. Kirby, Middle Tennessee State University</td>
<td>(1154-A5-1651)</td>
</tr>
<tr>
<td>9:20 AM</td>
<td>Coordinating First-Year Courses.</td>
<td>Jacqueline Jensen-Vallin, Lamar University</td>
<td>(1154-A5-490)</td>
</tr>
</tbody>
</table>
Program of the Sessions – Saturday, January 18 (cont’d.)

9:40AM
(2227) Coordinating Active Learning Across First-Year Mathematics and Statistics. Jennifer Clinkenbeard, Alana Unfried and Jeffrey O Wand*, California State University, Monterey Bay (1154-A5-2590)

9:40AM
(2235) The Impact of the Jackson State University Girls Engaging in the Mathematical Sciences Program on Participant Self-Efficacy and Propensity to Engage in Mathematical Activities. Preliminary report. Jana Talley* and Carmen Wright, Jackson State University (1154-F5-2781)

10:00AM
(2228) A Community of Practice Model for Infusing Active Learning in the Classroom. Jesus R Oliver* and Julia Olkin, California State University East Bay (1154-A5-861)

10:00AM
(2236) Dixie Tensor Scholar Program. Preliminary report. Bhuvaneswari Sambandham, Clare Banks, Jie Liu* and Vinodh Chellamuthu, Dixie State University (1154-F5-2780)

10:20AM
(2229) Change comes from without: lessons learned in a chaotic year. Marion Campisi*, Wes Maciejewski, John Bragelman, Tim Hsu, Andrea Gottlieb, Jordan Schettler, Trisha Bergthold and Bem Cayco, San Jose State University (1154-A5-1151)

10:20AM
(2237) Math Circle continues: activities, assessment, and campus visit. Vita Borovyk* and Christina Therkelsen, University of Cincinnati (1154-F5-2750)

10:40AM
(2230) Designing, Coordinating, and Supporting Active Learning for Multi-Section College Algebra Courses. Topaz H Wiscons, California State University, Sacramento (1154-A5-2749)

10:40AM
(2238) GirlsDoMath in Western Colorado. Preliminary report. Tracii Friedman* and Cathy Bonan-Hamada, Colorado Mesa University (1154-F5-2594)

11:00AM
(2231) Active Learning Infusion Through a Comprehensive Graduate Teaching Assistant (GTA) Training Program. Preliminary report. Gary A Olson*, Michael Ferrara, Michael Jacobson and RakIsa Manzanares, University of Colorado Denver (1154-A5-2534)

11:00AM
(2239) The Advanced Mathematics Program (AMP) and promoting equity through community. Daniel Collister*, Tim McEldowney, Alex Rowell and Po-Ning Chen, University of California, Riverside (1154-F5-2574)

11:20AM
(2232) Transforming tradition in calculus instruction at Ferris State University. David M McClendon, Ferris State University (1154-A5-1405)

11:20AM
(2240) An analysis of racialized and gendered logics in Black and Latinx women’s interpretations of instructional events in undergraduate pre-calculus and calculus classrooms. Preliminary report. Luis Leyva, R Taylor McNeill*, Vanderbilt University, and Brittany Marshall, Rutgers University (1154-F5-2420)

11:40AM
(2233) Transformative Teaching Redesign: Development of High-Impact Strategies to Maximize Learning and Minimize Failure in Introductory Courses of Mathematics. Aleksei Talonov*, University of Nevada Las Vegas, and Viktoria Savatorova, Central Connecticut State University (1154-A5-36)

11:40AM
(2241) Minority Students in STEM Research. Eugene Fiorini*, Gail Marsella, James Russell, Karen Tuerk and Marten Edwards, Muhlenberg College (1154-F5-2402)

MAA Contributed Paper Session on Inclusive Excellence for the Mathematical Sciences, II

8:00 AM – 11:55 AM Room 504, Meeting Room Level, Colorado Convention Center

Organizers: Naiomi Cameron, Lewis & Clark College
Rachelle DeCoste, Wheaton College
Chris Goff, University of the Pacific
Semra Kilic-Bahi, Colby-Sawyer College

8:00 AM – 10:15 AM Room 505, Meeting Room Level, Colorado Convention Center

Organizers: Elizabeth Arnold, James Madison University
Wesley Calvert, Southern Illinois University
Elizabeth Fulton, Montana State University
Yvonne Lai, University of Nebraska - Lincoln

M A A Contributed Paper Session on Mathematical Knowledge for Teaching as an Integrated Application in Core Mathematics Courses

9:20AM
(2234) Building Community and Improving Equity through Small-Group Collaborative Learning. Preliminary report. Michaela Kubacki, Middlebury College (1154-F5-118)
April Strom, Chandler/Gilbert Community College

8:00AM Meaningful content for high school teachers.
  Tamas Szabo, UW Whitewater (1154-J5-1562)

8:20AM Seriously: Why is negative times negative positive? Reflections on a META-Math annotated lesson plan.
  James Stuart Tanton, Mathematical Association of America (1154-J5-1312)

8:40AM On the Development and Effectiveness of Tasks Focused on Analyzing Student Thinking as an Application for Teaching in Abstract Algebra.
  James A. Mendoza Álvarez*, Andrew Kercher and Kyle Turner, The University of Texas at Arlington (1154-J5-1330)

9:00AM Purposeful use of simulations of teaching practice to uncover Mathematical Knowledge for Teaching.
  Yvonne Lai*, University of Nebraska-Lincoln, Jeremy Strayer, Middle Tennessee State University, and Cynthia Anhalt, University of Arizona (1154-J5-2047)

9:20AM Building connections to secondary algebra teaching in a course on ring and field theory.
  Cody L Patterson*, Texas State University, and Christopher Duffer, University of Texas at San Antonio (1154-J5-2542)

  Scott Zinzer, Aurora University (1154-J5-1765)

10:00AM Five types of connections addressing mathematical knowledge for teaching secondary mathematics.
  Elizabeth G. Arnold, James Madison University, Elizabeth A. Burroughs* and Elizabeth W. Fulton, Montana State University (1154-J5-1852)

MAA Contributed Paper Session on Role of Explanation in Mathematical Proofs

8:00 AM – 11:30 AM Room 502, Meeting Room Level, Colorado Convention Center

Organizers: Jeff Buechner, Rutgers University Newark
  Sally Cockburn, Hamilton College
  Kevin Iga, Pepperdine University

8:00AM Explanatory Proofs.
  James R Henderson, Penn State Behrend (1154-O1-487)

8:35AM Mathematical Explanation as an Aesthetic. Preliminary report.
  Jeremy Case*, Taylor University, and Sam Stueckle, Trevecca Nazarene University (1154-O1-2227)

9:10AM Proofs that explain, proofs that don’t, and proofs of the obvious.
  Paul Zorn, Saint Olaf College (1154-O1-2672)

  Bonnie Gold, Monmouth University (Emerita) (1154-O1-716)

10:20AM How logic is presented may obscure or enlighten.
  Susan Ruff, Massachusetts Institute of Technology (1154-O1-2716)

11:00AM Are mathematical explanations interest relative? Preliminary report.
  Jeff Buechner, Rutgers University-Newark and Saul Kripke Center, CUNY GC (1154-O1-1421)

MAA Contributed Paper Session on The Teaching and Learning of Undergraduate Ordinary Differential Equations

8:00 AM – NOON Room 503, Meeting Room Level, Colorado Convention Center

Organizers: Christopher S. Goodrich, Creighton Preparatory School
  Beverly H. West, Cornell University

8:00AM Using Interactive Visualizations to Stimulate Conceptual Understanding in Differential Equations.
  Douglas B Meade, University of South Carolina - Columbia (1154-Q1-2821)

8:20AM Using Complex Visualization to Enhance Understanding of DE Solution Techniques.
  Itai Seggev, Wolfram Research (1154-Q1-2713)

8:40AM Engaging STEM Students with Ordinary Differential Equations through Modern Models. Preliminary report.

9:00AM Active Differential Equations, Whiteboard Pedagogy and Slope Fields.
  Mel Henriksen* and Mami Wentworth, Wentworth Institute of Technology (1154-Q1-2322)

  Timothy A Lucas, Pepperdine University (1154-Q1-747)
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:40 AM</td>
<td>Modeling the Historical Effects of Overhunting and the Current Effects of Conservation on Whale Populations. Glenn Ledder, Department of Mathematics, University of Nebraska-Lincoln (1154-Q1-618)</td>
</tr>
<tr>
<td>10:00 AM</td>
<td>Students’ Comprehension of Qualitative Techniques in an Inquiry-Oriented Differential Equations Course. Samer Habre, Lebanese American University (1154-Q1-127)</td>
</tr>
<tr>
<td>10:20 AM</td>
<td>SIR Models: Differential Equations that Support the Common Good. Lorelei Koss, Dickinson College (Q1-127)</td>
</tr>
<tr>
<td>10:40 AM</td>
<td>Discussion: The global role of the CODEE Journal. Beverly Henderson West, Cornell University (Q1-2596)</td>
</tr>
<tr>
<td>11:00 AM</td>
<td>Discussion</td>
</tr>
</tbody>
</table>

**MAA General Contributed Paper Session on Modeling and Applications, II**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 AM</td>
<td>Modelling and Analysis of Effect of Delay Induced by Toxic Metal on Plant Dry Weight. Raminder Pal Singh, Lovely Professional University, Phagwara, India (1154-VF-120)</td>
</tr>
<tr>
<td>8:30 AM</td>
<td>Mathematical model of annual growth in trees: a response to perturbation by fire. Preliminary report. Sean M. Laverty*, and Brittany E Bannish, Department of Mathematics and Statistics, University of Central Oklahoma (1154-VF-2652)</td>
</tr>
<tr>
<td>8:45 AM</td>
<td>Adaptability Conditions in Biological Networks. Tracey G. Oellerich*, Maria Emelianenko, George Mason University, Robyn Araujo, Queensland University of Technology, Lance Liotta, Alessandra Luchini and Abdulaziz Alaraini, George Mason University (1154-VF-1934)</td>
</tr>
<tr>
<td>9:00 AM</td>
<td>A Data-driven Mathematical Study of the Role of Energy in Sepsis. Preliminary report. Ivan Ramirez Zuniga*, Jonathan E Rubin, David Swigon, University of Pittsburgh, Department of Mathematics, and Gilles Clermont, University of Pittsburgh, Dept of Critical Care Medicine, Dept of Chemical and Petroleum Engineering, Dept Mathematics (1154-VF-2824)</td>
</tr>
<tr>
<td>9:30 AM</td>
<td>A Stochastic Predictive Model to Determine the Network Vulnerability Risk. Nawa Raj Pokhrel*, Xavier University of Louisiana, Chris P. Tsokos, University of South Florida, and Keshav Pokhrel, University of Michigan Dearborn (1154-VF-2060)</td>
</tr>
</tbody>
</table>

**MAA General Contributed Paper Session on Number Theory, II**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00 AM</td>
<td>Explicit Burgess Bounds for Composite Moduli. Niraek Jain-Sharma*, UC Berkeley, Tanmay Khale, Lafayette College, and August Liu, Cambridge University (1154-VF-2060)</td>
</tr>
<tr>
<td>10:15 AM</td>
<td>Minimal Discriminants of Rational Elliptic Curves with Specified Isogeny. Owen Gary-Dennis Ekblad*, University of Michigan - Dearborn, Abigail G. Loe, Carleton College, Alvaro Jose Cornejo, University of California - Santa Barbara, Marietta Elizabeth Geist, Carleton College, and Kayla Iman Harrison, Eckerd College (1154-VS-2069)</td>
</tr>
<tr>
<td>10:30 AM</td>
<td>A Tannakian framework for displays and Rapoport-Zink spaces. Patrick Daniels, University of Maryland (1154-VS-2106)</td>
</tr>
<tr>
<td>10:45 AM</td>
<td>A Conjectural Inequality for Visible Points in Lattice Parallelograms. Gabriel Khan, University of Michigan, Mizan R. Khan, Eastern Connecticut State University, Joydip Saha, Narayanganj, Bangladesh, and Peng Zhao*, Indiana State University (1154-VS-890)</td>
</tr>
<tr>
<td>Time</td>
<td>Session</td>
</tr>
<tr>
<td>----------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>11:00AM</td>
<td><strong>Improvements of the Chevalley-Warning Theorems.</strong> Preliminary report.</td>
</tr>
<tr>
<td></td>
<td>Rachel Louise Petrik, University of Kentucky (1154-VS-1947)</td>
</tr>
<tr>
<td>11:15AM</td>
<td><strong>Characteristic 0 Automorphism loci of the moduli spaces of dynamical systems $\mathcal{M}_3$ and $\mathcal{M}_4$ and Applications.</strong></td>
</tr>
<tr>
<td></td>
<td>Benjamin Hutz, Saint Louis University, Grayson Jorgensen, Florida State University, Brandon Gottmacher, Stony Brook University, Srinjoy Srimani*, Brown University, and Shuofeng Xu, Colby College (1154-VS-1886)</td>
</tr>
<tr>
<td>11:30AM</td>
<td><strong>A Novel Generating Function for a Parametrized Family of Möbius-like Arithmetic Functions Related to the Riemann $\zeta$ Function.</strong></td>
</tr>
<tr>
<td></td>
<td>Sky Pelletier Waterpeace, Rowan University (1154-VS-2814)</td>
</tr>
</tbody>
</table>

**MAA General Contributed Paper Session on Outreach, Teaching and Learning Advanced Mathematics**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 AM</td>
<td><strong>Human Cellular Automaton Activities for Fun and Mathematical Insight.</strong></td>
</tr>
<tr>
<td></td>
<td>Andrew Penland, Western Carolina University (1154-VG-1134)</td>
</tr>
<tr>
<td>8:15 AM</td>
<td><strong>Worcester State Math Academy Circle Project 2019-2020.</strong> Preliminary report.</td>
</tr>
<tr>
<td></td>
<td>Hansu To* and Maria Fung, Worcester State University (1154-VG-876)</td>
</tr>
<tr>
<td>8:30 AM</td>
<td><strong>Program on Math Outreach in Panama.</strong></td>
</tr>
<tr>
<td></td>
<td>Jeanette Shakalli, Republic of Panama (1154-VG-212)</td>
</tr>
<tr>
<td>8:45 AM</td>
<td><strong>OMPR Summer Camp.</strong></td>
</tr>
<tr>
<td></td>
<td>Luis Caceres*, University of Puerto Rico, Mayaguez campus, and Omar Colon, University of Puerto Rico, Mayaguez Campus (1154-VG-354)</td>
</tr>
<tr>
<td>9:00 AM</td>
<td><strong>Mathematical kangaroo: The world’s largest international math competition.</strong></td>
</tr>
<tr>
<td></td>
<td>Luis Caceres*, University of Puerto Rico at Mayaguez, Meike Akveld*, ETH Zurich, Switzerland, Rafael Sanchez, Universidad Antonio Narino, and Jose Heber Nieto, Universidad del Zulia (1154-VG-455)</td>
</tr>
<tr>
<td>9:15 AM</td>
<td><strong>A tale of two circles: math with urban middle school teachers and rural secondary school teachers.</strong> Preliminary report.</td>
</tr>
<tr>
<td></td>
<td>Patrick X. Rault* and Janice Rech, University of Nebraska at Omaha (1154-VG-2282)</td>
</tr>
<tr>
<td>9:30 AM</td>
<td><strong>Problems from Math Teachers’ Circle Outreach Program.</strong> Preliminary report.</td>
</tr>
<tr>
<td></td>
<td>Sarah L Sparks*, Alees Lee, Gulden Karakok and Katie Morrison, University of Northern Colorado (1154-VG-1119)</td>
</tr>
<tr>
<td>9:45 AM</td>
<td><strong>Math Circles Program to Facilitate Challenging Tasks.</strong></td>
</tr>
<tr>
<td></td>
<td>Stephanie L Hurtt*, Gulden Karakok, Katherine Morrison, University of Northern Colorado, Cathleen Craviotto, Boulder Valley School District, Colorado, and Elizabeth Sasse, Weld County School District, Colorado (1154-VG-1779)</td>
</tr>
<tr>
<td>10:00 AM</td>
<td><strong>Maps, Bridges, Networks, and Art Galleries: Introducing Secondary Students to Graph Theory through Classic Problems.</strong></td>
</tr>
<tr>
<td></td>
<td>Jessica Oehrlein, Columbia University (1154-VG-1311)</td>
</tr>
<tr>
<td>10:15 AM</td>
<td><strong>Incorporating Python in a Linear Programming Course.</strong></td>
</tr>
<tr>
<td></td>
<td>Brian Drake, Grand Valley State University (1154-VG-946)</td>
</tr>
<tr>
<td>10:30 AM</td>
<td><strong>Exploring the Use of Presentations and Oral Examinations in Abstract Algebra Courses.</strong> Preliminary report.</td>
</tr>
<tr>
<td></td>
<td>Lisa Schneider, Salisbury University (1154-VG-2161)</td>
</tr>
</tbody>
</table>

**SIAM Minisymposium on Random Matrices and Integrable Systems, I (a joint session with the AMS-SIAM Special Session on the same topic)**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 AM</td>
<td><strong>Program on Math Outreach in Panama.</strong></td>
</tr>
<tr>
<td></td>
<td>Jeanette Shakalli, Republic of Panama (1154-VG-212)</td>
</tr>
<tr>
<td>8:15 AM</td>
<td><strong>OMPR Summer Camp.</strong></td>
</tr>
<tr>
<td></td>
<td>Luis Caceres*, University of Puerto Rico, Mayaguez campus, and Omar Colon, University of Puerto Rico, Mayaguez Campus (1154-VG-354)</td>
</tr>
<tr>
<td>8:30 AM</td>
<td><strong>Program on Math Outreach in Panama.</strong></td>
</tr>
<tr>
<td></td>
<td>Jeanette Shakalli, Republic of Panama (1154-VG-212)</td>
</tr>
<tr>
<td>8:45 AM</td>
<td><strong>OMPR Summer Camp.</strong></td>
</tr>
<tr>
<td></td>
<td>Luis Caceres*, University of Puerto Rico, Mayaguez campus, and Omar Colon, University of Puerto Rico, Mayaguez Campus (1154-VG-354)</td>
</tr>
<tr>
<td>9:00 AM</td>
<td><strong>Mathematical kangaroo: The world’s largest international math competition.</strong></td>
</tr>
<tr>
<td></td>
<td>Luis Caceres*, University of Puerto Rico at Mayaguez, Meike Akveld*, ETH Zurich, Switzerland, Rafael Sanchez, Universidad Antonio Narino, and Jose Heber Nieto, Universidad del Zulia (1154-VG-455)</td>
</tr>
<tr>
<td>9:15 AM</td>
<td><strong>A tale of two circles: math with urban middle school teachers and rural secondary school teachers.</strong> Preliminary report.</td>
</tr>
<tr>
<td></td>
<td>Patrick X. Rault* and Janice Rech, University of Nebraska at Omaha (1154-VG-2282)</td>
</tr>
<tr>
<td>9:30 AM</td>
<td><strong>Problems from Math Teachers’ Circle Outreach Program.</strong> Preliminary report.</td>
</tr>
<tr>
<td></td>
<td>Sarah L Sparks*, Alees Lee, Gulden Karakok and Katie Morrison, University of Northern Colorado (1154-VG-1119)</td>
</tr>
<tr>
<td>9:45 AM</td>
<td><strong>Math Circles Program to Facilitate Challenging Tasks.</strong></td>
</tr>
<tr>
<td></td>
<td>Stephanie L Hurtt*, Gulden Karakok, Katherine Morrison, University of Northern Colorado, Cathleen Craviotto, Boulder Valley School District, Colorado, and Elizabeth Sasse, Weld County School District, Colorado (1154-VG-1779)</td>
</tr>
</tbody>
</table>

**Project NExT Workshop**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 AM</td>
<td><strong>Project NExT Workshop</strong></td>
</tr>
<tr>
<td></td>
<td>Organizers: Matt DeLong, Marian University</td>
</tr>
<tr>
<td>8:15 AM</td>
<td><strong>Incorporating Python in a Linear Programming Course.</strong></td>
</tr>
<tr>
<td></td>
<td>Brian Drake, Grand Valley State University (1154-VG-946)</td>
</tr>
<tr>
<td>8:30 AM</td>
<td><strong>Exploring the Use of Presentations and Oral Examinations in Abstract Algebra Courses.</strong> Preliminary report.</td>
</tr>
<tr>
<td></td>
<td>Lisa Schneider, Salisbury University (1154-VG-2161)</td>
</tr>
<tr>
<td>8:45 AM</td>
<td><strong>A Student Exploration of Spherical Geometry.</strong></td>
</tr>
<tr>
<td></td>
<td>Shannon R Lockard, Bridgewater State University (1154-VG-2266)</td>
</tr>
<tr>
<td>Event</td>
<td>Time</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td><strong>MAA Townhall</strong></td>
<td>8:00 AM – 9:20 AM</td>
</tr>
<tr>
<td><strong>Project NExT</strong></td>
<td>8:30 AM – 9:45 AM</td>
</tr>
<tr>
<td><strong>AMS Invited Address</strong></td>
<td>9:00 AM – 9:50 AM</td>
</tr>
<tr>
<td><strong>ASL Invited Address</strong></td>
<td>9:00 AM – 9:50 AM</td>
</tr>
<tr>
<td><strong>MAA Minicourse #7: Part B</strong></td>
<td>9:00 AM – 11:00 AM</td>
</tr>
<tr>
<td><strong>MAA Minicourse #6: Part B</strong></td>
<td>9:00 AM – 11:00 AM</td>
</tr>
<tr>
<td><strong>MAA Minicourse #10: Part B</strong></td>
<td>9:00 AM – 11:00 AM</td>
</tr>
<tr>
<td><strong>MAA Contributed Paper Session on Effective Assessment Practices in Large-enrollment Classes or Non-traditional Classrooms</strong></td>
<td>9:00 AM – 10:15 AM</td>
</tr>
<tr>
<td><strong>AWM Workshop: Women in Several Complex Variables (WinSCV), I</strong></td>
<td>9:00 AM – 12:30 PM</td>
</tr>
</tbody>
</table>
Liz Vivas, Ohio State University

Holomorphic approximation via Dolbeault cohomology.

Mei-Chi Shaw*, University of Notre Dame, and Christine Laurent-Thiebaut, Université Grenoble-Alpes, Institut Fourier (1154-32-943)

On the stability of the hull(s) of an n-sphere in C^n via a nonlinear Riemann-Hilbert problem.

Purvi Gupta* and Chloe U. Wawrzyniak, Rutgers University, New Brunswick (1154-32-2478)

Critical locus for complex Henon maps.

Purvi Gupta*, Rutgers University, New Brunswick (1154-32-2478)

Uniform estimates for the Monge-Ampère foliation on a compact Kähler manifold.

Katherine Brubaker, Emory & Henry College (1154-32-2493)

German boundary condition for \( \bar{\partial} \).

William Gryc, Muhlenberg College, Maxie Lahn, University of Michigan, Terry Mullen, University of Massachusetts, Amherst

Parameterization, o-minimality and counting points.

Margaret E. M. Thomas, Purdue University (1154-03-1819)

Who Wants to Be a Mathematician—Championship Contest.

AMS Special Presentation

Two research projects birthed from curiosity, recreation, and joy.

aBa Mbirika, University of Wisconsin-Eau Claire (1154-A0-81)

MAA Panel Discussion on Changing Curriculum and the Zeitgeist: Effects and Current Trends on Underrepresented Students in Undergraduate Mathematics Ed

NAM Panel Discussion on Changing Curriculum and the Zeitgeist: Effects and Current Trends on Underrepresented Students in Undergraduate Mathematics Ed

9:00 AM – 9:50 AM Room 607, Meeting Room Level, Colorado Convention Center

Panelists: Torina Lewis, Clark Atlanta University

Farrah Jackson Ward, Elizabeth City University

Terrence Blackman, Medgar Evers College, CUNY

Exhibits and Book Sales

9:00 AM – NOON Hall D, Exhibit Level, Colorado Convention Center

ASL Invited Address

10:00 AM – 10:50 AM Room 302, Meeting Room Level, Colorado Convention Center

Parameterization, o-minimality and counting points.

Margaret E. M. Thomas, Purdue University (1154-03-1819)

AMS Special Presentation

10:00 AM – 11:45 AM Four Seasons Ballroom 1, Ballroom Level, Colorado Convention Center

Who Wants to Be a Mathematician—Championship Contest.

NAM Business Meeting

10:00 AM – 10:50 AM Room 607, Meeting Room Level, Colorado Convention Center

MAA Invited Address

10:05 AM – 11:40 AM Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center

Two research projects birthed from curiosity, recreation, and joy.

aBa Mbirika, University of Wisconsin-Eau Claire (1154-A0-81)

MAA Business Meeting

11:10 AM – 11:40 AM Room 702, Meeting Room Level, Colorado Convention Center

Organizer: James Sellers, University of Minnesota-Duluth
AMS Business Meeting

11:45 AM – 12:30 PM  Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center

NAM Claytor-Woodard Lecture

1:00 PM – 1:50 PM  Room 607, Meeting Room Level, Colorado Convention Center

(2304)  A numerical and analytical study of dynamic materials.
Suzanne Weekes, Worcester Polytechnic Institute (1154-35-50)

ASL Invited Address

1:00 PM – 1:50 PM  Room 302, Meeting Room Level, Colorado Convention Center

(2305)  Choiceless Polynomial Time.
Benjamin Rossman, University of Toronto (1154-68-1742)

AMS-MAA Special Session on History of Mathematics, III

1:00 PM – 5:50 PM  Room 102, Meeting Room Level, Colorado Convention Center

Organizers: Jemma Lorenat, Pitzer College
Sloan Despeaux, Western Carolina University
Daniel Otero, Xavier University
Adrian Rice, Randolph-Macon College

1:00 PM  What's Happening with the Euler Archive? Preliminary report.
Erik R. Tou*, University of Washington Tacoma, Christopher D. Goff and Michele Gibney, University of the Pacific (1154-01-213)

1:30 PM  Olinde Rodrigues' contribution to Catalan numbers.
Johannes Familton, Borough of Manhattan Community College The City University of New York (1154-01-196)

2:00 PM  Canonical Transformations and Hamilton-Jacobi Theory 1866–1920. Preliminary report.
Craig Fraser*, University of Toronto, and Michiyo Nakane, Seijo University, Tokyo (1154-01-147)

Rosie Lev-Halutz, Tel-Aviv University (1154-01-938)

AMS-SIAM Special Session on Random Matrices and Integrable Systems, II (a joint session with the SIAM Minisymposium on the same topic)

1:00 PM – 5:50 PM  Room 405, Meeting Room Level, Colorado Convention Center

Organizers: Ken McLaughlin, Colorado State University
Sean O'Rourke, University of Colorado Boulder

1:00 PM  Universality and Delocalization of random band matrices.
Fan Yang, U. Penn, Horng-Tzer Yau, Harvard University, and Jun Yin*, UCLA (1154-60-1227)

2:00 PM  Universality for random band matrices.
Tatyana Shcherbina, Princeton University (1154-60-496)

3:00 PM  Invertibility of inhomogeneous random matrices.
Galyna V. Livshyts, Konstantin Tikhomirov*, Georgia Institute of Technology, and Roman Vershynin, University of California, Irvine (1154-60-2102)

4:00 PM  A combinatorial approach to the quantitative invertibility of random matrices.
Vishesh Jain, MIT (1154-60-1091)
4:30PM
(2319)
Distributional approximation of the characteristic polynomial of a Gaussian beta-ensemble.
Elliot Paquette*, The Ohio State University, and Gaultier Lambert, University of Zurich (1154-60-1685)

5:00PM
(2320)
Eigenvalue Gaps in Sparse Random Matrices.
Kyle Luh, Harvard University (1154-60-1230)

5:30PM
(2321)
Partial linear eigenvalue statistics for i.i.d. random matrices.
Sean O'Rourke, University of Colorado Boulder, and Noah N. Williams*, Appalachian State University (1154-60-1918)

AMS-AWM Special Session on Women in Topology, II

1:00 PM – 5:50 PM Room 105, Meeting Room Level, Colorado Convention Center
Organizers: Jocelyn Bell, Hobart and William Smith Colleges
Rochy Flint, Columbia University Teachers College
Candice Price, Smith College
Arunima Ray, Max Planck Institute for Mathematics

1:00PM
(2322)
Nancy Scherich, Wake Forest University, and Sherilyn Tamagawa*, Davidson College (1154-57-1430)

1:30PM
(2323)
Fully Augmented Links in the Thickened Torus.
Alice Kwon, CUNY Graduate Center (1154-51-149)

2:00PM
(2324)
NP-hard problems naturally arising in knot theory.
Dale Koenig, Okinawa Institute of Science and Technology, Japan, and Anastasiiia Tsvietkova*, Rutgers University, Newark (1154-57-2527)

2:30PM
(2325)
Link concordance, Milnor invariants, and low-order solvability. Preliminary report.
Taylor E Martin, Sam Houston State University (1154-57-2346)

3:00PM
(2326)
Towards Directed Collapsibility.
Elizabeth Vidaurre*, Molloy College, Robin Belton, Montana State University, Robyn Brooks, Tulane University, Stefania Ebli, EPFL Lausanne, Brittany Terese Fasy, Montana State University, Nicole Sanderson, Lawrence Berkeley National Lab, Catherine Ray, Northwestern University, and Lisbeth Fajstrup, Aalborg University (1154-55-1920)

3:30PM
(2327)
Unknotting with a single twist.
Samantha Allen*, Dartmouth College, and Charles Livingston, Indiana University (1154-57-1595)

4:00PM
(2328)
Ordering actions on hyperbolic spaces.
Carolyn Abbott, Columbia University (1154-20-1234)

4:30PM
(2329)
Applying topology to polynomial recognition.
James Belk, St. Andrews University, Justin Lanier, Dan Margalit, Georgia Tech, and Rebecca R Winarski*, University of Michigan (1154-57-2529)

5:00PM
(2330)
Dehn surgery on links vs. the Thurston norm.
Maggie Miller, Princeton University (1154-57-892)

5:30PM
(2331)
An analogy of the curve complex for Artin groups of FC type.
Rose Morris-Wright, Brandeis University (1154-20-1111)

AMS Special Session on Algorithms, Analysis, and Applications of Numerical PDEs

1:00 PM – 5:50 PM Room 712, Meeting Room Level, Colorado Convention Center
Organizers: Xiaoming He, Missouri University of Science and Technology
Jianfeng (James) Liu, Colorado State University

1:00PM
(2332)
A localized reduced-order modeling approach for PDEs with bifurcating solutions.
Alessandro Alla, Pontifical Catholic University of Rio de Janeiro, Max Gunzburger*, Florida State University, Martin Hess, International School for Advanced Studies, Trieste, Annalisa Quaini, University of Houston, and Gianluigi Rozza, International School for Advanced Studies, Trieste (1154-65-1094)

1:30PM
(2333)
Primal-Dual Weak Galerkin Finite Element Methods.
Junping Wang, National Science Foundation (1154-65-2140)

2:00PM
(2334)
Finite element methods with discontinuous approximations.
Xiu Ye, University of Arkansas at Little Rock (1154-65-623)

2:30PM
(2335)
A posteriori error analysis for domain decomposition.
Simon Tavener*, Colorado State University, Jehanzeb Chaudhry, University of New Mexico, and Don Estep, Colorado State University (1154-65-300)
<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker and Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:30PM</td>
<td>A second order in time energy stable variable step method for the Cahn-Hilliard equation. Xiaoeming Wang, Southern University of Science and Technology (China) (1154-65-836)</td>
</tr>
<tr>
<td>4:00PM</td>
<td>Arbitrarily High-order Unconditionally Energy Stable Schemes for Thermodynamically Consistent Gradient Flow Models. Jia Zhao*, Utah State University, Yuezheng Gong, Nanjing University of Aeronautics and Astronautics, and Qi Wang, University of South Carolina (1154-65-746)</td>
</tr>
<tr>
<td>4:30PM</td>
<td>The Uniaxially Constrained Q-tensor Model for Nematic Liquid Crystals. Shawn W. Walker*, Louisiana State University, Juan-Pablo Borthagaray and Ricardo H. Nochetto, University of Maryland (1154-65-1051)</td>
</tr>
<tr>
<td>5:00PM</td>
<td>A comparison of discretizations for the Biharmonic equation. Preliminary report. Tino Heister*, Clemson University, Luca Heltai, International School for Advanced Studies, Trieste, Italy, and Natasha Sharma, University of Texas at El Paso (1154-65-1460)</td>
</tr>
<tr>
<td>5:30PM</td>
<td>Lax-Wendroff Schemes for Quasi-Exponential Moment-Closure Approximations. James A Rossmanith* and Christine Wiersma, Iowa State University (1154-65-272)</td>
</tr>
</tbody>
</table>

AMS Special Session on Analysis and Differential Equations at Undergraduate Institutions

1:00 PM – 5:50 PM Room 108, Meeting Room Level, Colorado Convention Center

Organizers: William Green, Rose-Hulman Institute of Technology

Katharine Ott, Bates College

1:00PM | Computing Change with Partial Differential Equations: Running a MAA NREUP at a Liberal Arts College. Jennifer Beichman, Smith College (1154-35-419) |
| 1:30PM | Beyond the first semester on differential equations. Alfonso Castro, Harvey Mudd College (1154-34-420) |
| 2:00PM | The effect of an environmental toxin on a competitive species model. Jennifer M. Miller, Bellarmine University (1154-34-1629) |

AMS Special Session on Analysis of Nonlocal Models

1:00 PM – 5:50 PM Room 407, Meeting Room Level, Colorado Convention Center

Organizers: Giacomo Capodaglio, Florida State University

Marta D'Elia, Center for Computing Research, Sandia National Laboratories

Max Gunzburger, Florida State University

1:00PM | Regularity theory for nonlocal space-time master equations. Pablo Raúl Stinga, Iowa State University (1154-35-235) |
| 1:30PM | Classic dynamic fracture recovered as the limit of a nonlocal peridynamic model: The single edge notch in tension. Robert P Lipton*, Louisiana State University, and Prashant K Jha, University of Texas at Austin (1154-74-570) |
2:00PM (2354) Nonlocal operators: properties and decompositions.
Marta D’Elia, Sandia National Laboratories, Cynthia Flores, California State University Channel Islands, Xingjie Li, University of North Carolina-Charlotte, NC., Petronela Radu*, University of Nebraska-Lincoln, and Yue Yu, Lehigh University (1154-45-1636)

2:30PM On Theoretical Aspects of Nonlocal Helmholtz Decomposition of a Vector Field.
M. D’Elia, Sandia National Laboratories, Cynthia Flores*, California State University, Channel Islands, Xingjie Li, University of North Carolina, Charlotte, Petronela Radu, University of Nebraska, Lincoln, and Yue Yu, Lehigh University (1154-45-1995)

3:00PM Nonlocal models with approximate nonlocal neighborhoods: towards fast nonlocal FEM.
Marta D’Elia*, Sandia National Laboratories, Christian Vollmann, University of Trier, and Max Gunzburger, Florida State University (1154-45-424)

3:30PM Modeling and approximation of interface problems in nonlocal diffusion.
Pavel B. Bochev, Center for Computing Research, Sandia National Laboratories, Giacomo Capodaglio*, Department of Scientific Computing, Florida State University, Marta D’Elia, Center for Computing Research, Sandia National Laboratories, and Max D. Gunzburger, Department of Scientific Computing, Florida State University (1154-65-537)

4:00PM Variable-order fractional PDEs: modeling, computation and analysis. Preliminary report.
Hong Wang, Department of Mathematics, University of South Carolina (1154-35-1591)

4:30PM A nonlocal diffuse interface model with a nonsmooth potential.
Olena Burkovska*, Oak Ridge National Laboratory, and Max Gunzburger, Florida State University (1154-65-1911)

5:00PM Asymptotic analysis of a coupled system of nonlocal equations with oscillatory coefficients. Preliminary report.
James M Scott* and Tadele Mengesha, The University of Tennessee (1154-45-1543)

5:30PM Nonlocal Problems with the Tempered Fractional Laplacian.
Yanzhi Zhang*, Missouri University of Science and Technology, and Siwei Duo, University of South Carolina (1154-45-837)

AMS Special Session on Arithmetic Galois Actions
1:00 PM – 6:00 PM Room 304, Meeting Room Level, Colorado Convention Center
Organizers: Ozlem Ejder, Colorado State University
Jamie Juul, University of British Columbia
Rachel Pries, Colorado State University

1:00PM (2362) Local-to-Global Extensions for Wildly Ramified Covers of Curves.
Renee Hyunjeong Bell, University of Pennsylvania, Universite Paris-Sud (1154-11-1784)

1:30PM (2363) A local-global principle for isogenies of elliptic curves of composite degree.
Isabel Vogt, Stanford University (1154-11-1325)

2:00PM (2364) Computing central endomorphisms of an abelian variety via reductions modulo p.
Edgar Costa, MIT (1154-11-1500)

2:30PM (2365) Comparison of 3-dimensional Galois representations by computational method.
Lian Duan, Colorado state university (1154-11-1512)

3:00PM (2366) Sectional monodromy groups of projective curves.
Borys Kadets, MIT (1154-11-763)

3:30PM (2367) Computations on Ceresa class.
Daniel Corey, Jordan S Ellenberg, University of Wisconsin-Madison, and Wanlin Li*, MIT (1154-11-640)

4:00PM (2368) Heuristics on distributions of Galois groups of unramified extensions.
Yuan Liu*, University of Michigan, Melanie Matchett Wood, University of California, Berkeley, and David Zureick-Brown, Emory University (1154-11-360)

4:30PM (2369) Proportion of ordinary curves in some families.
Soumya Sankar, University of Wisconsin - Madison (1154-11-1898)

5:00PM (2370) Super-Isolated Abelian Varieties.
Travis Scholl, University of California. Irvine (1154-11-1860)

5:30PM (2371) Newly Reducible Polynomial Iterates.
Peter Illig, Rafe Jones*, Eli Orvis, Yukihiko Segawa and Nick Spinaile, Carleton College (1154-11-1853)

AMS Special Session on Experimental and Computer Assisted Mathematics
1:00 PM – 6:00 PM Room 113, Meeting Room Level, Colorado Convention Center
Organizers: Shashank Kanade, University of Denver
Matthew Russell, Rutgers University
AMS Special Session on Fractal Geometry, Dynamical Systems, and Applications, II

1:00 PM – 5:20 PM Room 111, Meeting Room Level, Colorado Convention Center

Organizers: Andrea Arauza Rivera, California State University, East Bay
Robert Niemeyer, Metropolitan State University
John Rock, California State Polytechnic University, Pomona

1:00PM
Wavelet based multifractal analysis of loss of tissue homeostasis in mammographic breast tissue.
Andre Khalil, CompuMAINE Lab, University of Maine (1154-92-1315)

1:30PM
Constructing finitely generated projective modules for noncommutative solenoids.
Shen Lu, University of Colorado Boulder (1154-46-569)

2:00PM
Fractal Complex Dimensions and Zeta Functions, With Applications to Fractal Geometry.
Michel L Lapidus, University of California, Riverside (1154-51-596)

2:30PM
Geometric Understanding of a Zero Free Region.
Machiel van Frankenhuijsen, Utah Valley University (1154-11-500)

3:00PM
Bounded Remainder Sets for Rotations on Products of Adelic Tori. Preliminary report.
Akshat Das, University of Houston, Joanna Furno*, DePaul University, and Alan Haynes, University of Houston (1154-37-1649)

3:30PM
Measures of maximal entropy on subsystems of topological suspension semiflows.
Tamara Kucherenko*, The City College of New York, and Daniel Thompson, Ohio State University (1154-37-1639)

4:00PM
Approximation of quasi-linear Koch-type fractal energy functionals on varying Hilbert spaces.
Alejandro Velez-Santiago, University of Puerto Rico - Mayaguez (1154-35-728)

4:30PM
Dimensions and measures of shrinking target sets.
Marco Antonio López, Wake Forest University (1154-37-2563)

5:00PM
Fourier Bases for Certain Fractal $L^2$ Spaces.
Calvin F Hotchkiss*, University of Delaware (1154-42-2107)

Program of the Sessions – Saturday, January 18 (cont’d.)

Ali Kemal Uncu, Research Institute for Symbolic Computation, Johannes Kepler University Linz

1:00PM Numberscope. Preliminary report.
Katherine E Stange, University of Colorado, Boulder (1154-11-1790)

1:30PM Using Machine Learning in Algebra and Geometry.
Zafeirakis Zafeirakopoulos, Institute of Information Technologies, Gebze Technical University (1154-68-1345)

2:00PM Neural-Inspired Computation for Efficient Scientific Computing via Random Walks and Surrogate Models.
William Mark Severa, Sandia National Laboratories (1154-68-1850)

3:00PM Proving Infinite Pochhammer Sum Identities.
Jakob Ablinger, JKU Linz, Research Institute for Symbolic Computation (1154-05-173)

3:30PM A Tale of Two Omegas.
Michael J. Mossinghoff*, Center for Communications Research, and Timothy S. Trudgian, UNSW Canberra at ADFA (1154-11-1256)

4:00PM Statistics on hypercube orientations.
Nathan Chenette, Rose-Hulman Institute of Technology, Lara Pavfell*, Valparaiso University, and Manda Riehl, Rose-Hulman Institute of Technology (1154-05-553)

4:30PM Finite Rogers-Ramanujan type identities.
Andrew V Sills*, Georgia Southern University (1154-11-362)

5:00PM Some $q$-series conjectures related to Rogers-Ramanujan type identities of Kanade and Russell.
Chris Jennings-Shaffer*, University of Denver, Kathrin Bringmann, University of Cologne, and Karl Mahlburg, Louisiana State University (1154-11-379)

5:30PM Congruence mods powers of 5 and 7 for the rank and crank parity functions. Preliminary report.
Dandan Chen, Rong Chen, School of Mathematical Sciences, East China Normal University, and Frank Garvan*, University of Florida (1154-11-1437)
AMS Special Session on From STEM to STEAMS (Science, Technology, Engineering, AI, Mathematics, Statistics)

1:00 PM – 3:50 PM Room 406, Meeting Room Level, Colorado Convention Center
Organizers: Charles Chen, Applied Materials
Mason Chen, Stanford OHS

1:00PM STEAMS Methodology. Preliminary report.
(2391) Charles Chen*, Morrill Learning Center, and Mason Chen, Stanford OHS (1154-62-1640)

1:30PM STEAMS Methodology. Preliminary report.
(2392) Charles Chen*, Morrill Learning Center, and Mason Chen, Stanford OHS (1154-62-1647)

2:00PM Prediction Intervals for Hypergeometric Distribution.
Shanshan Lv*, Truman State University, and K. Krishnamoorthy, University of Louisiana at Lafayette (1154-60-401)

2:30PM Small Sample Inference for The Product Limit survival function Estimator. Preliminary report.
Emad M. Abdurasul, James Madison University (1154-62-1078)

3:00PM Manifold Learning Using Persistent Homology on the Laplacian Eigenfunctions. Preliminary report.
Mustafa Hajij, KLA (1154-68-2798)

3:30PM On Orthogonal Components of a Solution to a Cauchy BVP. Preliminary report.
Denjie Alemayehu Lakew, Hampton University (1154-46-621)

AMS Special Session on Future Directions in Theory & Applications of Nonlinear Reaction-Diffusion Equations

1:00 PM – 5:50 PM Room 107, Meeting Room Level, Colorado Convention Center
Organizers: Jerome Goddard, II, Auburn University at Montgomery
Nsozi Mavinga, Swarthmore College
Quinn Morris, Appalachian State University

1:00PM Dynamics of a Reaction-Diffusion Benthic-Drift Model with Strong Allee Effect Growth.
Yan Wang, Beijing Normal University, and Junping Shi*, College of William & Mary (1154-92-1319)

1:30PM Existence of traveling wave solutions of a deterministic vector-host epidemic model with direct transmission.
Rachidi B Salako*, The Ohio State University, Dawit Denu, Georgia Southern University, Savannah, and Sedar Ngoma, State University of New York at Geneseo (1154-35-1289)

2:00PM Classes of reaction diffusion equations where a parameter influences the equation as well as the boundary condition.
Nalin Fonseka*, Ratnasingham Shivaji, University of North Carolina at Greensboro, Byungjae Son, University of Maine, and Keri Spetzer, University of North Carolina at Greensboro (1154-35-504)

2:30PM Existence of positive solutions to nonlinear equations involving distinct fractional Laplacians. Preliminary report.
Yan Li*, Department of Mathematics, Baylor University, and Ran Zhuo, School of mathematics and statistics, Huanghuai University (1154-35-511)

3:00PM Fractional Laplacian problems involving logistic reaction terms.
Elliott Z Hollifield*, Maya Chhetri, UNC Greensboro, and Petr Gird, University of West Bohemia (1154-35-2191)

3:30PM On the effects of the exterior matrix hostility and a U-shaped density dependent dispersal on a diffusive logistic growth model.
N. Fonseka, University of North Carolina at Greensboro, J. Goddard, Auburn University at Montgomery, Q. Morris, Appalachian State University, R. Shivaji, University of North Carolina at Greensboro, and B. Son*, University of Maine (1154-35-614)

4:00PM Existence of positive solutions for a class of superlinear fractional Laplacian problems.
Maya Chhetri*, UNC Greensboro, Petr Gird, University of West Bohemia, and Elliott Hollifield, UNC Greensboro (1154-35-2306)

4:30PM Discrete Resonance Problems Subject to Periodic Forcing.
Stephen B Robinson*, Department of Mathematics and Statistics, Wake Forest University, and Klaus Schmitt, Department of Mathematics, University of Utah (1154-15-434)

5:00PM Infinitely many solutions of semilinear equations on the exterior domains.
Janak R Joshi, Cameron University, Lawton. OK (1154-35-685)

5:30PM Multiple Solutions of Elliptic PDEs in Exterior Domains of R^N.
David G Costa, University of Nevada Las Vegas (1154-35-1525)

AMS Special Session on International Research Experience for Students (IRES)

1:00 PM – 5:40 PM Room 210/212, Meeting Room Level, Colorado Convention Center
Organizers: Asuman G. Aksoy, Claremont McKenna College
Zair Ibragimov, California State University, Fullerton
**Program of the Sessions – Saturday, January 18 (cont’d.)**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00PM</td>
<td>International Research Experiences for Students in Uzbekistan.</td>
<td>Room 106, Meeting Room</td>
<td>Robert McRae, Vanderbilt University</td>
</tr>
<tr>
<td>1:30PM</td>
<td>Dynamics of Prion Proliferation Under Combined Treatment of Pharmacological Chaperones and Interferons.</td>
<td>Room 402, Meeting Room</td>
<td>Michael Maroun, Purdue University Indianapolis</td>
</tr>
<tr>
<td>2:00PM</td>
<td>Finite-dimensional nilpotent Leibniz algebras and their derivations.</td>
<td>Room 106, Meeting Room</td>
<td>Evgeny Mukhin, Indiana University</td>
</tr>
<tr>
<td>2:45PM</td>
<td>Break</td>
<td>Room 106, Meeting Room</td>
<td>Jacob Kesten, University of Notre Dame</td>
</tr>
<tr>
<td>3:30PM</td>
<td>On a boundary value problem for a time-fractional wave equation with the Riemann-Liouville and Atangana-Baleanu derivatives.</td>
<td>Room 402, Meeting Room</td>
<td>Luan Bezerra, Yachay Tech University, and Evgeny Mukhin, Universidad Nacional de Colombia</td>
</tr>
<tr>
<td>4:00PM</td>
<td>Transitivity on the Calogero-Moser Variety $C_2$.</td>
<td>Room 106, Meeting Room</td>
<td>Vladimir Kovalchuk, University of Colorado, Denver</td>
</tr>
<tr>
<td>4:30PM</td>
<td>Classification of Leibniz Algebras Corresponding to Three Dimensional Solvable Lie Algebras.</td>
<td>Room 402, Meeting Room</td>
<td>Dan D. Graybill, University of Denver</td>
</tr>
<tr>
<td>5:00PM</td>
<td>On nilpotent and solvable Leibniz superalgebras.</td>
<td>Room 106, Meeting Room</td>
<td>Andrew Linshaw, University of Denver</td>
</tr>
</tbody>
</table>

**AMS Special Session on Mathematical Aspects of Conformal Field Theory, II**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
<th>Organizer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00PM</td>
<td>AMS Special Session on Mathematical Physics Some Open Problems for the 21st Century, III</td>
<td>Room 402, Meeting Room</td>
<td>Michael Maroun</td>
</tr>
</tbody>
</table>

Organizers: Shashank Kanade, University of Denver and Andrew Linshaw, University of Denver

**AMS Special Session on Mathematical Physics Some Open Problems for the 21st Century, III**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
<th>Organizer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00PM</td>
<td>A Generalized Nonlinear Schrodinger Equation.</td>
<td>Room 106, Meeting Room</td>
<td>Michael A Maroun, Boston, MA</td>
</tr>
<tr>
<td>1:50PM</td>
<td>$p$-Adic Brownian Motion as a Limit of Discrete Time Random Walks.</td>
<td>Room 106, Meeting Room</td>
<td>David Eric Weisbart, University of California, Riverside</td>
</tr>
</tbody>
</table>
2:40 PM  **Bulk Viscous Cosmological model in General Relatively.** Preliminary report.  
  **Reena Tandon,** Lovely Professional University (1154-85-2156)

3:30 PM  **Discussion**

3:40 PM  **Time-Sliced Path-Integral Propagator for (1+1) Quantum Gravity with Factor Ordering Ambiguity.** Preliminary report.  
  **Rachel Lash Maitra** and **John E Haga,** Wentworth Institute of Technology, Department of Applied Mathematics (1154-81-2412)

4:10 PM  **Factoring ordering ambiguity in (1+1) gravity manifests as the index of a Bessel process.** Preliminary report.  
  **John E Haga** and **Rachel Lash Maitra,** Wentworth Institute of Technology (1154-81-2415)

4:40 PM  **The Characteristic Polynomial of a Quantum Binary Graph.** Preliminary report.  
  **Tori Hudgins** and **Jon Harrison,** Baylor University (1154-81-863)

5:10 PM  **Generalized Span Categories in Classical Mechanics.**  
  **David Weisbart** and **Adam Yassine**

5:40 PM  **Duality for Bethe algebras acting on polynomials in anticommutative variables.** Preliminary report.  
  **Filipp Uvarov,** IUPUI (1154-81-2822)

**AMS Special Session on Mathematics and Motherhood**

1:00 PM – 6:00 PM  **Room 403, Meeting Room Level, Colorado Convention Center**

Organizers:  
  **Della Dumbaugh,** University of Richmond  
  **Carrie Diaz Eaton,** Bates College  
  **Emille Lawrence,** University of San Francisco

1:00 PM  **Discussion**

1:30 PM  **The Upside of Down Syndrome: Math is My Superpower!**  
  **Heidi Berger,** Simpson College (1154-00-2661)

2:00 PM  **The elastohydrodynamics of a simplified model of human birth.**  
  **Roseanna Gossmann,** Art of Problem Solving Academy (1154-76-2331)

2:30 PM  **The Mathematics Behind Twin Motherhood.**  
  **Tiffany N Kolba,** Valparaiso University (1154-92-87)

3:00 PM  **Using parenting to understand and manage inquiry-based learning and teaching.**  
  **Aliza Steurer,** Dominican University (1154-00-2043)

3:30 PM  **Finding Luz.**  
  **Carrie Diaz Eaton**, Bates College (1154-01-1140)

4:00 PM  **Then and Now: Calculating Intersections of Math and Motherhood.**  
  **Della Dumbaugh,** University of Richmond, and **Hannah Fenster**

4:30 PM  **Panel Please visit the AMS Panel listing for more information.**

**AMS Special Session on Quantum Theory of Matter Meets Noncommutative Geometry and Topology, III**

1:00 PM – 5:40 PM  **Room 110, Meeting Room Level, Colorado Convention Center**

Organizers:  
  **Masoud Khalkhali,** University of Western Ontario  
  **Markus Pflaum,** University of Colorado, Boulder

1:00 PM  **Coarse geometry and family invariants of gapped phases of quantum matter.**  
  **Anton Kapustin,** California Institute of Technology (1154-82-590)

2:00 PM  **Homotopy theoretic methods in phases of matter.**  
  **Agnes Beaudry,** University of Colorado Boulder (1154-55-619)

3:00 PM  **Some Homotopical Computations in Physics.**  
  **Jonathan A Campbell,** Duke University (1154-55-304)

4:00 PM  **Gapped phases of quantum matter and topological quantum field theories.**  
  **Michael Hermele,** University of Colorado Boulder (1154-81-1839)

5:00 PM  **Smooth Connes–Thom isomorphism, cyclic homology, and equivariant quantisation.** Preliminary report.  
  **Sayan Chakraborty,** Department of Mathematics, Indian Institute of Science Education and Research Bhopal, **Xiang Tang**

**AMS Special Session on Recent Advances of Mathematical Modeling on Ecology and Epidemiology**

1:00 PM – 5:50 PM  **Room 109, Meeting Room Level, Colorado Convention Center**

Organizers:  
  **Xi Huo,** University of Miami  
  **Rongsong Liu,** University of Wyoming

1:00 PM  **Discussion**

1:30 PM  **The Upside of Down Syndrome: Math is My Superpower!**  
  **Heidi Berger,** Simpson College (1154-00-2661)

2:00 PM  **The elastohydrodynamics of a simplified model of human birth.**  
  **Roseanna Gossmann,** Art of Problem Solving Academy (1154-76-2331)

2:30 PM  **The Mathematics Behind Twin Motherhood.**  
  **Tiffany N Kolba,** Valparaiso University (1154-92-87)

3:00 PM  **Using parenting to understand and manage inquiry-based learning and teaching.**  
  **Aliza Steurer,** Dominican University (1154-00-2043)
### AMS Special Session on Representations of Finite Groups and Related Structures, II

<table>
<thead>
<tr>
<th>Time</th>
<th>Panel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 PM</td>
<td>An alternative formulation for a delayed logistic equation.</td>
</tr>
<tr>
<td></td>
<td>Gail Wolkowicz*, Chiu-Ju Lin, McMaster University, and Lin Wang, University of New Brunswick (1154-92-463)</td>
</tr>
<tr>
<td>1:30 PM</td>
<td>Mathematical Modeling of HIV/SIV</td>
</tr>
<tr>
<td></td>
<td>Weston Roda, Michael Li* and Christopher Power, University of Alberta, Edmonton, Alberta, Canada (1154-34-1007)</td>
</tr>
<tr>
<td>2:00 PM</td>
<td>Time series analytics: Networks</td>
</tr>
<tr>
<td></td>
<td>Wei Lin, Fudan University (1154-92-772)</td>
</tr>
<tr>
<td>2:30 PM</td>
<td>Larval versus adult dispersal: implications of two modes of dispersal on the spread rate of an invasion.</td>
</tr>
<tr>
<td></td>
<td>James Wathamough*, Lin Wang, Myriam Barbeau and Ali Gharouni, University of New Brunswick (1154-92-447)</td>
</tr>
<tr>
<td>3:00 PM</td>
<td>Continuous Natural Language Vowel Change</td>
</tr>
<tr>
<td></td>
<td>Patrick Shipman, Colorado State University (1154-92-460)</td>
</tr>
<tr>
<td>3:30 PM</td>
<td>Population Dynamics of Honeybees: Interplay Effects of Parasites and Nutrition.</td>
</tr>
<tr>
<td></td>
<td>Yun Kang*, Jun Chen, Arizona State University, Komi Messan, NIH fellowship, Marisabel Rodriguez-Messan, Brian Sweeney, Arizona State University, and Gloria Hoffman, Carl Hayden Bee Research Center, USDA-ARS (1154-34-798)</td>
</tr>
<tr>
<td>4:00 PM</td>
<td>The potential impact of climate change on the transmission risk of tick-borne encephalitis: insights from dynamical modeling.</td>
</tr>
<tr>
<td></td>
<td>Kyeongah Nah, York University (1154-92-446)</td>
</tr>
<tr>
<td>4:30 PM</td>
<td>A Data-Driven Approach to Modeling the Heroin and Fentanyl Epidemic.</td>
</tr>
<tr>
<td></td>
<td>Tricia Phillips*, Suzanne Lenhart and Christopher Strickland, University of Tennessee, Knoxville (1154-92-485)</td>
</tr>
<tr>
<td>5:00 PM</td>
<td>Role of Regulatory T Cells on a Tumor-Immune System with Immunotherapy.</td>
</tr>
<tr>
<td></td>
<td>Peng Feng* and Menaka Navaratna, Florida Gulf Coast University (1154-34-1080)</td>
</tr>
<tr>
<td>5:30 PM</td>
<td>Rigorous Analysis of Edge-Based Network Disease Models.</td>
</tr>
<tr>
<td></td>
<td>Zhisheng Shuai, University of Central Florida (1154-92-2546)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Time</th>
<th>Panel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 PM</td>
<td>Discussion</td>
</tr>
<tr>
<td>2:00 PM</td>
<td>Tensor Product Markov Chains.</td>
</tr>
<tr>
<td></td>
<td>Persi Diaconis, Stanford University (1154-20-2101)</td>
</tr>
<tr>
<td>3:00 PM</td>
<td>Kohnert polynomials as characters of flagged Schur modules.</td>
</tr>
<tr>
<td></td>
<td>Sami Assaf*, University of Southern California, and Dominic Searles, University of Otago (1154-05-1322)</td>
</tr>
<tr>
<td>3:30 PM</td>
<td>Representation theory and combinatorial Hopf structures.</td>
</tr>
<tr>
<td></td>
<td>Farid Aliniaeifard, University of British Columbia (1154-20-1031)</td>
</tr>
<tr>
<td>4:00 PM</td>
<td>Towards a tropical geometry of Coxeter matroids.</td>
</tr>
<tr>
<td></td>
<td>Christopher Eur, UC Berkeley (1154-05-1983)</td>
</tr>
<tr>
<td>4:30 PM</td>
<td>Invariants of modular reflection groups and (q,1)-binomial coefficients.</td>
</tr>
<tr>
<td></td>
<td>Chelsea Drescher* and Anne V. Shepler, University of North Texas (1154-13-591)</td>
</tr>
<tr>
<td>5:00 PM</td>
<td>Cartan subalgebras in the C^*-algebras of non-principal groupoids.</td>
</tr>
<tr>
<td></td>
<td>Elizabeth Gillaspy*, University of Montana, Anna Duwenig, University of Victoria, Rachael Norton, Fitchburg State University, Sarah Reznikoff, Kansas State University, and Sarah Wright, Fitchburg State University (1154-46-1893)</td>
</tr>
<tr>
<td>5:30 PM</td>
<td>The rectangular representation of the double affine Hecke algebra via elliptic Schur-Weyl duality.</td>
</tr>
<tr>
<td></td>
<td>David Jordan, University of Edinburgh, and Monica Vazirani*, UC Davis (1154-05-2008)</td>
</tr>
</tbody>
</table>

### AMS Special Session on Representations of Finite Groups and Related Structures, II

<table>
<thead>
<tr>
<th>Time</th>
<th>Panel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 PM</td>
<td>Alternative formulation for a delayed logistic equation.</td>
</tr>
<tr>
<td></td>
<td>Gail Wolkowicz*, Chiu-Ju Lin, McMaster University, and Lin Wang, University of New Brunswick (1154-92-463)</td>
</tr>
<tr>
<td>1:30 PM</td>
<td>Mathematical Modeling of HIV/SIV</td>
</tr>
<tr>
<td></td>
<td>Weston Roda, Michael Li* and Christopher Power, University of Alberta, Edmonton, Alberta, Canada (1154-34-1007)</td>
</tr>
<tr>
<td>2:00 PM</td>
<td>Time series analytics: Networks</td>
</tr>
<tr>
<td></td>
<td>Wei Lin, Fudan University (1154-92-772)</td>
</tr>
<tr>
<td>2:30 PM</td>
<td>Larval versus adult dispersal: implications of two modes of dispersal on the spread rate of an invasion.</td>
</tr>
<tr>
<td></td>
<td>James Wathamough*, Lin Wang, Myriam Barbeau and Ali Gharouni, University of New Brunswick (1154-92-447)</td>
</tr>
<tr>
<td>3:00 PM</td>
<td>Continuous Natural Language Vowel Change</td>
</tr>
<tr>
<td></td>
<td>Patrick Shipman, Colorado State University (1154-92-460)</td>
</tr>
<tr>
<td>3:30 PM</td>
<td>Population Dynamics of Honeybees: Interplay Effects of Parasites and Nutrition.</td>
</tr>
<tr>
<td></td>
<td>Yun Kang*, Jun Chen, Arizona State University, Komi Messan, NIH fellowship, Marisabel Rodriguez-Messan, Brian Sweeney, Arizona State University, and Gloria Hoffman, Carl Hayden Bee Research Center, USDA-ARS (1154-34-798)</td>
</tr>
<tr>
<td>4:00 PM</td>
<td>The potential impact of climate change on the transmission risk of tick-borne encephalitis: insights from dynamical modeling.</td>
</tr>
<tr>
<td></td>
<td>Kyeongah Nah, York University (1154-92-446)</td>
</tr>
<tr>
<td>4:30 PM</td>
<td>A Data-Driven Approach to Modeling the Heroin and Fentanyl Epidemic.</td>
</tr>
<tr>
<td></td>
<td>Tricia Phillips*, Suzanne Lenhart and Christopher Strickland, University of Tennessee, Knoxville (1154-92-485)</td>
</tr>
<tr>
<td>5:00 PM</td>
<td>Role of Regulatory T Cells on a Tumor-Immune System with Immunotherapy.</td>
</tr>
<tr>
<td></td>
<td>Peng Feng* and Menaka Navaratna, Florida Gulf Coast University (1154-34-1080)</td>
</tr>
<tr>
<td>5:30 PM</td>
<td>Rigorous Analysis of Edge-Based Network Disease Models.</td>
</tr>
<tr>
<td></td>
<td>Zhisheng Shuai, University of Central Florida (1154-92-2546)</td>
</tr>
</tbody>
</table>
AMS Special Session on Self-Distributive
Structures, Knot Theory, and the
Yang-Baxter Equation

1:00 PM – 6:00 PM  Room 404, Meeting Room
Level, Colorado Convention Center

Organizers: Mohamed Elhamdadi,
University of South Florida
Petr Vojtechovsky,
University of Denver
David Stanovský, Charles
University in Prague

1:00 PM  The Structure of Hom Quandles.
(2469)  Alissa S Crans*, Loyola Marymount
University, Marco Bonatto, Universidad
de Buenos Aires, and Glen Whitney,
Studio Infinity (1154-57-1332)

1:30 PM  Quandles and Biquandles in
Virtual Knot Theory. Preliminary report.
(2470)  Louis H Kauffman, University of Illinois
at Chicago (1154-57-994)

2:00 PM  Constructing almost classical virtual
links from virtual links.
(2471)  Naoko Kamada, Nagoya City University
(1154-57-386)

2:30 PM  A geometric field theory for
three-manifolds.
(2472)  Charles Frohman*, The University of
Iowa, and Joanna Kania-Bartoszynska,
National Science Foundation
(1154-57-188)

3:00 PM  Motions and their actions on the
fundamental groups and quandles of
H-trivial links.
(2473)  Seiichi Kamada, Osaka University
(1154-57-435)

3:30 PM  Diagrammatic categorification of the
polynomial ring \( \mathbb{Z}[x] \).
(2474)  Radmila Sazdanovic*, NC State
University, and Mikhail Khovanov,
Columbia University (1154-18-2453)

3:55 PM  Break
AMS Special Session on Stochastic Differential Equations and Application of Mathematical Biology, II

1:00 PM – 5:50 PM  
Room 112, Meeting Room  
Level, Colorado Convention Center  
Organizers: Jianjun Paul Tian, New Mexico State University  
Hai-Dang Nguyen, University of Alabama  
Xianyi Zeng, University of Texas at El Paso  
Robert Smits, New Mexico State University

1:00PM  
Matt Roberts, University of Bath, and Jason Schweinsberg*, University of California San Diego (1154-60-787)

1:30PM  
Asymptotic harvesting of populations in random environments.  
Alexandru Hening*, Tufts University, Dang H Nguyen, University of Alabama, Sergiu C Ungureanu, City University London, and Tak Kwong Wong, Hong Kong University (1154-60-815)

2:00PM  
A Nutrient-Prey-Predator Model: Stability and Bifurcations.  
Mary M Ballyk*, Department of Mathematical Sciences, New Mexico State University, Ibrahim Jawarneh, Faculty of Science, Al-Hussein Bin Talal University, and Ross Staffeldt, Department of Mathematical Sciences, New Mexico State University (1154-34-1428)

2:30PM  
Closed form probability distribution of number of infections at a given time in a stochastic SIS epidemic model.  
Olusegun Michael Otunuga, Marshall University (1154-92-181)

3:00PM  
Robert G Smits, New Mexico State University (1154-60-575)

3:30PM  
Stochastic Functional Kolmogorov Equations.  
Dang H Nguyen, University of Alabama (1154-60-845)

4:00PM  
Keisha Cook, Tulane University (1154-92-1623)

4:30PM  
Mahbubur Rahman, University of North Florida (1154-34-2081)

5:00PM  
Stochastic models for the emergence of HIV-1 drug resistance. Preliminary report.  
Damilola O Olabode and Xueying Wang, Washington State University (1154-92-1792)

5:30PM  
Stochastic growth pattern of untreated human glioblastomas predicts the survival time for patients. Preliminary report.  
Jianjun Paul Tian, New Mexico State University (1154-60-2240)

AMS Special Session on The Geometry of Complex Polynomials and Rational Functions

1:00 PM – 5:20 PM  
Room 303, Meeting Room  
Level, Colorado Convention Center  
Organizers: Trevor Richards, Monmouth College  
Malik Younssi, University of Hawaii

1:00PM  
The Intrinsic Noncrossing Combinatorics of the Space of Generic Complex Polynomials. Preliminary report.  
Michael Dougherty*, Colby College, and Jon McCammond, University of California, Santa Barbara (1154-30-2524)

1:30PM  
Rouché’s Theorem and the Geometry of Rational Functions.  
Trevor J. Richards, Monmouth College (1154-30-2285)

2:00PM  
A Nonlocal Transport Equation  
Describing Roots of Polynomials Under Differentiation.  
Stefan Steinerberger, Yale (1154-31-124)

2:30PM  
Polynomial and rational approximation in several complex variables.  
Javier Falco, Universidad de Valencia, Paul M. Gauthier, University of Montreal, Myro Manolaki*, University College Dublin, and Vassili Nestoridis, University of Athens (1154-32-2319)
AMS Special Session on Vietoris-Borsuk-Rips Homotopy

1:00 PM – 5:50 PM  Room 104, Meeting Room

Organizers: Danuta Kolodziejczyk, Warsaw University of Technology
Krystyna Kuperberg, Auburn University

1:00 PM  (2498) Parametrized homotopy theory and motion planning problems.
Gunnar Erik Carlsson, Stanford University (1154-55-1277)

2:00 PM  (2499) An application of nerve complexes in imputation.
Ryan Moag and Boris Goldfarb*, University at Albany, SUNY (1154-57-1347)

2:30 PM  (2500) Quasi Z-Structures. Preliminary report.
Craig R Guilbault, University of Wisconsin-Milwaukee, and Molly A Moran*, Colorado College (1154-54-838)

3:00 PM  (2501) Vietoris-Rips complexes of spheres.

3:30 PM  (2502) Inverse systems with simplicial bonding maps and cell structures.
Edward Tymchatyn*, University of Saskatchewan, Wojciech Debski, Parksville, British Columbia, Kazuhiro Kawamura, University of Tsukuba, and Murat Tuncali, Nipissing University (1154-55-754)

4:00 PM  (2503) Maps of rank ≤ m revisited.
Pawel Krupski, Wroclaw University of Science and Technology, and Murat Tuncali*, Nipissing University (1154-54-440)

4:30 PM  (2504) On coarse properties of persistence diagrams.
Greg Bell* and C. Neil Pritchard, UNC Greensboro (1154-54-778)

5:00 PM  (2505) Linear algebra and unification of geometries in all scales: Evolution of concepts. Preliminary report.
Jerzy Dydak, University of Tennessee (1154-51-316)

5:30 PM  (2506) Polyhedra with Finite Depth II.
Danuta Kolodziejczyk, Warsaw University of Technology (1154-55-2679)

MAA Minicourse #8: Part B

1:00 PM – 3:00 PM  Room 706, Meeting Room
Level, Colorado Convention Center

Stats for Data Science.
Presenter: Daniel Kaplan, Macalester College

AMS Contributed Paper Session on Algebra and Algebraic Geometry, III

1:00 PM – 5:40 PM  Room 206, Meeting Room
Level, Colorado Convention Center

1:00 PM  (2507) The index of Lie poset algebras.
Nicholas W. Mayers, Lehigh University (1154-17-810)

1:15 PM  (2508) Crystal structure on Gelfand-Tsetlin-Zhelobenko patterns.
O'Neill Kingston* and Jonas Hartwig, Iowa State University (1154-17-1563)

1:30 PM  (2509) Unimodality for certain families of Frobenius seaweed algebras.
Nicholas V. Russo, Nick W., Mayers and Vincent E. Coll, Lehigh University (1154-17-1635)

1:45 PM  (2510) A 3-parameter vertex algebra interpolating between the diagonal cosets of sl_n*. Preliminary report.
Andrew R. Linshaw, University of Denver (1154-17-2239)

2:00 PM  Break

2:15 PM  (2511) Gluing vertex algebras.
Thomas Creutzig, University of Alberta, Shashank Kanade, University of Denver, and Robert McRae*, Tsinghua University (1154-17-2751)

2:30 PM  (2512) Network models from Petri nets with catalysts.
John C. Baez, University of California, Riverside, John D. Foley*, Metron, Inc., and Joe Moeller, University of California, Riverside (1154-18-2063)

2:45 PM  (2513) A Categorification of Group Cohomology.
Michael Horst, The Ohio State University (1154-18-2470)
3:00PM An Explicit Formula for the Loday Assembly. Preliminary report.
Virgil Chan, Indiana University-Purdue University Indianapolis (1154-19-676)

3:15PM Extensions of M-matrix Theory to Rectangular M-matrices.
Tyler J Gonzales, University of Wisconsin - Eau Claire and University of California - Santa Barbara (1154-15-872)

3:30PM Break

3:45PM On the Graph Laplacian and the Rankability of Data.
Thomas R Cameron, Davidson College (1154-15-1284)

4:00PM The almost semimonomotone matrices.
Megan G Wendler, Washington State University (1154-15-698)

4:15PM Generalization Theory for Linear Algebra II: Appropriate Inverses for Non-Injective and Non-Surjective Mappings.
Christina Pospisil, University of Massachusetts Boston (1154-15-1364)

4:30PM Understanding Behavioral Synchrony: Differences in Behavioral Synchrony in Adolescents with Autism Spectrum Disorder using Functional EEG Networks.

4:45PM Diagonalizing the Undiagonalizable.
Sarah Friday*, Jordan Smith, Aaron Waclawczyk and Fumiko Futamura, Southwestern University (1154-15-2370)

5:00PM A generalization of Skew Adjacency.
Enzo Wendler, Washington State University (1154-15-2428)

5:15PM Solution of Linear Ill-Posed Problems Using Random Dictionaries.
Pawan K. Gupta* and Marianna Pensky, University of Central Florida (1154-15-2604)

5:30PM Tensor Train Random Projection.
Beheshteh Tolouei Rakhshan, Purdue University (1154-15-2841)

1:15PM Lattice Paths and Pattern-Avoiding Uniquely Sorted Permutations.
Hanna Mularczyk, Harvard University (1154-05-2344)

1:30PM Using matrices for analyzing the Game of Cycles. Preliminary report.
Malgorzata Aneta Marciniak*, City University of New York LaGuardia Community College, Ryan Alvarado, Amherst College, Maia Averett, Mills College, Benjamin Gaines, Iona College, Christopher Jackson, Coleman, Florida, Mary Leah Karker, Providence College, Francis Edward Su, Harvey Mudd College, and Shanise Walker, University of Wisconsin-Eau Claire (1154-05-2359)

1:45PM Generating functions of the binomial numbers. Preliminary report.
Ji Young Choi, Shippensburg University of PA (1154-05-2360)

2:00PM The Game of Cycles: Winning Strategies and Open Problems.
Maia Averett*, Mills College, Ryan Alvarado, Amherst College, Benjamin Gaines, Iona College, Christopher Jackson, Coleman, FL, Mary Leah Karker, Providence College, Malgorzata Aneta Marciniak, LaGuardia Community College of the City University of New York, Francis Su, Harvey Mudd College, and Shanise Walker, University of Wisconsin-Eau Claire (1154-05-2364)

2:15PM Counting locally-flat-foldable origami configurations via 3-coloring graphs.
Alvin Chiu*, Georgia Tech, William Hoganson, Swarthmore College, Thomas C. Hull, Western New England University, and Sylvia Wu, Clemson University (1154-05-2388)

2:30PM Connectivity in origami flip graphs for flat-foldable vertices.
Thomas C. Hull, Western New England University, Manuel Morales, Arizona State University, Sarah Nash*, New College of Florida, and Natasha Ter-Saakov, MIT (1154-05-2404)

2:45PM Graph properties of and algorithms on origami flip graphs for flat-foldable vertices with equal sector angles.
Thomas C. Hull, Western New England University, Manuel Morales*, Arizona State University, Sarah Nash, New College of Florida, and Natasha Ter-Saakov, MIT (1154-05-2411)

3:00PM The NGD-Circulant Graphs $C_n (1, k)$.
Jean A. Guillaume*, Sacred Heart University, and Michael D. Barrus, University of Rhode Island (1154-05-2413)

3:15PM Ordered set partitions, Garsia-Procesi modules, and rank varieties. Preliminary report.
Sean T. Griffin, University of Washington (1154-05-2482)
1:00 PM – 5:10 PM  Room 208, Meeting Room Level, Colorado Convention Center

1:00PM  Machine learning approach for image reconstruction in electrical impedance tomography inverse problem. Preliminary report.
  Taufiquar R Khan*, Shyla Rae Kupis, Clemson University, and Vincent Barra, LIMOS, University of Clermont Auvergne, France (1154-65-1746)

1:15PM  A level-set method combing explicit exponential time differencing scheme (eETD) with adaptive Krylov subspace for a class of stiff reaction-diffusion system with free boundary. Preliminary report.
  Shuang Liu* and Xinfeng Liu, Department of Mathematics, University of South Carolina (1154-65-1705)

1:30PM  A Parallel-in-Time Multigrid Approach to Constrained Optimization.
  Joseph Munar*, Rice University, Isaiam Meyers, The University of Texas at Austin, Tom Overman, The University of Texas at Arlington, and Eric Neville, University College Dublin (1154-65-1382)

  Andrew P Miller* and Dmitriy Leykekhman, University of Connecticut (1154-65-983)

2:00PM  Preconditioners for nonsymmetric indefinite linear systems.
  Zhen Chao*, Dexuan Xie, University of Wisconsin-Milwaukee, and Ahmed H. Sameh, Purdue University (1154-65-914)

2:15PM  High order well-balanced discontinuous Galerkin methods for blood flow simulation through arteries with living man equilibrium.
  Yulong Xing, University of California, Berkeley, and Eric Neville, University College Dublin (1154-65-1382)

2:30PM  Can we hear the shape of a fractal?
  Spectral Consideration in the context of self-similar sets.
  Nikhil Nagabandi*, Nova Southeastern University, and Elizabeth Melville, Brigham Young University (1154-65-2483)

2:45PM  Convergent semi-discrete finite difference approximations for the boundary control of partial differential equations.
  Ahmet Ozkam Ozer, Department of Mathematics, Western Kentucky University (1154-65-1465)

3:00PM  Surface Grid Generation Using R.
  Bashar Zogheib, American University of Kuwait (1154-65-533)

3:15PM  Approximate penalty function for elliptic control problems.
  Arvind Saibaba*, University of California, Davis, and Joseph Munar*, Rice University (1154-65-1382)

3:30PM  Preliminary report.
  Joseph Munar*, Rice University, Isaiam Meyers, The University of Texas at Austin, Tom Overman, The University of Texas at Arlington, and Eric Neville, University College Dublin (1154-65-1382)

  Xinyun Zhu, Department of Mathematics, College of William and Mary, and Mingwei Sun, Samford University (1154-65-1821)
AMS Contributed Paper Session on Mathematical Biology and Related Fields, III

1:00 PM – 5:10 PM  Room 204, Meeting Room Level, Colorado Convention Center

1:00 PM  Modeling Zika Virus Transmission
Naveen K. Vaidya, San Diego State University (1154-92-2451)

1:15 PM  Classifying the Maximum Number of Steady States of Chemical Reaction Networks through Mixed Volume.
Preliminary report.
Dilruba A Sofia*, University of Massachusetts-Dartmouth, Nida Obatake and Anne Shiu, Texas A&M University (1154-92-2471)

1:30 PM  Proteins with random effects become evolutionary capacitors.
Swati Patel*, and Scott Mckinley, Tulane University (1154-92-2486)

1:45 PM  Modeling liver glutathione redox balance metabolism and the action of agents which promote oxidative stress in liver: applications to arsenical poisoning and acetaminophen overdose.
Lydia M Bilinsky, National Center for Toxicological Research, U.S. F.D.A. (1154-92-2501)

2:00 PM  Estimating Time-Varying Applied Current in the Hodgkin-Huxley Model.
Kayleigh Campbell, Laura Staugler*, and Andrea Arnold, Worcester Polytechnic Institute (1154-92-2498)

2:15 PM  Platelet Plug This Hole: A mathematical model of flow-mediated platelet accumulation in an extravascular injury.
Preliminary report.
Kathryn G. Link*, Department of Mathematics, University of Utah, Nicholas Danes, Department of Applied Mathematics and Statistics, Colorado School of Mines, Matthew Sorrells, Department of Chemical and Biological Engineering, Colorado School of Mines, Karin Leideman, Department of Applied Mathematics & Statistics, Colorado School of Mines, Keith B. Neeves, Departments of Bioengineering and Pediatrics, University of Colorado, Denver — Anschutz Medical Campus, and Aaron L. Fogelson, Department of Mathematics & Bioengineering, University of Utah (1154-92-2523)

3:00 PM  Agent-based and continuous models of locusts form a traveling pulse mediated by resource consumption. Preliminary report.
Jasper Weinburd*, Andrew J Bernoff, Harvey Mudd College, Michael Culshaw-Mauer, UC Davis, Rebecca A Everett, Haverford College, Maryann E Hohn, Pomona College, and W. Christopher Strickland, UT Knoxville (1154-92-2629)

3:15 PM  A simple ODE model relating BDNF content and circadian rhythms.
Preliminary report.
Jordan Michael Culp, Washington State University (1154-92-2664)

3:30 PM  Topological Data Analysis on Murine Pulmonary Arterial Networks Under Hypoxia-Induced Pulmonary Hypertension. Preliminary report.
Megan J Chambers, North Carolina State University (1154-92-2771)

3:45 PM  Continuous Mathematical Model of Blood Vessel Formation.
Cynthia Melissa Ramirez, California State University - Los Angeles (1154-92-2636)

4:00 PM  Applying observers to track Astragalus dynamics with reduced population counts. Preliminary report.
Amanda N Laubmeier*, Richard Rebarber and Brigitte Tenhumberg, University of Nebraska - Lincoln (1154-92-2784)

4:15 PM  Selectivity of the KcsA potassium channel: Analysis and computation.
Zilong Song*, UC Riverside, Xiulei Cao, York University, Tzvy-Leng Horng, Feng Chia University, and Huaxiong Huang, York University (1154-35-1266)
AMS Contributed Paper Session on Number Theory, II

1:00 PM – 4:40 PM  Room 602, Meeting Room Level, Colorado Convention Center

1:00PM  (2573)  A Primitive Counterpart to the Fifteen Theorem.
Andrew G Earnest* and Lakshika Gunawardana*, Southern Illinois University Carbondale (1154-11-1760)

1:15PM  (2574)  Explicit Classification of Isogeny Classes of Rational Elliptic Curves.
Alexander J. Barrios*, Carleton College (1154-11-2712)

1:30PM  (2575)  Minimal Discriminants of Rational Elliptic Curves with Specified Isogeny.
Alvaro Cornejo*, University of California, Santa Barbara, Owen Eklblad, University of Michigan at Dearborn, Marietta Geist, Carleton College, Kayla Harrison, Eckerd College, and Abigail Loe, Carleton College (1154-11-2747)

1:45PM  (2576)  Eisenstein series at marked points
approaching a cusp.
Daniel Garbin, Queensborough Community College, CUNY (1154-11-1906)

2:00PM  (2577)  Small Mahler Measure in Cubic Fields.
Lydia Eldredge* and Kate Petersen, Florida State University (1154-11-2172)

2:15PM  (2578)  Extremal and Probabilistic Results for Sum-Difference Sidon Sets.
Sayok Chakravarty*, University of California, San Diego, and Alitzin Cornejo-Reynoso, Harvey Mudd College (1154-11-1941)

2:30PM  (2579)  Metacommutation in quaternion orders and actions on the Bruhat-Tits tree.
Angelica Babei*, Vanderbilt University, and Sara Chari, Bates College (1154-11-2764)

2:45PM  (2580)  The Diophantine equation
m.A² + n.B³ = C³.
Susil Kumar Jena, Plot No-170, Sector-5, Niladri Vihar, Chandrasekharpur, Bhubaneswar-751021, Odisha, India (1154-11-2231)

3:00PM  (2581)  Augmented Generalized Happy Numbers.
Breeanne Baker Swart, The Citadel, Kristen Beck, Saint Mary’s College of California, Susan Crook, Loras College, Christina Eubanks-Turner, Loyola Marymount University, Helen G. Grundman*, Bryn Mawr College, Laura Hall-Seelig, Merrimack College, May Mei, Denison University, and Laurie Zack, High Point University (1154-11-2247)

3:15PM  (2582)  Rational points close to a hypersurface and the dimension growth conjecture.
Jing-Jing Huang, University of Nevada, Reno (1154-11-2833)

3:30PM  (2583)  Counting Towers of Number Fields.
Brandon Alberts, University of Connecticut (1154-11-2381)

3:45PM  (2584)  The average size of the automorphism group of a smooth projective hypersurface in the large degree limit.
Vlad Matei, University of California Irvine (1154-11-2435)

4:00PM  (2585)  Metacommutation and ideals of prime norm in locally Eichler orders.
Preliminary report.
Sara Chari*, Bates College, and Angelica Babei, Vanderbilt University (1154-11-2696)

4:15PM  (2586)  Counting primitive subsets and other statistics of the divisor graph of \{1, 2, \ldots, n\}.
Nathan G McNew, Towson University (1154-11-2639)

4:30PM  (2587)  Abundant Numbers and Nonunique Factorization.
Paul Baginski*, Fairfield University, and Jill Stifano, Fairfield University and Brandeis University (1154-11-2708)

MAA Contributed Paper Session on Active Learning in Introductory Courses: Insights from Math Departments in the Process of Change, III

1:00 PM – 2:55 PM  Room 501, Meeting Room Level, Colorado Convention Center

Organizers: Chris Rasmussen, San Diego State University
               Wendy Smith, University of Nebraska Lincoln
               Matthew Voigt, San Diego State University

1:00PM  (2588)  Establishing Learning Assistant
Gina Monks, Penn State - Hazleton (1154-A5-332)
Program of the Sessions – Saturday, January 18 (cont’d.)


1:40PM ▶ (2590) Role of Active Collaborative Learning Workshops in Changing the Introductory Mathematics Course. Vesna Kilibrda*, Yuanying Guan and Xiaofang Wang, Indiana University Northwest (1154-A5-1682)

2:00PM ▶ (2591) Establishing Consistent Active Learning in Calculus I Courses. Steve Bennoun* and Tara Holm, Cornell University (1154-A5-974)

2:20PM ▶ (2592) Our Experiences in a Graduate Teaching Assistant Training Pilot. Preliminary report. Daniel James* and Christopher Raymond, University of Delaware (1154-A5-2816)

2:40PM ▶ (2593) Active Calculus at the University of Florida. Preliminary report. Darryl J Chamberlain Jr., Kevin Knudson, Melissa Shabazz, Willard Keenan, Alexander York, Amy Grady* and Corey Stone, University of Florida (1154-A5-2586)

MAA Contributed Paper Session on Inclusive Excellence for the Mathematical Sciences, III

1:00 PM – 1:55 PM Room 504, Meeting Room Level, Colorado Convention Center

Organizers: Naïomi Cameron, Lewis & Clark College
          Rachelle DeCoste, Wheaton College
          Chris Goff, University of the Pacific
          Semra Kılıç-Bahi, Colby-Sawyer College

1:00PM ▶ (2594) How Oxford College’s Mathematics Center Encourages Inclusivity. Christina Lee, Oxford College of Emory University (1154-F5-2349)

1:20PM ▶ (2595) Girls Talk Math: Providing a Path to Math-related Careers through Early Support and Media. Sarah Cassie Burnett, University of Maryland at College Park (1154-F5-2348)

1:40PM ▶ (2596) Programmatic Inclusive Environment Building in the Context of a Large Department. Hanna Bennett*, Paul Kessenich, P. Gavin LaRose and Nina White, University of Michigan (1154-F5-2127)

MAA General Contributed Paper Session on Applied Mathematics, IV

1:00 PM – 3:25 PM Room 709, Meeting Room Level, Colorado Convention Center

Organizers: Cathy Erbes, Hiram College
          Holley Friedlander, Dickinson College
          Steven McKay, Brigham Young University

1:00PM ▶ (2597) Stress-strength Inference for the Multicomponent System Based on Progressively type-II censored samples from Pareto Distributions. Preliminary report. Lauren J Sauer, University of South Dakota (1154-VN-2131)


1:45PM ▶ (2600) Risk Assessments and Measurements of Privacy Leaks within Google’s Ads Data Hub. Miguel Fuentes*, University of Delaware, Shreya Gupta, Delhi Technological University, Sarika Aggarwal, University of Pittsburgh, and Aviva Prind, University of Maryland, College Park (1154-VN-407)

2:00PM ▶ (2601) Symmetries of the Canonical Geodesic Equations of Five-Dimensional Nilpotent Lie Algebras. Hassan Almusawa*, Virginia Commonwealth University, Ryad Ghanam and Gerard Thompson, University of Toledo (1154-VV-2789)

2:15PM ▶ (2602) Rayleigh-Bénard Problem (2D): A Determining Form and Algebraic Bounds on the Global Attractor. Yu Cao, Indiana University (1154-VN-2160)

2:30PM ▶ (2603) Numerical Results for Linear Sequential Caputo Fractional Boundary Value Problems with Mixed Nonhomogeneous Boundary Conditions. Preliminary report. Bhuvaneswari Buna Sambandham*, Dixie State University, Aghalaya S Vatsala, University of Louisiana at Lafayette, and Vinodh K Chellamuthu, Dixie State University (1154-VN-452)

2:45PM ▶ (2604) High Order Local Discontinuous Galerkin Method for Solving Nonlinear Thin Film Equations. Caleb Logemann* and James Rossmanneth, Iowa State University (1154-VN-1614)
MAA General Contributed Paper Session on Teaching and Learning Mathematics, II

1:00 PM – 4:40 PM Room 707, Meeting Room Level, Colorado Convention Center

Organizers: Cathy Erbes, Hiram College

Holley Friedlander, Dickinson College

Steven McKay, Brigham Young University

1:30PM Finding the missing values: An activity for introducing limits in a Calculus course.

Bernadette Boyle, Sacred Heart University (1154-VI-2223)

1:45PM Shortening Pathways to Completing Calculus.

Preliminary report.

Brendan Kelly*, Harvard, Emina Alibegovic, Rowland Hall, Rebecca Noonan-Heale, Anna Schoening and Amanda Cangelosi, University of Utah (1154-VI-2820)

2:00PM Using an Ellipse to Compute the Elipse of an Ellipse in Multivariate Calculus.

Melanie Pivarski, Roosevelt University (1154-VI-2618)

2:15PM Using Peer Facilitators in Calculus Labs.

Preliminary report.

Jordan Nikkel* and Cathy Grilli, Christian Brothers University (1154-VI-1724)

2:30PM Designing a Calculus Course for Middle School Teachers.

Preliminary report.

Reva Kasman, Salem State University (1154-VI-1410)

2:45PM Active Learning in College Calculus: Supporting Instructors and Targeting Cultural Change.

Brian E. Moore*, Erin Saitta, Michele Gill, Jacylenj J. Chin, Melissa Dagley and Xin Li, University of Central Florida (1154-VI-2190)

3:00PM Mastery-Based Grading in a Large Calculus Course.

Silva Chang* and Anne Dougherty, University of Colorado Boulder (1154-VI-2810)

3:15PM A Propensity Score Matching Analysis of the Effects of Assessment and Learning in Knowledge Spaces (ALEKS) on Student Achievement at a Historically Black University.

Torina Lewis, Clark Atlanta University (1154-VI-2568)

3:30PM Achieving a Baseline for Preparation in the Mathematics Classroom.

Tyson H. Walsh*, Matt Webb, Lee Evans and Kayla Blyman, United States Military Academy – West Point (1154-VI-2213)

3:45PM Massachusetts Department of Higher Education Mathematics Pathways Project & Bridgewater State University.

Preliminary report.

Rebecca Metcalf, Bridgewater State University (1154-VI-1588)

4:00PM Coordinating Calculus with Limited Resources.

Jila Niknejad* and Joseph Phillip Brennan, University of Kansas (1154-VI-1997)

4:15PM Co-requisite courses and the STEM pathway: a report from Humboldt State University.

Bori Mazzag, Humboldt State University (1154-VI-1986)

4:30PM Instructors’ and Administrators’ Experiences: Perspectives from the Other Side of Developmental Mathematics Reform.

Jennifer Zakotnik-Gutierrez, University of Northern Colorado (1154-VI-2462)

SIAM Minisymposium on Deterministic and Probabilistic Approaches for Nonlinear PDEs.

1:00 PM – 5:25 PM Room 301, Meeting Room Level, Colorado Convention Center

Organizer: Hakima Bessaih, University of Wyoming

1:00PM Pointwise convergence of the Schrödinger flow.

Erin Compaan, MIT, Renato Luca*, Universitàt Basel, and Gigliola Staffilani*, MIT (1154-35-1937)

1:30PM Uniform large deviations principles.

Michael Salins, Boston University (1154-60-439)

2:00PM Behavior of solutions in stochastic critical and supercritical NLS equation with additive or multiplicative noise.

Svetlana Roudenko, Florida International University (1154-35-2522)

2:30PM An A Posteriori Error Estimation for Numerical Solution of Richards Equation.

Preliminary report.

Victor Ginting, University of Wyoming (1154-65-2252)
Monday, January 13 – Program of the Sessions

MAA-AMS-SIAM Gerald and Judith Porter
Public Lecture
3:00 PM – 3:50 PM  Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center
   (2634)  The fantastic intersection of math and sports: Where no one is afraid of a decimal point.
Rajiv Maheswaran, Second Spectrum
(1154-00-9)

AMS Panel
4:30 PM – 6:00 PM  Room 403, Meeting Room Level, Colorado Convention Center
   Mathematics and Motherhood: A Town Hall with Women in Leadership
Organizers:  Della Dumbaugh, University of Richmond
            Carrie Diaz Eaton, Bates College
            Emille Davie Lawrence, University of San Francisco
Moderator:  Karoline Pershell, Association for Women in Mathematics and Service Robotics and Technologies
Panelists:  Maeve McCarthy, Murray State University
            Karen Saxe, American Mathematical Society
            Maggy Tomova, University of Iowa
            Talithia Williams, Harvey Mudd College

AMS Social at JMM2020: Mathematicians in the Performing Arts
6:00 PM – 9:30 PM  Chambers Grant Salon, Denver Performing Arts, 1355 Curtis Street, Denver
Michel L. Lapidus  Hortensia Soto
AMS Associate Secretary  MAA Associate Secretary
Riverside, California  Greeley, Colorado