

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

9:00AM Registration

9:45AM Introduction

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

11:30AM Break

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

NOON Lunch

2:00PM *The Master Equation.*
(3) **F. Delarue**, Université Cote d'Azur,
France

3:15PM Discussion and Break

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

5:00PM 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.

Program of the Sessions – Tuesday, January 14 (cont'd.)

**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

9:00AM *The convergence problem.*
(5) **Daniel Lacker**, Columbia University

10:15AM Break

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

NOON Lunch

2:00PM *Numerical methods.*
(7) **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

8:00AM *Eigenvalue Distributions of Random
Iterated Block Matrices.*
► (8)

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)

8:30AM *Solvability of Multiple Unicast Networks
Over Finite Fields.*
► (9)

Paige 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)

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

9:30AM *Probabilistic Counting-Out Game on a
Line.* Preliminary report.
► (11) **Tingting Ou*** and **Michelle Shu**, Johns
Hopkins University (1154-05-1055)

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

10:30AM *Most Reliable Two-Terminal Graphs With
Node Failures.*
► (13) **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

8:00AM *Choice from finite sets — a topos view.*
(14) Preliminary report.
Andreas Blass, University of Michigan
(1154-03-317)

8:30AM (15) *Ground model definability in ZF.*
Victoria Gitman, CUNY Graduate Center
 (1154-03-774)

9:00AM (16) *Friedman-Stanley jumps and
 Kinna-Wagner principles.*
Assaf Shani, CMU, Harvard
 (1154-03-704)

9:30AM (17) *What does a choiceless model theory look
 like?*
Rehana Patel, African Institute for
 Mathematical Sciences-Senegal
 (1154-03-2040)

10:00AM (18) *Polish groupoids and $\mathcal{L}_{\omega_1\omega}$ -theories.*
Ruiyuan Chen, University of Illinois at
 Urbana-Champaign (1154-03-1217)

10:30AM (19) *Groundedness of infinitary sentences.*
 Preliminary report.
Michael C. Laskowski, University of
 Maryland (1154-03-839)

**AMS-AWM Special Session on Women in
 Mathematical Biology, I**

8:00 AM – 10:50 AM **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

8:00AM (20) *Tumor control, elimination, and escape
 through a compartmental model of
 dendritic cell therapy for melanoma.*
Lauren Johnson Dickman, Arizona State
 University (1154-92-846)

8:30AM (21) *Topological Data Analysis for Ring
 Channels in Intracellular Transport.*
Maria-Veronica Ciocanel*, MBI/The Ohio
 State University, **Riley Juenemann**,
 Mathematics/Tulane University, **Adriana
 Dawes**, Mathematica, Molecular
 Genetics/The Ohio State University, and
Scott McKinley, Mathematics/Tulane
 University (1154-92-418)

9:00AM (22) *Handguns and Hotspots: Cellular
 Automata Models of Gun Crime in
 Chicago, Illinois.* Preliminary report.
Shelby M Scott, University of Tennessee,
 Knoxville (1154-92-776)

9:30AM (23) *Understanding the role of fibrinogen in
 fibrin gel formation: Kinetic models of
 two monomer polymerization.*
Anna Nelson*, **Aaron Fogelson** and
James Keener, University of Utah
 (1154-92-1627)

10:00AM (24) *Agent-based multi-scale modeling
 enhances understanding of the immune
 response to M. tuberculosis infection.*
 Preliminary report.

Caitlin S. Hult*, **Jennifer J. Linderman**
 and **Denise E. Kirschner**, University of
 Michigan (1154-92-1810)

10:30AM (25) *Multiscale modeling of epidermal-dermal
 interactions during skin wound healing.*
Huijing Du, University of
 Nebraska-Lincoln (1154-35-508)

**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 (26) *Symplectic embedding problems.*
 Preliminary report.
Dusa McDuff, Barnard College
 (1154-53-767)

9:00AM (27) *Legendrian Invariants.* Preliminary
 report.
Ziva Myer, Duke University
 (1154-53-2287)

9:30AM (28) *Homological mirror symmetry for the
 Hopf surface.*
Abigail R. Ward, Stanford University
 (1154-51-1296)

10:00AM (29) *Symplectic Cohomology of Affine
 Varieties.* Preliminary report.
Dahye Cho, Stony Brook University
 (1154-51-707)

10:30AM (30) *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

Rochy 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.*
(31) **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.*
(32) **Lynne Yengulalp**, Wake Forest University (1154-54-525)
- 9:00AM *All the augmentations come from immersed Lagrangian fillings.*
(33) **Yu Pan***, MIT, and **Dan Rutherford**, Ball State University (1154-57-40)
- 9:30AM *The embedded contact homology of Seifert fiber spaces.*
(34) **Jo Nelson** and **Morgan Weiler***, Rice University (1154-53-669)
- 10:00AM *Computational grid Floer homology: explorations of crossing change and knot genus.*
(35) **Margaret I Doig**, Creighton University (1154-54-1727)
- 10:30AM *k-matching sequences of simplicial complexes.*
(36) **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.*
(37) **Paul S. Muhly**, Department of Mathematics, University of Iowa (1154-47-1095)
- 9:00AM *Jordan decomposition for free noncommutative kernels.* Preliminary report.
(38) **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.
(39) **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.*
(40) **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.*
(41) **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.*
(42) **Ralph S Freese**, University of Hawaii (1154-08-718)
- 9:30AM *Varieties of Semilattice Sums.* Preliminary report.
(43) **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.
▶ (44) **George F McNulty**, University of South Carolina (1154-08-1375)
- 10:30AM *Supernilpotence Need Not Imply Nilpotence.*
(45) **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.*
▶ (46) **Michael G. Luby**, International Computer Science Institute (1154-15-2464)

8:30AM *Distributions for Luby Transform Codes with Low Encoding Node Degrees.*
(47)
Preliminary report.

Carolyn Mayer, Worcester Polytechnic Institute (1154-94-2085)

9:00AM *How to distribute the multiplication of Secret Matrices?*
(48)

Salim El Rouayheb*, Rutgers, **Rafael G.L. D Oliveira**, Rutgers University, **David Karpuk**, F Secure, and **Daniel Heinlein**, Aalto University (1154-00-486)

9:30AM *Load Balancing Properties of Codes and Matching Problems on Graphs.*
▶ (49)
Preliminary report.

Emina Soljanin, Rutgers University (1154-05-2440)

10:00AM *Graph-Based Codes & Window Decoding.*
▶ (50)
Preliminary report.

Emily McMillon*, University of Nebraska - Lincoln, **Allison Beemer**, New Jersey Institute of Technology, and **Christine A Kelley**, University of Nebraska - Lincoln (1154-94-1115)

10:30AM *Graph based codes for distributed storage.*
▶ (51)

Iwan Duursma*, **Xiao Li** and **Hsin-Po Wang**, Univ of Illinois Urbana-Champaign (1154-05-1753)

AMS Special Session on Cohomological Field Theories and Wall Crossing, I

8:00 AM – 10:40 AM **Room 106, Meeting Room Level, Colorado Convention Center**

Organizers: **Yefeng Shen**, University of Oregon

Mark Shoemaker, Colorado State University

8:00AM *Virtual Cycle on the Moduli Space of Maps to a Complete Intersection.*
(52)
Rachel Webb*, University of Michigan, **Felix Janda**, Institute for Advanced Study, and **Qile Chen**, Boston College (1154-14-1531)

8:30AM *Mirror Symmetry for nonabelian Landau-Ginzburg models.*
▶ (53)

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

9:00AM *Gopakumar-Vafa invariants and the $P=W$ conjecture.*
(54)

Junliang Shen, MIT (1154-14-560)

9:30AM *The stability manifold of local orbifold elliptic quotients.*
(55)

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

10:00AM *On factorization and vector bundles of conformal blocks from vertex algebras.*
(56)
Preliminary report.

C Damiolini, 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 Glazyrin, University of Texas Rio Grande Valley

Kasso Okoudjou, University of Maryland, College Park

Oleksandr Vlasiuk, Florida State University

8:00AM *Universal optimality and its failure.*
(57)
Henry Cohn, Microsoft Research New England (1154-52-2681)

9:00AM *Discreteness of minimizing measures.*
(58)
Dmitriy Bilyk, University of Minnesota (1154-28-1219)

9:30AM *Optimal packings in real projective spaces.*
(59)
Dustin G. Mixon and **Hans Parshall***, The Ohio State University (1154-52-1644)

10:00AM *Stable phase retrieval from magnitude of point evaluation for infinite dimensional subspaces of $L_2(\mathbb{R})$.*
▶ (60)
Robert Calderbank, **Ingrid Daubechies**, Duke University, **Daniel Freeman***, St Louis University, and **Nikki Freeman**, University of North Carolina, Chapel Hill (1154-46-1572)

10:30AM *Supports of solutions to the minimal log-energy problem with constraints.*
(61)
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

8:00AM *Introduction to Group Actions in Harmonic Analysis.*
(62)
Emily J King, Colorado State University (1154-43-1813)

8:30AM *Wasserstein ISOMAP for Image Manifold Learning.* Preliminary report.
(63)
Keaton Hamm* and **Nick Henscheid**, University of Arizona (1154-68-803)

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

9:00AM *The Prony-Laplace method for identifying burst-like forcing terms.*
▶ (64) **Akram Aldroubi**, Vanderbilt University, **Longxiu Huang**, University of California Los Angeles, **Keri A. Kornelson**, University of Oklahoma, and **Ilya A. Krishtal***, Northern Illinois University (1154-41-603)

9:30AM *Time-Variant System Approximation via Later-Time Samples.* Preliminary report.
(65) **Roza Aceska***, Ball State University, and **Yeon Hiang Kim**, Central Michigan University (1154-42-1408)

10:00AM *Constructing tight unit norm frames for finite-dimensional Banach spaces using group actions.* Preliminary report.
(66) **J. Alejandro Chávez-Domínguez**, University of Oklahoma (1154-46-1072)

10:30AM *HRT conjecture and linear independence of translates on the Heisenberg group.* Preliminary report.
(67) **Bradley Currey**, St. Louis University, and **Vignon Oussa***, Bridgewater State University (Massachusetts) (1154-43-241)

AMS Special Session on Hamiltonian Systems, I

8:00 AM – 10:50 AM Room 406, Meeting Room Level, Colorado Convention Center

Organizers: **Sean Gasioerek**, 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.*
(68) **Philip J Morrison**, The University of Texas at Austin (1154-37-1825)

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

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

9:30AM *Scattering in the N-Body Problem; Preliminary Report.*
(71) **Richard Montgomery**, UC Santa Cruz (1154-37-1738)

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

10:30AM Discussion

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.*
▶ (73) **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.*
(74) **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.*
(75) **Chartese Darnel Jones**, Mississippi State University (1154-65-2149)

9:30AM *Dynamics of a childhood disease model with isolation.*
▶ (76) **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.*
▶ (77) **Ricela Feliciano-Semidei**, Northern Illinois University (1154-97-397)

10:30AM *Probability of Consensus in Spatial Opinion Models with Confidence Threshold.*
▶ (78) **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.
▶ (79) **Shashika Nuwan Chamara Petta Mestrige**, Baton Rouge (1154-11-1407)

8:30AM (80) *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 (81) *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 (82) *Parity considerations in Rogers–Ramanujan–Gordon type overpartitions.*

Ae Ja Yee, Penn State University (1154-11-1418)

10:00AM (83) *The method of weighted words re-visited.* Preliminary report.

Ali K Uncu, Austrian Academy of Sciences OeAW RICAM / Johannes Kepler University RISC (1154-05-1343)

10:30AM (84) *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 (85) *Some Inverse Problems in Graph Signal Processing.* Preliminary report.

Qiyu Sun, University of Central Florida (1154-94-1074)

8:30AM (86) *Inverse Magnetization Problems and Potential Field Separation.*

Christian Gerhards, TU Bergakademie Freiberg (1154-49-1349)

9:00AM (87) *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 (88) *Semiclassical Sampling and Discretization of Linear Inverse Problems.*

Plamen Stefanov, Purdue University (1154-35-1052)

10:00AM (89) *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)

10:30AM (90) *Lattice Point Identities, Shannon Sampling, and Antenna Problem.*

Willi Freeden, Department of Mathematics, University of Kaiserslautern, Germany (1154-41-1069)

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 (91) *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 (92) *Monte Carlo approximation certificates for k-means clustering.*

Soledad Villar, New York University (1154-90-1259)

9:00AM (93) *On the minimum ℓ_p -norm of random matrices.* Preliminary report.

Josiah Park, Georgia Tech (1154-60-2762)

9:30AM (94) *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 (95) *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 (96) *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 (97) *Localization in Hochschild Homology and Applications.*

Markus Pflaum, University of Colorado (1154-18-732)

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

8:30AM (98) *Idempotent elements and holomorphic structures on quantum complex projective spaces.* Preliminary report.
Adam-Christiaan van Roosmalen, Hasselt University, **Réamonn Ó Buachalla**, Université libre de Bruxelles, and **Zhaoting Wei***, Kent State University at Geauga (1154-51-633)

9:00AM (99) *Gapped boundary theories in three dimensions.* Preliminary report.
Daniel S Freed, University of Texas at Austin (1154-81-1261)

10:00AM (100) *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)

10:30AM (101) *Geodesics in the Banach-Mazur distance.*
Alvaro Arias* and **Vladimir Kovalchuk**, University of Denver (1154-46-665)

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

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

8:00AM (102) *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)

9:00AM (103) *Numerical simulations of macroscopic quantities for stochastic differential equations with α -stable processes.*
Xiaofan Li, Illinois Institute of Technology (1154-65-584)

9:30AM (104) *Optimal distribution of dielectrics via boundary integral constrained optimization.*
Oana Marin, **Marieme Ngom*** and **Barry Smith**, Argonne National Laboratory (1154-35-1213)

10:00AM (105) *New results for the EMAC formulation of the Navier-Stokes equations.* Preliminary report.
Leo Rebholz, Clemson University (1154-65-1432)

10:30AM (106) *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 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

8:00AM (107) *Dimensions of generalized spline spaces.*
Laetitia Huang, **Valeri Jean-Pierre***, **Karen Reed** and **Isabella Zhu**, Smith College (1154-05-2769)

8:30AM (108) *A Tale of Two Graph Theory Projects: From Graceful Trees to Domino Tilings.* Preliminary report.
Rachelle Bouchat*, **Patrick Cone** and **Williem Rizer**, Indiana University of Pennsylvania (1154-05-2491)

9:00AM (109) *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)

9:30AM (110) *Arithmetical structures on graphs.*
Joel Louwsma, Niagara University (1154-05-1221)

10:00AM (111) *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)

10:30AM (112) *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

Manon Stipulanti, Hofstra University

- 8:00AM (113) *Combinatorics of Kaprekar's Junction Numbers*. Preliminary report.
Max Alekseyev*, George Washington University, and **Neil Sloane**, The OEIS Foundation, Inc. (1154-11-1093)
- 8:30AM (114) *Bow Sequences*.
Melissa Dennison, Baldwin Wallace University (1154-11-2289)
- 9:00AM (115) *Automatic sequences and curves over finite fields*.
Andrew Bridy, Yale University (1154-11-1900)
- 9:30AM (116) *Substitutive systems and a finitary version of Cobham's theorem*.
Jakub Byszewski, Jagiellonian University (1154-05-1737)
- 10:00AM (117) *Syntactic Tokens*.
Andrzej Ehrenfeucht, Computer Science Dept. University of Colorado Boulder (1154-05-263)
- 10:30AM (118) *Automorphisms of the Free Group and Perfectly Clustering Words*.
Mélodie Lapointe, LaCIM, Université du Québec à Montréal (1154-05-1181)

AMS Special Session on Singularities and Characteristic Classes, I

8:00 AM – 10:50 AM **Room 108, Meeting Room Level, Colorado Convention Center**

Organizers: **Paolo Aluffi**, Florida State University
Leonardo Mihalcea, Virginia Tech

- 8:00AM (119) *Motives of intersections of quadrics and the Feynman integral of the massive sunset graph*.
Matilde Marcolli*, Caltech, and **Goncalo Tabuada**, MIT (1154-14-1803)
- 8:30AM (120) *Algebraic approximation of analytic and semi-analytic sets*.
Leslie C Wilson*, University of Hawaii, Manoa, **Massimo Ferrarotti**, Politecnico di Torino, and **Elisabetta Fortuna**, Università di Pisa (1154-14-804)
- 9:00AM (121) *Characteristic Polar Cycles of Perverse Sheaves*.
David B Massey, Northeastern University (1154-32-597)
- 9:30AM (122) *An enriched count of the bitangents to a smooth plane quartic curve*.
Hannah Larson and **Isabel Vogt***, Stanford University (1154-14-1326)
- 10:00AM (123) *Linear recurrence sequences and the duality defect conjecture*.
Grayson Jorgenson, Florida State University (1154-14-1209)
- 10:30AM (124) *Characteristic classes of vector bundles on spheres and Bott periodicity: algebra, geometry, topology*.
Hannah Larson and **Ravi Vakil***, Stanford University (1154-14-2194)

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

- 8:00AM (125) *Ballistic transport for one-frequency Schrödinger operators*. Preliminary report.
Ilya Kachkovskiy, Michigan State University (1154-47-2000)
- 8:30AM (126) *Diffusion in the mean for a periodic Schrödinger equation perturbed by a fluctuating potential*.
J Schenker, **F Z Tilocco***, Michigan State University, and **S Zhang**, University of Minnesota (1154-47-2272)
- 9:00AM (127) *An energy-dependent Lieb-Robinson bound for quantum rotors*. Preliminary report.
Alvin Moon, UC Davis (1154-81-1504)
- 9:30AM (128) *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/MCQST (1154-82-1414)
- 10:00AM (129) *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)
- 10:30AM (130) *Localization at the bottom of the spectrum of a disordered XXZ spin chain*. Preliminary report.
Alexander Elgart*, Virginia Tech, and **Abel 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

- 8:00AM (131) *Properties of low complexity symbolic systems and applications*.
Van Cyr*, Bucknell University, and **Bryna Kra**, Northwestern University (1154-37-2418)
- 8:30AM (132) *Mapping class groups of zero-entropy subshifts*.
Kitty Yang, Northwestern University (1154-37-2165)

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

9:00AM (133) *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)

9:30AM (134) *Low Complexity and the Loosely Bernoulli Property.* Preliminary report.
Van Cyr, Bucknell University, **Aimee Johnson**, Swarthmore College, **Bryna Kra**, Northwestern University, and **Ayşe Şahin***, Wright State University (1154-37-2406)

10:00AM (135) *Determining when a Bratteli-Vershik system is expansive.*
Sarah Bailey Frick, Furman University (1154-37-2198)

10:30AM (136) *Characteristic Measures of Symbolic Dynamical Systems.*
Joshua Frisch, California Institute of Technology (1154-37-2341)

MAA Invited Paper Session on Creating Spaces for Mathematics

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

Organizer: **Della Dumbaugh**, University of Richmond

▶ 8:00AM (137) *Prospering Through Questions and Answers: Almanacs as a space for English mathematicians to prosper, 1775-1850.*
Sloan Evans Despeaux, Western Carolina University (1154-AA-399)

▶ 8:30AM (138) *19th-century eclipse expeditions: A space for mathematical greatness?*
Deborah A. Kent, Drake University (1154-AA-1987)

▶ 9:00AM (139) *Bryn Mawr College, 1885-1940: "Mathematics on its mind".*
Madeline E. Polhill, University of Richmond (1154-AA-48)

▶ 9:30AM (140) *The case for mathematical models – in which Charlotte Angas Scott attempts to build a mathematical research school.*
Jemma Lorenat, Pitzer College (1154-01-100)

▶ 10:00AM (141) *Emergency Mathematics for the Engineer: US Regional Training Programs in the Second World War.*
Brit Shields, University of Pennsylvania (1154-AA-1579)

▶ 10:30AM (142) *Spreading the Wealth: The Ford Foundation and Eugene Northrop's Advancement of Mathematics and Science at Home and Abroad.*
Patti W Hunter, Westmont College (1154-AA-1494)

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 (143) *Module bundles and module amenability.*
Terje Höim*, Wilkes Honors College, Florida Atlantic University, and **D. A. Robbins**, Tucson, AZ (1154-46-282)

8:15AM (144) *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 (145) *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 (146) *Unitary topological free entropy.* Preliminary report.
Weihua Li, Columbia College Chicago (1154-46-1846)

9:00AM (147) *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)

▶ 9:15AM (148) *Theorem of isomorphism and theorem of reduction for real non-commutative L_p -spaces.* Preliminary report.
Sofya S Masharipova*, University of Pittsburgh at Johnstown, and **Shukhrat M Usmanov**, Concord University (1154-46-1957)

9:30AM (149) *On Gelfand-Naimark theorem for real locally W^* -algebras.*
Alexander A. Katz, St. John's University, NY, USA, **Roman Kushnir** and **Mark Ustayev***, University of South Africa, Pretoria, RSA (1154-46-2307)

9:45AM (150) *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 (151) *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)

- 8:15AM (152) *Sinc and Solitary Wave Solutions to the Generalized Benjamin-Bona-Mahony-Burgers Equations.*
Kamel M. Al-Khaled, Jordan University of Science and Technology (1154-35-63)
- 8:30AM (153) *P1 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)
- 8:45AM (154) *Radiation dynamics in fast soliton collisions in the presence of nonlinear dissipation.*
Avner Peleg*, Jerusalem, Israel, and **Debananda Chakraborty**, Department of Mathematics, New Jersey City University, Jersey City, New Jersey 07305, USA (1154-35-291)
- 9:00AM Break
- 9:15AM (155) *Micropteron traveling waves in diatomic Fermi-Pasta-Ulam-Tsingou lattices under the equal mass limit.*
Timothy E. Faver* and **Hermen Jan Hupkes**, Leiden University (1154-35-493)
- 9:30AM (156) *Generalized Two-phase Mass Flow Model.* Preliminary report.
Sayonita Ghosh Hajra, California State University, Sacramento (1154-35-576)
- 9:45AM (157) *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)
- 10:00AM (158) *Neural partial differential equation solver with fractional gradient descent.*
Mostafa Rezapour*, **Adebowale Sijuwade** and **Thomas J. Asaki**, Washington State University (1154-35-714)
- 10:15AM (159) *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)
- 8:00AM (160) *Online Exercises for a Proofs Course.*
Susanna S Epp, DePaul University (1154-B1-1871)
- 8:20AM (161) *An Online IBL Geometry Class.*
Nathaniel Miller, University of Northern Colorado (1154-B1-977)
- 8:40AM (162) *Hands-On-Online Real Life Data Collection.*
Kirsten K Meymaris* and **Michael Heeren**, Purdue University Global (1154-B1-2633)
- 9:00AM (163) *Addressing Mindset, Pacing, Comprehension, and Persistence in Online Self-Paced Mathematics Classes.* Preliminary report.
Erika Wittenborn*, **Heather Rosenblatt**, **Hilda Black** and **Neil Starr**, Western Governors University (1154-B1-1968)
- 9:20AM (164) *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)
- 9:40AM (165) *Tools, tips, and techniques: Lessons learned from a decade of teaching statistics online.*
Kate McGivney, Shippensburg University (1154-B1-1172)
- 10:00AM (166) *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

9:20AM (167) *Using tools like Mathematica and Wolframalpha to develop exercise problems with solutions in a Discrete Math Course.*
Mohamed Jamalooden, Georgia Gwinnett College (1154-D1-1369)

9:40AM (168) *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)

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

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

10:00AM *The Power of Nested Loops.*
▶ (169) **John S. Caughman***, Portland State University, and **Elise Lockwood**, Oregon State University (1154-D1-2807)

10:20AM *Counting Problems with Python.*
▶ (170) **Jason Lee**, Montgomery College (1154-D1-42)

10:40AM *Connecting Sets of Outcomes with Counting Processes: What is the mth element?*
▶ (171) **Adaline E De Chenne*** and **Elise Lockwood**, Oregon State University (1154-D1-1789)

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

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

8:00AM *The Origins of Mathematics: An Inquiry-based Seminar in the History of Mathematics.* Preliminary report.
▶ (172) **Benjamin Purkis**, Oxford College of Emory University (1154-H5-2355)

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

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

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

9:20AM Break

9:40AM *Promoting Inquiry in Linear Algebra with Student Videos, Reflections, and Portfolios.* Preliminary report.
▶ (176) **Megan Wawro***, Virginia Tech, **Michelle Zandieh**, Arizona State University, **Christine Andrews-Larson**, Florida State University, and **David Plaxco**, Clayton State University (1154-H5-2600)

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

10:20AM *Complementing Inquiry-based Learning with Specification Grading in a Differential Equations Course.* Preliminary report.
▶ (178) **Mami T Wentworth*** and **Mel Henriksen**, Wentworth Institute of Technology (1154-H5-2108)

10:40AM *Team Work and Evaluation: Finding the Missing Link.* Preliminary report.
▶ (179) **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

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

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

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

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

9:20AM *Design Principles of Hexastix and Related Homogeneous Cubic Cylinder Rod Packings.*
▶ (184) **Anduriel Widmark**, Denver, Colorado (1154-K1-122)

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

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

10:20AM *The Art of New Generalized Hilbert Curves: Pinwheel, Mandala, Meta-Hilbert, and Tendril-Based Half-Domino Curves.*
▶ (187) **Douglas McKenna**, Mathemaesthetics, Inc., Boulder, CO (1154-K1-1300)

10:40AM *Collaborative sculptural art installation using textile and other media to illustrate mathematical creativity.* Preliminary report.
▶ (188) **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 ▶ (189) *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 ▶ (190) *What does he \bar{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 ▶ (191) *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 ▶ (192) *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)
- 9:20AM ▶ (193) *Dynamic Groundwater Flow Modeling Investigations with Excel.*
Michael A. Karls, Ball State University (1154-L5-233)
- 9:40AM ▶ (194) *Stability of random Perturbed Logistic Model.*
Reza R Ahangar, Texas A& M University - Kingsville, Texas 78363 (1154-L5-2502)
- 10:00AM ▶ (195) *Teaching Differential Equations with Modeling First.*
Arati Nanda Pati, University of St. Thomas (1154-L5-1684)
- 10:20AM ▶ (196) *Comparing Symmetrical, Asymmetrical, and Parallel Modeling Projects.*
Corban Harwood, George Fox University (1154-L5-1281)
- 10:40AM ▶ (197) *Empirical Models for Tropical Storm Windspeeds After Landfall-A Modeling Activity using Separable Equations.*
Terrance L Pendleton, Drake University (1154-L5-1894)

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

8:00 AM – 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 Martínez-Garza, Pennsylvania State University at Berks

- 8:20AM ▶ (198) *Vector Calculus Imagery in Science Fiction and Fantasy.*
Cesar Martínez-Garza, Penn State - Berks (1154-Q5-2739)
- 8:40AM ▶ (199) *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 (200) *Stories and Jokes that Worked At Least Once.*
Susan B. Crook, Loras College (1154-Q5-2729)
- 9:20AM ▶ (201) *Cinematic Chicken: A Friendly Introduction to Game Theory.*
Jennifer Firkins Nordstrom*, Linfield College, and **Jessica K. Sklar**, Pacific Lutheran University (1154-Q5-1263)

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 ▶ (202) *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-O5-1037)
- 8:20AM ▶ (203) *Utilizing Exam Wrappers to Improve Student Metacognitive Skills in College Algebra.* Preliminary report.
Ashley D. Cherry, Lubbock Christian University (1154-O5-1695)
- 8:40AM ▶ (204) *Retrieving, Interleaving, and Intervention in Calculus.*
Daniel L Kern* and **Menaka Navaratna**, Florida Gulf Coast University (1154-O5-2441)
- 9:00AM ▶ (205) *What kinds of homework more effective for Calculus I students?* Preliminary report.
Kristin A. Camenga, Juniata College (1154-O5-1910)
- 9:20AM ▶ (206) *The Impact of Frequent Student-Faculty Interactions on Repeater Students.* Preliminary report.
Shanda R Hood* and **Joshua Girshner**, University of Arkansas (1154-O5-78)

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

- 9:40AM ▶ (207) *Using Primary Sources to Improve Classroom Climate and Promote Shared Responsibility.*
Spencer Bagley*, Westminster College, and **Anil Venkatesh**, Adelphi University (1154-O5-2126)
- 10:00AM ▶ (208) *Using inquiry-based learning as a form of professional development to assess teachers' dispositions towards mathematics.* Preliminary report.
Rita Patel*, College of DuPage, **Amanda Harsy**, Lewis University, and **Angela Antonou**, University of St. Francis (1154-O5-1455)
- 10:20AM ▶ (209) *An Analysis of Post-Secondary Mathematics Instructors.* Preliminary report.
Jimmy Edward Miller, University of Tennessee (1154-O5-627)
- 10:40AM ▶ (210) *S³MT: Supporting and Sustaining Scholarly Mathematics Teaching.* Preliminary report.
Jean McGivney-Burelle*, **Larissa Schroeder**, **Mako Haruta** and **Fei Xue**, University of Hartford (1154-O5-1544)

MAA General Contributed Paper Session on Algebra, I

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

- 8:00AM (211) *A New Method to Find Relations Between Invariants of Representations.*
Alison E Becker, University of Wisconsin-Milwaukee (1154-VL-1877)
- 8:15AM ▶ (212) *On the Weyl Algebras (I), by Jacques Dixmier Translated by Ann E. Rogers.* Preliminary report.
Ann E. Rogers, DePaul University, Chicago, IL (1154-VL-2567)
- 8:30AM (213) *Optimality of an Improved Bound on Pólya's Positivity Theorem (Univariate Case).* Preliminary report.
Brittany Riggs* and **Hoon Hong**, North Carolina State University (1154-VL-2288)
- 8:45AM ▶ (214) *Independence Complexes of Finite Groups.*
Casey M. Pinckney, Colorado State University (1154-VL-907)
- 9:00AM ▶ (215) *Check digit schemes and the Dihedral group.*
Cheryl Lynn Ferguson* and **Roman Wong**, Washington & Jefferson College (1154-VL-1159)
- 9:15AM (216) *Endomorphism invariant modules and ring classifications.* Preliminary report.
Haydee M Lindo, Williams College (1154-VL-2485)

- 9:30AM (217) *Explicit Pieri Inclusions.* Preliminary report.
John A Miller*, **Markus Hunziker** and **Mark Sepanski**, Baylor University (1154-VL-644)
- 9:45AM (218) *A Note on a Class of Generalized Nilpotent Groups Introduced by Bechtell and Doerk.* Preliminary report.
Joseph Kirtland, Marist College (1154-VL-481)
- 10:00AM (219) *Groups of Units Modulo $f(x)$.*
Karlee Westrem, University of Minnesota Duluth (1154-VL-1088)
- 10:15AM (220) *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

- 8:30AM ▶ (221) *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)
- 8:45AM (222) *Some Recent Advances in Group Coloring of Graphs.* Preliminary report.
Lucian Mazza, West Virginia University (1154-VP-1570)
- 9:00AM (223) *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)
- 9:15AM ▶ (224) *Adinkras: Pictures of supersymmetry and its friends.*
Kevin Iga, Pepperdine University and Brown University (1154-VP-2427)
- 9:30AM (225) *Inequalities of Kazhdan Constants on Isomorphic Graph Pairs.* Preliminary report.
Manuel A Davila, California State University of Los Angeles (1154-VP-2570)
- 9:45AM ▶ (226) *Seymour's Second Neighborhood Conjecture from a Different Perspective.*
Farid Bouya* and **Bogdan Oporowski**, Louisiana State University (1154-VP-1829)

- 10:00AM *Inflection Points and Comparability of Reliability Polynomials*. Preliminary report. (227)
Tyler Russell*, UT Tyler, **Isaac Brown**, Washington State University, and **Brendan Miller**, Saint Francis University (1154-VP-1815)
- 10:15AM *Planar Graphs with Girth 20 are Additively 3-choosable*. (228)
Alex Brandt, Northern Kentucky University, **Nathan Tenpas**, Vanderbilt University, and **Carl Yerger***, Davidson College (1154-VP-2143)
- 10:30AM *Enumerating Acyclic Orientations of Complete Multipartite Graphs*. (229)
Arvind Ayyer, 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

- 8:00AM *Incorporating Technology to make Calculus Interactive and Engaging in the Classroom*. Preliminary report. (230)
Dushanthi N Herath, Department of Mathematics, Maryville University (1154-VD-2424)
- 8:15AM *Using a Mathematical Software Package in a Class Exercise to Demonstrate Google's Simple PageRank Algorithm*. Preliminary report. (231)
Gerald Kruse, Juniata College (1154-VD-2229)
- 8:30AM *Digital Image Processing in Undergraduate Math*. (232)
Yevgeniy Galperin, East Stroudsburg University of PA (1154-VD-2236)
- 8:45AM *Using YouTube videos to promote learning inside and outside the classroom*. Preliminary report. (233)
Peyam Ryan Tabrizian, University of California - Irvine (1154-VD-2707)
- 9:00AM *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*. (234)
Bob Carmichael* and **Sid Grover**, Edfinity (1154-VD-2517)

- 9:15AM *A Standard Architecture for a Real-Time Monitoring System Based on the Internet of Things*. (235)
Nilakantha Paudel, Gran Sasso Science Institute, and **Ram C Neupane***, Texas A&M University-Texarkana (1154-VD-1475)
- 9:30AM *Mediating Victorian Geometry Anxiety Through Curve Stitching*. (236)
Brittany Anne Carlson, University of California, Riverside (1154-VD-330)
- 9:45AM *Conflicting Sines*. (237)
John Robert Botzum*, Kutztown University, and **Andrew Martin**, Kentucky State University (1154-VD-2362)
- 10:00AM *Existence of Measurable Cardinals and Modal Logic*. (238)
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)
- 10:15AM *Axiomatic Systems*. (239)
Janine E. Janoski, King's College (1154-VD-2614)
- 10:30AM *Finitely branching computable trees: a way to think about almost-solvable unsolvable problems*. Preliminary report. (240)
Joshua Cole, University of Findlay (1154-VD-2770)
- 10:45AM *Infinite paralysis*. Preliminary report. (241)
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

- 8:00AM *Grain Structure, Grain Growth and Evolution of the Grain Boundary Network*. (242)
Yekaterina Epshteyn, The University of Utah (1154-65-516)
- 8:30AM *High order accurate versions of threshold dynamics*. (243)
Alexander Zaitzeff, **Selim Esedoglu***, Department of Mathematics, University of Michigan, and **Krishna Garikipati**, Department of Mechanical Engineering, University of Michigan (1154-65-2114)
- 9:00AM *Microstructural entropy and stored energy in modeling recrystallization and microstructure-property relationships in polycrystals*. (244)
Maria Emelianenko, George Mason University (1154-70-1631)

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

9:30AM (245) *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 (246) *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 (247) *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 #3: Part A

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 #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 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

9:00AM (248) *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 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

Danny E. Otero, Xavier University
Nicholas A. Scoville, Ursinus College
Diana White, University of Colorado - Denver

10:00AM *Calculus: Origins, Reforms, and New Directions.*
 ▶ (249) **Alex M. McAllister***, Centre College, **Robin Cruz**, The College of Idaho, **Tom Halverson**, Macalaster College, **Joel Kilty**, Centre College, **Alison Marr**, Southwestern University, and **Chad Topaz**, Williams College (1154-N1-2698)

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

10:20AM *An Overview of the Motivation, Enactment, and Perceived Success of Course Variations.*
 ▶ (250) **Tenchita Alzaga Elizondo***, **Kristen Vroom**, Portland State University, and **Matt Voigt**, San Diego State University (1154-N1-1931)

10:40AM *Departmental Change in Reaction to the Threat of Losing Calculus: Three Cases.*
 ▶ (251) **Naneh Apkarian***, Western Michigan University, **Tenchita Alzaga Elizondo**, **Brittney Ellis**, Portland State University, **Brigitte Sánchez Robayo**, **Claire K. Robbins** and **Estrella Johnson**, Virginia Tech (1154-N1-2210)

AMS Invited Address

10:05 AM – 10:55 AM **Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center**

▶ (252) *The geometric disposition of Diophantine equations.*
Anthony Várilly-Alvarado, Rice University (1154-11-1771)

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 V èlez, University of Arizona

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

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-MAA Invited Address

11:10 AM – NOON **Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center**

▶ (253) *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**

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

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.*
(256) **David Marker**, University of Illinois at
Chicago (1154-03-768)
- 3:15PM *What is the difference between sets of*
▶ (257) *primes? Preliminary report.*
Alexandra Shlapentokh, East Carolina
University (1154-03-911)
- 4:15PM *A constructive solution to Tarski's circle*
▶ (258) *squaring problem.*
Andrew Marks, UCLA (1154-03-1264)
- 5:15PM *Passing Hilbert's Final Test.*
▶ (259) **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*
(260) *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*
(261) *Content on the Coexistence of Competing*
Consumer Species.
Lale Asik* and **Angela Peace**, Texas
Tech University (1154-34-690)

- 3:15PM *A stochastic discrete time population*
▶ (262) *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*
(263) *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*
▶ (264) *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*
▶ (265) *Interactions and Traits Associated with*
Microbiome. Preliminary report.
Lihong Zhao, University of Idaho
(1154-37-1960)

- 5:15PM *Modeling the effects of a novel HIV*
▶ (266) *drug on human immune system with*
differential equations. Preliminary report.
Iordanka Panayotova*, Christopher
Newport University, and **Nicole**
Rychagov, Harvard College
(1154-92-1761)

- 5:45PM *Fluid Dynamics of Nematocyst Prey*
▶ (267) *Capture.*
Rebecca Segal*, Virginia Commonwealth
University, **Wanda Strychalski**, Case
Western Reserve University, **Sarah**
Bryant, Dickinson College, **Baasasuren**
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 (268) *Right-veering and twist-left-veering open books.*
Keiko Kawamuro, University of Iowa (1154-57-730)

3:15PM (269) *Planarity in higher-dimensional contact manifolds.*
Bahar Acu, Northwestern University (1154-51-1267)

3:45PM (270) *Complements of toric divisors in toric 4 manifolds.*
Bahar Acu, Northwestern University, **Orsola Capovilla-Searle***, Duke University, **Agnes Gadbled**, Uppsala 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 (271) *Non-Hamiltonian symplectic circle actions.*
Susan Tolman, University of Illinois at Urbana-Champaign (1154-53-781)

5:15PM (272) *Toric pseudo-rotations and quantum cohomology.*
Mita Banik, University of California, Santa Cruz (1154-53-1383)

▶ 5:45PM (273) *Polynomial quadratic differentials on \mathbb{P}^1 .* Preliminary report.
Jayadev Athreya, University of Washington, **Subhojoy Gupta**, Indian Institute of Science, and **Heather Lee***, University of Washington (1154-53-823)

AMS Special Session on Algebras and Algorithms, II

2:15 PM – 6:15 PM 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

2:15PM (274) *Clonoids into finite target algebras without cube terms.* Preliminary report.
Athena Sparks, University of Colorado Boulder (1154-08-1687)

2:45PM (275) *Maltsev conditions invariant under permutation group actions.*
Alexandr Kazda* and **Michael Kompatscher**, Charles University (1154-08-1529)

3:15PM (276) *QCSPs on finite groups.* Preliminary report.
Keith Kearnes, University of Colorado Boulder, **Benoit Larose***, LACIM/UQAM Montréal, **Barnaby Martin**, Durham University UK, and **Ágnes Szendrei**, University of Colorado Boulder (1154-08-1102)

3:45PM (277) *Four types of subuniverses and the complexity of the constraint satisfaction problem.* Preliminary report.
Dmitriy Zhuk, Lomonosov Moscow State University (1154-08-931)

▶ 4:15PM (278) *Finite algebras and regular tree languages.*
Matt Valeriote, McMaster University (1154-08-659)

▶ 4:45PM (279) *Computational Complexity of Semigroup Properties.*
Trevor Elliott Jack*, University of Colorado Boulder, and **Lukas Fleischer**, University of Stuttgart, University of Waterloo (1154-20-518)

▶ 5:15PM (280) *Formalizing Universal Algebra with Dependent and Inductive Types.* Preliminary report.
William DeMeo, Charles University, Prague (1154-03-1804)

5:45PM Problem Solving

AMS Special Session on Coding Theory and Applications, II

2:15 PM – 6:05 PM 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

2:15PM (281) *Algebraic geometry code-based crypto.*
Gretchen L. Matthews, Virginia Tech (1154-14-2665)

2:45PM (282) *Monomial-Cartesian codes and their duals, with applications to LCD codes, quantum codes, and locally recoverable codes.*

Hiram H. Lopez*, Cleveland State University, **Gretchen L. Matthews**, Virginia Tech, and **Ivan Soprunov**, Cleveland State University (1154-94-204)

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

- 3:15PM (283) *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 Manganiello**, Clemson University (1154-94-1777)
- ▶ 3:45PM (284) *How can a coding theorist make blockchains more efficient and scalable?*
Swanand Kadhe* and **Kannan Ramchandran**, University of California Berkeley (1154-68-2613)
- 4:15PM (285) *Optimal Locally Recoverable Codes via Galois Theory.*
Giacomo Micheli, University of South Florida (1154-11-1196)
- 4:45PM (286) *On Codes over Noncommutative Rings.* Preliminary report.
Steve Szabo, Eastern Kentucky University (1154-94-1161)
- 5:15PM (287) *Distance Distributions of Cyclic Orbit Codes.*
Heide Gluesing-Luerssen and **Hunter Lehmann***, University of Kentucky (1154-94-1148)
- 5:45PM (288) *On the Theory of Cyclic \mathbb{F}_q -linear \mathbb{F}_{q^t} Codes.*
W. Cary Huffman, Department of Mathematics and Statistics, Loyola University, Chicago (1154-94-414)

AMS Special Session on Cohomological Field Theories and Wall Crossing, II

2:15 PM – 6:05 PM Room 106, Meeting Room Level, Colorado Convention Center

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

- 2:15PM (289) *All genus Landau-Ginzburg/Calabi-Yau correspondence.* Preliminary report.
Felix Janda, Institute of Advanced Study, Princeton NJ (1154-14-1019)
- ▶ 2:45PM (290) *A tour of hyperelliptic loci.*
Renzo Cavalieri, Colorado State University (1154-14-661)
- 3:15PM (291) *Computing descendent insertions for surfaces.*
Y Cooper, IAS (1154-14-1660)
- 3:45PM (292) *Descendent Potentials on Hassett Spaces.*
Vance Blankers, Northeastern University (1154-14-1711)
- 4:15PM (293) *Genus-zero Gromov-Witten theory under extremal transitions.*
Rongxiao Mi*, Harvard University, and **Mark Shoemaker**, Colorado State University (1154-14-1769)

- 4:45PM (294) *K-theoretic quasimap wall-crossing for GIT quotients.* Preliminary report.
Ming Zhang*, University of British Columbia, and **Yang Zhou**, Center of Mathematical Sciences and Applications, Harvard University (1154-14-1772)
- 5:15PM (295) *Cycle-valued quantum Serre duality for quasimaps.* Preliminary report.
Levi Heath, Colorado State University (1154-14-1605)
- 5:45PM (296) *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 (297) *Lozenge tilings in Algebraic Combinatorics.*
Greta Panova, University of Southern California (1154-05-2232)
- ▶ 3:15PM (298) *Cyclic sieving for plane partitions and symmetry.*
Samuel F Hopkins, University of Minnesota (1154-05-982)
- 3:45PM (299) *Integrable Mappings from a Unified Perspective.*
Tova Brown*, Wisconsin Lutheran College, and **Nicholas M. Ercolani**, University of Arizona (1154-05-790)
- 4:15PM (300) *From Yang-Baxter equations to stochastic systems.*
Leonid Petrov, University of Virginia (1154-60-529)
- 5:15PM (301) *Vector-relation configurations and plabic graphs.*
Niklas Affolter, Technische Universität Berlin, **Max Glick***, The Ohio State University, **Pavlo Pylyavskyy**, University of Minnesota, and **Sanjay Ramassamy**, CNRS (1154-05-995)
- 5:45PM (302) *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)

AMS Special Session on Frames, Designs, and Optimal Spherical Configurations, II

2:15 PM – 6:05 PM Room 712, Meeting Room Level, Colorado Convention Center

Organizers: **Xuemei Chen**, New Mexico State University
Alexey Glazyrin, University of Texas Rio Grande Valley

- Kasso Okoudjou**, University of Maryland, College Park
- Oleksandr Vlasiuk**, Florida State University
- 2:15PM *Unconstrained Polarization (Chebyshev) Problems: Basic Properties and Asymptotics.*
(303)
E. B. Saff*, **D. P. Hardin**, Vanderbilt University, and **M. Petrache**, Pontificia Universidad Catolica de Chile (1154-52-1806)
- 2:45PM *Doubly transitive lines.*
(304)
Dustin G. Mixon, The Ohio State University (1154-52-2297)
- 3:15PM *Symmetry and dimensionality for generalized frame energies.*
▶ (305)
Josiah Park, Georgia Tech (1154-52-2655)
- 3:45PM *Universal Minimizers of the p -Frame Potentials.*
(306)
Shujie Kang, University of Maryland (1154-42-1424)
- 4:15PM *Log-optimal $(d + 2)$ -configurations in d -dimensions.*
▶ (307)
Peter D Dragnev*, Purdue University Fort Wayne, and **Oleg R Musin**, University of Texas Rio Grande Valley (1154-74-1977)
- 4:45PM *Minimization of the p -frame energy.*
(308)
Dmitriy Bilyk, University of Minnesota - Twin Cities, **Alexey Glazyrin**, University of Texas - Rio Grande Valley, **Ryan W Matzke***, University of Minnesota - Twin Cities, **Josiah Park**, Georgia Institute of Technology, and **Oleksandr Vlasiuk**, Florida State University (1154-31-2015)
- 5:15PM *Majorization and energy on spheres.*
(309)
Oleg R Musin, University of Texas Rio Grande Valley (1154-05-1417)
- 5:45PM *Linear programming bounds for packing and energy on the sphere.*
(310)
Douglas P Hardin*, Vanderbilt University, **Peter Boyvalenkov**, Bulgarian Academy of Science, **Peter Dragnev**, Purdue University Ft. Wayne, **Edward Saff**, Vanderbilt University, and **Maya Stoyanova**, University of Sofia (1154-41-1560)
- 2:15PM *The Scattering Transform for Geometric Deep Learning.*
(311)
Michael Perlmutter*, 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)
- 3:15PM *Irreducible Representations of Groups in Image Processing.*
(313)
Mark Blumstein*, **Louis Scharf**, **Edwin Chong** and **Chris Peterson**, Colorado State University (1154-22-2353)
- 3:45PM *Hamiltonian Group Actions on Frame Spaces.*
(314)
Tom Needham, Florida State University, and **Clayton Shonkwiler***, Colorado State University (1154-42-1125)
- 4:15PM *Doubly transitive lines: Symmetry implies optimality.*
(315)
Joseph W. Iverson*, Iowa State University, and **Dustin G. Mixon**, The Ohio State University (1154-52-684)
- 4:45PM *Complete translation invariant measurements.*
(316)
Jameson Cahill, New Mexico State University (1154-42-218)
- 5:15PM *Harmonic equiangular tight frames and their combinatorial generalizations.*
(317)
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?*
▶ (318)
Preliminary report.
Cezar Lupu, Texas Tech University (1154-97-1976)

2:45PM *Psychological Drivers of Mathematically Gifted Students.* Preliminary report.
▶ (319)
Scott Jeremy Baldridge, Louisiana State University (1154-97-1875)

AMS Special Session on Group Actions in Harmonic Analysis, II

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

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

- 3:15PM ▶ (320) *Identifying very strong high-school students + An early-college REU.*
sarah-marie belcastro, Mathematical Staircase, Inc. (1154-97-1309)
- 3:45PM (321) *A Comprehensive Model for Preparing Underrepresented Students for Graduate Programs in Mathematics.*
Scott Annin* and **Anael Verdugo**, California State University, Fullerton (1154-97-1153)
- 4:15PM ▶ (322) *Integrating Learning, Cognitive and Measurement Theories for Identifying Gifted Mathematics Students.* Preliminary report.
Luis Saldivia* and **Michelle Worthington**, Educational Testing Service (1154-97-1136)
- 4:45PM ▶ (323) *UC Irvine Math CEO and After-School Math Programs.* Preliminary report.
Shoo Seto, University of California, Irvine (1154-97-269)
- 5:15PM ▶ (324) *Developing interest and extraordinary ability in mathematics.*
Po-Shen Loh, Carnegie Mellon University (1154-97-2074)

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

2:15 PM – 6:05 PM Room 401, Meeting Room Level, Colorado Convention Center

Organizers: **David Goldberg**, Purdue University
Phil Kutzko, University of Iowa

- 2:15PM ▶ (325) *Quantifying Flows in Time-Irreversible Markov Chains: Application to a Gene Regulatory Network.*
Danielle Middlebrooks, University of Maryland- College Park (1154-60-1200)
- 2:45PM ▶ (326) *Quotients of integers with restricted digit sets mod b.*
Simone Sisneros-Thiry, University of Illinois at Urbana-Champaign (1154-11-2315)
- 3:15PM (327) *Basis of an infinite-dimensional tensor product representation of $\mathfrak{osp}(1|2n)$.* Preliminary report.
Dwight Anderson Williams II* and **Dimitar Grantcharov**, The University of Texas at Arlington (1154-17-1216)
- 3:45PM (328) *On some local invariants of geometric Langlands parameters.* Preliminary report.
Andrew Alaniz, Louisiana State University (1154-14-2694)
- 4:15PM ▶ (329) *Kernel-estimated Nonparametric Overlap-Based Syncytial Clustering.*
Israel A Almodovar-Rivera, University of Puerto Rico Medical Science Campus (1154-62-2472)

- 4:45PM ▶ (330) *On Complex-Valued Equivariant Neural Networks for Radio Frequency Fingerprinting.*
Camila Alexandra Ramirez, Expedition Technology (1154-68-1800)
- 5:15PM (331) *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)
- 5:45PM ▶ (332) *Overview of the Geometric Model of Propagating Strings in String Theory and Possible Generalizations.*
Lyda Pamela Urresta, University of Notre Dame (1154-81-2245)

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

2:15 PM – 6:05 PM Room 104, Meeting Room Level, Colorado Convention Center

Organizers: **Chris Jennings-Shaffer**, University of Denver
Frank Garvan, University of Florida

- 2:15PM ▶ (333) *Separable Integer Partition (SIP) Classes.*
George E. Andrews, The Pennsylvania State University (1154-11-39)
- 2:45PM (334) *On the refined q-trinomial coefficients.*
Alexander Berkovich, University of Florida (1154-11-550)
- 3:15PM (335) *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)
- 3:45PM ▶ (336) *Knot invariants and coefficient stability.*
Paul Beirne, University College Dublin (1154-57-637)
- 4:15PM (337) *Statistics for unimodal sequences of integers.*
Kathrin Bringmann, University of Cologne, **Chris Jennings-Shaffer**, University of Denver, and **Karl Mahlburg***, Louisiana State University (1154-11-1371)
- 4:45PM ▶ (338) *Limit Shapes for Unimodal Sequences.*
Walter M. Bridges, Louisiana State University (1154-05-1363)
- 5:15PM (339) *Maass forms and the mock theta function $f(q)$.*
Alexander J Dunn, University of Illinois at Urbana Champaign (1154-11-168)
- 5:45PM ▶ (340) *On certain partition identities related to $A_9^{(2)}$.* Preliminary report.
Shashank Kanade*, University of Denver, and **Matthew C Russell**, Rutgers, The State University of New Jersey (1154-11-315)

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
- 2:15PM *Orthogonal Fourier expansions for certain fractals.*
 (341) **Palle Jorgensen***, University of Iowa, and **Steen Pedersen**, Wright State University (1154-42-154)
- 2:45PM *Variational extrapolation.*
 (342) **Alexander Zaitzeff**, **Selim Esedoglu***, Department of Mathematics, University of Michigan, and **Krishna Garikipati**, Department of Mechanical Engineering, University of Michigan (1154-65-2104)
- 3:15PM *Phase Retrieval for Windowed Fourier Transform samples.*
 (343) **Cheng Cheng** and **Ingrid Daubechies***, Duke University (1154-46-1033)
- 3:45PM *Multiscale regularization strategies for the tensorial satellite gravitational gradiometry (SGG) problem.*
 (344) **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 (1154-41-1533)
- 4:15PM *On the peak value problem for non-uniform sampling.*
 (345) **Adel Faridani***, Oregon State University, and **Hussain Al-Hammali**, Yeosu Technical Institute in Tashkent (1154-42-1203)
- 4:45PM *A data-driven iteratively regularized Landweber iteration.*
 (346) **Andrea Aspri**, Johann Radon Institute for Computational and Applied Mathematics (RICAM) (1154-65-433)
- 5:15PM *On the Reconstruction of a Class of Signals Bandlimited to a Disc in the Linear Canonical Transform Domain.*
 (347) **Ahmed I Zayed**, DePaul University (1154-42-1036)
- 5:45PM *On the range characterization of the Radon transform in two dimensions.*
 (348) Preliminary report. **Alexandru Tamasan***, University of Central Florida, and **Kamran Sadiq**, Radon Institute for Computational and Applied Mathematics (1154-35-1697)

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

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.)

- 2:15PM *Building and Supporting Gender Diversity at Canada/USA Mathcamp.* (355)
Marisa Debowsky, Canada/USA Mathcamp (1154-97-2528)
- 2:45PM *GirlsGetMath: Building and expanding a day program for high school students.* (356)
Katharine Ott, Bates College (1154-97-646)
- 3:15PM *Research about Math Outreach Programs.* (357)
Max Warshauer* and **Hiroko K Warshauer**, Texas State University (1154-97-1483)
- 3:45PM *Reaching Inside before Reaching Out: Acknowledgement before attempting to provide Access.* (358)
Aris Benjamin Winger, Georgia Gwinnett College (1154-97-1426)
- 4:15PM *Program design and student outcomes at MIT $\sqrt{\text{mathroots}}$.* (359)
Vishal Arul and **Gweneth McKinley***, Massachusetts Institute of Technology (1154-97-740)
- 4:45PM *Prepare and Inspire: Broadening participation in STEM through outreach programs for pre-college students at MIT.* (360)
Reimi Hicks*, **Eboney Hearn** and **Kristin Kurianski**, MIT (1154-97-2737)
- 5:15PM *Early Access to Advanced Mathematics for Underrepresented Students.* (361)
Jacob Castaneda, Bridge to Enter Advanced Mathematics/Art of Problem Solving Initiative, Incc (1154-97-2545)
- 5:45PM *Supporting math proficiency and motivation through afterschool math enrichment: A focus on program design.* (362)
 Preliminary report.
Alessandra Pantano, University of California, Irvine (1154-00-1523)
- 3:15PM *Effective Sato-Tate conjecture for abelian varieties and applications.* (365)
Alina Bucur, UCSD, **Francesc Fité***, MIT, and **Kiran Kedlaya**, UCSD (1154-11-1372)
- 3:45PM *Sato-Tate Groups of Trinomial Hyperelliptic Curves.* (366)
Heidi Goodson, Brooklyn College (CUNY) (1154-11-1197)
- 4:15PM *Complexity of strong approximation on the sphere.* (367)
Naser Talebizadeh Sardari, Postdoctoral fellow/Institute for Advanced Study (1154-11-794)
- 4:45PM *Kodaira dimension of moduli spaces of low degree special $K3^{[2]}$ -fourfolds.* (368)
Jack Petok, Rice University (1154-14-1381)
- 5:15PM *Variation of the rank of the group of algebraic cycles under reduction.* (369)
Edgar Costa, MIT (1154-11-1498)
- 5:45PM *The arithmetic of intermediate Jacobians.* (370)
Jeff Achter*, Colorado State University, **Sebastian Casalaina-Martin**, University of Colorado, and **Charles Vial**, Universitat 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
Oana Marin, Argonne National Laboratory

- 2:15PM *A kernel-free boundary integral method for boundary value and interface problems in doubly-connected domain.* (371)
 Preliminary report.
Yue Cao and **Shuwang Li***, Dept. of Applied Math, Illinois Institute of Technology, Chicago, IL (1154-65-494)
- 2:45PM *Preconditioning with BDDC and FDM for High Order Finite Elements with libCEED.* (372)
 Preliminary report.
Jeremy L Thompson*, **Valeria Barra**, **Jed Brown**, CU Boulder, and **Yohann Dudouit**, LLNL (1154-62-2504)
- 3:15PM *Multirate Time Integration Methods and Their Deployment in the SUNDIALS Library.* (373)
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 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
Andrew Sutherland, MIT
Anthony Varilly-Alvarado, Rice University

- 2:15PM *Quadratic points on quartic del Pezzo surfaces.* (363)
 Preliminary report.
Brendan Creutz, University of Canterbury, and **Bianca Viray***, University of Washington (1154-11-1235)
- 2:45PM *Low degree points on curves.* (364)
Geoffrey Smith, Harvard University, and **Isabel Vogt***, Stanford University (1154-11-1324)

- 3:45PM *Inference of Uncertain Parameters in Physical Models Governed by PDEs with Application to Earth's Mantle Convection.* (374)
Johann Rudi*, Argonne National Laboratory, **Georg Stadler**, New York University, **Jiashun Hu**, **Micheal Gurnis**, California Institute of Technology, and **Omar Ghattas**, The University of Texas at Austin (1154-35-1292)
- 4:15PM *Reorthogonalization without iteration: stable pipelined Krylov iterations.* (375)
 Preliminary report.
Katarzyna Swirydowicz*, **Stephen Thomas**, National Renewable Energy Laboratory, **Daniel Bielich** and **Julien Langou**, Department of Mathematics, University of Colorado, Denver (1154-65-2343)
- 4:45PM *Discrete Maximal Parabolic Regularity for Time Discontinuous Galerkin Finite Element Schemes.* Preliminary report. (376)
Kyle Allaire* and **Dmitriy Leykekhman**, University of Connecticut (1154-65-1441)
- 5:15PM *Towards Convergent Finite-Difference Schemes for the Monge-Ampère PDE on the Sphere.* Preliminary report. (377)
Axel G R Turnquist, New Jersey Institute of Technology (1154-65-1189)
- 5:45PM *Convergence analysis of symmetric dual-wind discontinuous Galerkin methods for the obstacle problem.* (378)
Aaron F Rapp*, **Tom Lewis** and **Yi Zhang**, The University of North Carolina at Greensboro (1154-65-1720)

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. (379)
 ▶ **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.* (380)
 ▶ **Talia Goldwasser***, **Meera Nadeem** and **Garcia Sun**, Smith College (1154-05-2759)
- 3:15PM *The Quick Introduction to the Mathematics of Redistricting.* (381)
 ▶ **John Asplund**, Dalton State College (1154-05-415)

- 3:45PM *Using Graph Theoretical Designs of Self Assembling DNA to Motivate Undergraduate Research.* Preliminary report. (382)
 ▶ **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.* (383)
 ▶ **Raihana Mokhlissi***, Mohammed V University, Rabat, Morocco, and **Joyati Debnath**, Winona State University (1154-05-290)
- 4:45PM *Vertex differentiation in reconfiguration graphs.* Preliminary report. (384)
 ▶ **Janet Fierson***, **Tyler Knappenberger** and **Ricky Whitmoyer**, La Salle University (1154-05-2787)
- 5:15PM *Power Domination in ciclo and estrella graphs.* Preliminary report. (385)
 ▶ **Mary K Flagg** and **Phylcia Tran***, University of St. Thomas (1154-05-1113)
- 5:45PM *Interlace Polynomials of Friendship Graphs.* (386)
 ▶ **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.* (387)
 ▶ **Colin Defant**, Princeton University (1154-05-162)
- 2:45PM *Increasing consecutive patterns in words.* (388)
 ▶ **Mingjia Yang*** and **Doron Zeilberger**, Rutgers University (1154-05-1466)
- 3:15PM *The abelian complexity of infinite words and the Frobenius problem.* (389)
 ▶ **Ian Kaye** and **Narad Rampersad***, University of Winnipeg (1154-68-201)
- 3:45PM *Abelian subshifts.* (390)
 ▶ **Svetlana Puzynina**, Saint Petersburg State University, Russia (1154-05-1299)
- 4:15PM *On non-repetitive complexity of Arnoux-Rauzy words.* (391)
 ▶ **Kateřina Medková**, **Edita Pelantová**, Department of Mathematics, FNSPE, Czech Technical University in Prague, Czech Republic, and **Elise Vandomme***, Liège, Belgium (1154-05-1534)

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

- 4:45PM *The repetition threshold for binary rich words.*
▶ (392) **James D. Currie**, **Lucas Mol*** and **Narad Rampersad**, The University of Winnipeg (1154-05-444)
- 5:15PM *Nyldon words.*
▶ (393) **Émilie Charlier**, Université de Liège, **Manon Philibert**, Université Aix-Marseille, and **Manon Stipulanti***, Université de Liège and Hofstra University (1154-05-933)
- 5:45PM *New Results on Nyldon Words Derived Using an Algorithm from Hall Set Theory.*
▶ (394) **Swapnil Garg**, MIT (1154-05-2347)

AMS Special Session on Singularities and Characteristic Classes, II

2:15 PM – 6:05 PM **Room 108, Meeting Room Level, Colorado Convention Center**

Organizers: **Paolo Aluffi**, Florida State University
Leonardo Mihalcea, Virginia Tech

- 2:15PM *Positivity determines quantum cohomology.*
(395) **Anders Buch*** and **Chengxi Wang**, Rutgers University (1154-05-1520)
- 2:45PM *The direct sum map for classical-type flag varieties.*
(396) **David E Anderson**, The Ohio State University (1154-14-1652)
- 3:15PM *Motivic Chern classes of Bott-Samelson strata and Kazhdan-Lusztig polynomials.*
(397) **Leonardo C. Mihalcea** and **Camron M. Withrow***, Virginia Tech (1154-14-1373)
- 3:45PM *Equivariant K-theory and tangent spaces to Schubert varieties.*
(398) **William Graham***, University of Georgia, and **Victor Kreiman**, University of Wisconsin – Parkside (1154-22-1686)
- 4:15PM *Schubert calculus in equivariant elliptic cohomology.*
(399) **Richard Rimanyi***, UNC Chapel Hill, and **Andrzej Weber**, University of Warsaw Poland (1154-14-1129)
- 4:45PM *Singular and Virtual elliptic genera.*
▶ (400) Preliminary report. **Anatoly Libgober**, University of Illinois at Chicago (1154-14-748)
- 5:15PM *Lyubeznik numbers of irreducible projective varieties.*
(401) **Botong Wang**, University of Wisconsin-Madison (1154-14-691)
- 5:45PM *Elliptic fibrations and string theory: Crepant resolutions of Weierstrass models, characteristic numbers, and flops.*
(402) **Mboyo Esole**, Northeastern University (1154-14-2484)

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.*
(403) **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.*
(404) **Rodrigo Matos**, Michigan State University (1154-47-1502)
- 3:15PM *The landscape law for the integrated density of states.* Preliminary report.
(405) **Svitlana Mayboroda***, University of Minnesota, **Guy David**, Université Paris-Sud, and **Marcel Filoche**, Ecole Polytechnique (1154-35-2638)
- 3:45PM *Density of States and Eigenvalue Statistics for Fixed Width Random Band Matrix.* Preliminary report.
(406) **Benjamin Brodie*** and **Peter Hislop**, University of Kentucky (1154-82-2566)
- 4:15PM *Lifshitz tails for the fractional Anderson model.* Preliminary report.
▶ (407) **Martin Gebert***, University of California, Davis, and **Constanza Rojas-Molina**, Université 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.*
(408) **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.*
(409) **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.*
(410) **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 Garcia-Ramos***, CONACyT & Universidad Autónoma de San Luis Potosí, **Sebastian 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)
- 4:15PM (415) *Iterated constructions generated by countable non specified shifts.* Preliminary report. **Eugen Andrei Ghenciu**, University of Wisconsin Stout (1154-37-1805)
- 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 Gehrtz**, 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

Visual Complex Analysis- GeoGebra Tools and Mapping Diagrams.

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)
- ▶ (424)
- 2:30PM Preserving Identifiability in Linear Compartmental Models. **Seth Gerberding**, University of South Dakota (1154-00-743)
- ▶ (425)
- 2:45PM Communication, Representation, and Community: Entry Points to Advanced Mathematics. **Francesca Bernardi***, Florida State University, and **Katrina Morgan**, Northwestern University (1154-00-1581)
- ▶ (426)
- 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)
- (427)
- 3:15PM Adaptive SVD Image Compression Framework For Modeling The Impact Of Visual Stimulus And Complexity in Digital Images. Preliminary report. **Timothy Jesse Redford*** and **Xingjie Helen Li**, University of North Carolina at Charlotte (1154-00-2034)
- ▶ (428)
- 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)
- ▶ (429)
- 3:45PM Generalized permutations. Preliminary report. **Orli Herscovici**, Technion - Israel Institute of Technology (1154-05-1344)
- ▶ (430)
- 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)
- ▶ (431)
- 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)
- (432)
- 4:30PM Hyperdoctrines in Relevant Logic. **Shay Allen Logan**, Kansas State University (1154-03-1433)
- (433)

4:45PM Completeness Theorem for Zero-Order Logic. Preliminary report.

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 $\mathbb{C}_2(s)$ 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.

▶ (437) **Elise Lockwood*** and **Zackery Reed**, Oklahoma State University (1154-D1-566)

2:35PM Puzzling Through Discrete Mathematics. **Edmund A Lamagna**, University of Rhode Island (1154-D1-894)

▶ (438)

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 the Undergraduates?

▶ (440) **William Ted Mahavier***, Lamar University, and **David M. Clark**, SUNY New Paltz (1154-D1-1715)

3:35PM Leveling the Playing Field in Discrete Math with Inquiry-Based Learning. Preliminary report.

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

4:00PM Making Proofs Palatable!

▶ (442) **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

- Shannon R. Lockard,**
Bridgewater State University
- 2:15PM ▶ (443) *“When will I ever use this?” Incorporating Student Research into an Introductory Linear Algebra Course.* Preliminary report.
Sarah L. Marsh, Oklahoma Baptist University (1154-11-1922)
- 2:35PM ▶ (444) *Research in the Discrete Math and Combinatorics Classroom.*
Cayla D. McBee, Providence College (1154-11-2630)
- 2:55PM ▶ (445) *Creating Combinatorial Curiosity: Student Projects in an Applied Combinatorics Class.* Preliminary report.
Kelli M Karcher, Virginia Tech (1154-11-2098)
- 3:15PM ▶ (446) *A Two-Stage Approach to a Research-Based Capstone Experience.* Preliminary report.
Ryan Higginbottom, Washington & Jefferson College (1154-11-1882)
- 3:35PM ▶ (447) *Research Projects in Numerical Analysis.*
Mahmud Akelbek, Weber State University (1154-11-248)
- 3:55PM ▶ (448) *How Exposure to Research in Numerical PDEs Influenced Students In My PDE Class.*
Minah Oh, James Madison University (1154-11-1135)
- 4:15PM ▶ (449) *Bringing Industrial Mathematics Projects into classroom.*
Mihhail Berezovski, Embry-Riddle Aeronautical University (1154-11-1782)
- 4:35PM ▶ (450) *Collaborative Classroom Research Projects Motivated by Applications to National Security.*
Mihhail Berezovsky, Embry-Riddle Aeronautical University, **Marylesa Howard,** Nevada National Security Site, and **Aaron Luttmann*,** Pacific Northwest National Laboratory (1154-11-850)
- 4:55PM ▶ (451) *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 (1154-11-35)
- 5:15PM ▶ (452) *Internationalizing the Undergraduate Calculus Course at Albany State University.* Preliminary report.
Chinenye Ofofile, Albany State University (1154-11-649)

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

2:15 PM – 5:50 PM Room 504, Meeting Room Level, Colorado Convention Center

Organizer: **Douglas Norton,** Villanova University

- 2:15PM (453) *A NEW DAWN By ‘narrative voice’ of Leonardo da Vinci.*
Rosanna Iembo*, Crotone, Calabria, Italy, **Irene Iaccarino,** High School of Music, and **Maria Rosaria Iaccarino,** Headmaster (1154-K1-854)
- 2:35PM ▶ (454) *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)
- 2:55PM ▶ (455) *An Outlet for Creativity in Mathematics.* Preliminary report.
Ciara D Bursal*, **Monte S Meyerink** and **Fenqjen Luo,** Montana State University (1154-K1-2304)
- 3:15PM ▶ (456) *Learning mathematics through mathematical modeling of crafts.*
Mara Alagic, Wichita State University, Wichita, Kansas (1154-K1-2775)
- 3:35PM ▶ (457) *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)
- 3:55PM ▶ (458) *Dynamic Symmetry and Art.*
Jennifer Wilson, Eugene Lang College, The New School (1154-K1-1561)
- 4:15PM ▶ (459) *Visualizing Integer Sequences – Part 2.* Preliminary report.
Margaret Kepner, Washington, DC (1154-K1-607)
- 4:35PM ▶ (460) *Another cellular automaton for generative art.* Preliminary report.
Gary R Greenfield, University of Richmond (1154-K1-1698)
- 4:55PM ▶ (461) *Anamorphic distortion: it's closer than you think.*
Annalisa Crannell, Franklin & Marshall College (1154-K1-2233)
- 5:15PM ▶ (462) *Image Processing: Sgraffito Simulation.*
Vincent J. Matsko*, Spring Hill, FL, and **Stephen M Campbell,** Eccles, Manchester, UK (1154-K1-2045)
- 5:35PM ▶ (463) *Recent Progress in Opt Art.* Preliminary report.
Robert A Bosch, Oberlin College (1154-K1-1909)

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

2:15 PM – 3:10 PM Room 502, Meeting Room Level, Colorado Convention Center

Organizers: **Ben Galluzzo,** Clarkson University
Brian Winkel, SIMIODE
Corban Harwood, George Fox University

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

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

2:35PM *Throwing a ball can be such a drag.*
▶ (465) **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.*
▶ (466) **Brian J Winkel**, Director, SIMIODE, Cornwall NY USA (1154-L5-1691)

5:15PM *Widening the East Texas Math Teachers' Circle.*
(476) **Jane H Long**, Stephen F. Austin State University (1154-P5-1598)

5:35PM *Fresno Math Circle Program: Much More Than Just a Math Circle.*
▶ (477) **Maria S. Nogin*** and **Adnan H. Sabuwala**, California State University, Fresno (1154-P5-1411)

5:55PM *MathAmigos: A Community Math Initiative.*
▶ (478) **James C Taylor**, MathAmigos and Math Circles Collaborative of New Mexico (1154-P5-540)

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.*
▶ (467) **Tatiana Shubin**, San Jose State University (1154-P5-2721)

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

2:55PM *Mathematical Zendo.*
▶ (469) **Corey Pooler*** and **Philip DeOrsey**, Westfield State University (1154-P5-1645)

3:15PM *From Math Circles to Science Fairs.*
▶ (470) **Liz Lane-Harvard**, University of Central Oklahoma (1154-P5-604)

3:35PM *Cold War Escape Rooms (and other Student to Student Math nights).* Preliminary report.
▶ (471) **Michael E Matthews***, **Greg Lawson**, **Hannah Seidl**, University of Nebraska at Omaha, and **Rachel Pugh**, University of Nebraska at Omaha (1154-P5-1188)

3:55PM *Circles Tangent to Calculus.*
(472) **Sharon Lanaghan*** and **Carolyn Yarnall**, California State University, Dominguez Hills (1154-P5-700)

4:15PM *(MC)²: Math Club as a Math Circle.*
▶ (473) **Sarah Cobb*** and **Marcos Lopez**, Midwestern State University (1154-P5-1183)

4:35PM *Math Circle problems to undergraduate capstone projects.*
▶ (474) **Chiru Bhattacharya**, Randolph-Macon College (1154-P5-2318)

4:55PM *Werewolves and Addicts: An Exploration of Math Modeling and Stigma.* Preliminary report.
▶ (475) **Anne M. Ho*** and **W. Christopher Strickland**, University of Tennessee (1154-P5-753)

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.*
▶ (479) **Roxy 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.
▶ (480) **Sarah J Greenwald**, Appalachian State University (1154-O5-29)

2:55PM *Examining the Secondary-Tertiary Transition from Multiple Perspectives.* Preliminary report.
▶ (481) **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 (482) *Stochastic Functional Expansion for Identifying the Effective Heat Conductivity Coefficient of Polydisperse Suspension.*
Abhinandan Chowdhury, Savannah State University (1154-VN-2392)
- 2:30PM (483) *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 (484) *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 (485) *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 (486) *Solving PDEs with Neural Networks.*
Adebowale J. Sijuwade*, **Mostafa Rezapour** and **Thomas J. Asaki**, Washington State University (1154-VN-1967)
- 3:30PM (487) *A distributed active subspace method for scalable surrogate modeling of function valued outputs.* Preliminary report.
Hayley Guy*, **Alen Alexanderian**, North Carolina State University, and **Meilin Yu**, University of Maryland, Baltimore County (1154-VN-2351)
- 3:45PM (488) *Hollow-Fiber Microfiltration Systems: Stokes Flow Solution in a Semi-Infinite Channel with Permeable Walls.*
Francesca Bernardi*, **Nicholas G. Cogan** and **M. Nicholas J. Moore**, Florida State University (1154-VN-1582)
- 4:00PM (489) *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 (490) *Exact Controllability of Third order Dispersion Equation.*
Dimplekumar Navinchandra Chalisehajar, Virginia Military Institute (1154-VN-461)
- 4:30PM (491) *Augmentations with Random Triplet Mining: An Approach for Unsupervised Clustering and Manifold Learning.*
Oliver Nina, Air Force Research Laboratory, **Jamison M Moody***, Brigham Young University, and **Clarissa Milligan**, Wright State University (1154-VN-1985)
- 4:45PM (492) *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 (493) *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

2:15 PM – 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 (494) *Teaching iGen: Characteristics of Generation Z and implications for the college mathematics classroom.*
Paul R. Bialek, Trinity International University (1154-VE-1032)
- 2:30PM (495) *Mentoring Cross Institutional Undergraduate Research Projects.*
Elizabeth A. Donovan*, Murray State University, and **Lesley W. Wiglesworth**, Centre College (1154-VE-1736)
- 2:45PM (496) *Mentoring Students Through Research Projects.* Preliminary report.
Frederick M Butler, York College of Pennsylvania (1154-VE-666)
- 3:00PM (497) *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 (498) *A Support Structure of Mathematics Department at a Hispanic Serving Institution.*
Suleyman Tek, University of the Incarnate Word (1154-VE-1879)
- 3:30PM (499) *Lessons Learned in Designing & Implementing a Peer Mentoring Component to a Comprehensive Training Program for GTAs in the Mathematical Sciences.*
RaKissa D Manzanares*, **Michael Ferrara**, **Michael Jacobson** and **Gary Olson**, University of Colorado Denver (1154-VE-1747)
- 3:45PM (500) *Creating a Mathematics Community of Best Practices.*
Elizabeth Schott, **Laurice Garrett** and **Kelsea Livingstone***, Florida SouthWestern State College (1154-VE-2578)

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

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| <p>4:00PM ▶ (501) <i>College Algebra Classrooms - Assessment Study and the Challenges Ahead.</i> Preliminary report.
Perry Y.C. Lee* and Padraig M. McLoughlin, Kutztown University of Pennsylvania (1154-VE-2553)</p> <p>4:15PM ▶ (502) <i>In Class Versus Out of Class - A Comparison of Mastery Grading Retakes in an Introductory Statistics Course.</i> Preliminary report.
Robert Campbell and Anne Sinko*, College of St. Benedict/St. John's University (1154-VE-1849)</p> <p>4:30PM ▶ (503) <i>Formative versus summative assessment: a way to engage in a math classroom.</i> Preliminary report.
Timmy Ma, Dartmouth College (1154-VE-745)</p> <p>4:45PM ▶ (504) <i>Inter-rater reliability in departmental assessment.</i> Preliminary report.
Bernadette Mullins*, Catherine Cashio and Allie Ray, Birmingham-Southern College (1154-VE-2243)</p> <p>5:00PM ▶ (505) <i>Investigating item parameter distributions.</i> Preliminary report.
Fidele Ngwane, University of South Carolina, Salkehatchie (1154-VE-1939)</p> <p>5:15PM ▶ (506) <i>Role of Instruction on Spatial Skills on Middle School Students.</i>
Samuel Obara, Texas State University San Marcos TX (1154-VE-411)</p> <p>5:30PM ▶ (507) <i>An Inquiry into the Relationship Between Participation in Competitive Creative Math Competitions and Measures of Academic Success in High School Students.</i> 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)</p> <p>5:45PM ▶ (508) <i>Self-Efficacy in the Flipped Calculus II Classroom.</i> Preliminary report.
John A. Kerrigan, Rutgers University (1154-VE-70)</p> | <p>2:30PM (509) <i>Mathematical Model for Nutrient and Wastes Exchange Across the Placenta.</i>
Boniface O. Kwach*, Kibabii University, Department of Mathematics and Statistics, Omolo N. Ongati and Olielo Joel Odongo, JOOUST, School of Mathematics and Actuarial Science (1154-VF-1667)</p> <p>2:45PM ▶ (510) <i>Automated Identification of Sinkholes.</i> Preliminary report.
Yonathan Admassu and Celes Woodruff*, James Madison University (1154-VF-2352)</p> <p>3:00PM ▶ (511) <i>Connections of Molecular Symmetry with mathematics.</i>
Courtney Ann Frazier* and Ramanjit K. Sahi, Austin Peay State University (1154-VF-852)</p> <p>3:15PM ▶ (512) <i>Cheating and its detection in games such as poker and paintball.</i>
Amanda Metzner and Dan Zwilling*, BAE Systems (1154-VF-2704)</p> <p>3:30PM (513) <i>Modeling volatility dependence for count time series data.</i>
Hadi Safari Katesari* and S. Yaser Samadi, Department of Mathematics, Southern Illinois University Carbondale (1154-VF-2011)</p> <p>3:45PM ▶ (514) <i>Minimizing Drug Resistant Cases of Gonorrhoea through Cost-Effective Treatment Plans.</i>
Ixtaccihuatl Hortencia Obregon, University of the Incarnate Word (1154-VF-1929)</p> <p>4:00PM (515) <i>Meta-modeling and uncertainty quantification of an air quality simulation chain at urban scale.</i>
Janelle K. Hammond*, Vivien Mallet, Inria Paris, and Ruiwei Chen, CERE, Joint Laboratory of Ecole des Ponts ParisTech - EDF R&D, Université Paris-Est (1154-VF-1545)</p> <p>4:15PM ▶ (516) <i>A model for visual circuit development.</i>
Jennifer Crodelle, Courant Institute, NYU (1154-VF-970)</p> <p>4:30PM (517) <i>Simulating Bacterial Swimming Dynamics in Stokes Flow with a Stochastic Model of Chemotaxis.</i>
John LaGrone, Tulane University (1154-VF-1024)</p> <p>4:45PM ▶ (518) <i>Multi-compartment modeling of Neurospora circadian rhythm.</i> Preliminary report.
Leif Zinn-Brooks* and Marcus Roper, University of California Los Angeles (1154-VF-2513)</p> |
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MAA General Contributed Paper Session on Modeling and Applications, I

2:15 PM – 5:40 PM **Room 710, Meeting Room Level, Colorado Convention Center**

Organizers: **Cathy Erbes**, Hiram College

Holley Friedlander, Dickinson College

Steven McKay, Brigham Young University

- 5:00PM (519) *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)
- 5:15PM (520) *Solving parameter estimation problem using Least Square-based Algorithms.*
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 (521) *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
Maziar Raissi, Brown University

- 2:15PM (522) *Learning reduced dynamical-system models from data.*
Benjamin Peherstorfer, Courant Institute of Mathematical Sciences, New York University (1154-65-555)
- 2:45PM (523) *Overcoming gradient pathologies in physics-informed neural networks.*
Sifan Wang and **Paris Perdikaris***, University of Pennsylvania (1154-68-2423)
- 3:15PM (524) *Adaptive step-size selection for state-space probabilistic differential equation solvers.*
Oksana A Chkrebtii*, The Ohio State University, and **David A Campbell**, Carleton University (1154-34-1002)
- 3:45PM (525) *OpNet: Learning nonlinear operators for identifying differential equations.* Preliminary report.
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 (526) *Physics-compatible metrics for clustering algorithms.*
Mohammad Farazmand, Department of Mathematics, NC State University (1154-37-651)

- 5:00PM (527) *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 (528) *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

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

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

Tai-Danae Bradley, The Graduate Center, CUNY

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 \mathbb{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. Phan*^{*}, Bowling Green State University (1154-47-1462)

4:15PM (535) *A vector lattice of nonlinear operators on Banach lattices satisfying a disjointness condition.* Preliminary report.

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

4:30PM (536) *A characterization for 12-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)

- 5:00PM *Rigidity of Crossed Products Arising from \mathbb{Z} Acting on the Disc Algebra.*
(538) **Mitch Hamidi**, Embry-Riddle Aeronautical University - Prescott (1154-47-2700)
- 5:15PM *Generalization of iterates of Cesàro Averaging for functions to include non negative real powers, and Banach limits invariant under these new operators.*
(539) Preliminary report.
Pamela I Delgado*, University of Pittsburgh, **Christopher J Lennard**, University of Pittsburgh, and **Jeromy Sivek**, Temple University (1154-47-2825)

- 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.
(550) **David Sykes*** and **Igor Zelenko**, Texas A&M University (1154-53-1041)

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 Andrie**, **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 **Seo Yeong Shauna 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.* Preliminary report.
▶ (548) **Ryad Ghanam***, Virginia Commonwealth University in Qatar, and **Gerard Thompson**, University of Toledo (1154-53-30)

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)
- 2:55PM *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-H5-1880)
- 3:55PM *Modeling Sound Waves in Trigonometry.*
▶ (555) **Andrew Diener**, Christian Brothers University (1154-H5-2222)
- 4:15PM *Inquiry Learning in a Topic Rich General Education Mathematics Class.* Preliminary report.
▶ (556) **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.)

- 5:35PM *The Mathematical Inquiry Project: Fostering Sustainable, Widespread Adoption of Inquiry-Based Learning.*
▶ (560) **John Paul Cook***, Allison Dorko, William Jaco, Michael Oehrtman and Michael Tallman, Oklahoma State University (1154-H5-1198)

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

- 2:45PM *Analysis of the Bi-anisotropic Maxwell system in Lipschitz domains.*
(561) **Eric Stachura**, Kennesaw State University (1154-35-1075)
- 3:00PM *Rapid Approximate Diagonalization of Variable-Coefficient Differential Operators using the Uncertainty Principle.* Preliminary report.
▶ (562) **Carley R Walker**, The University of Southern Mississippi (1154-35-1447)
- 3:15PM *Optimal control of sterile insect techniques.*
(563) **Maeve L. McCarthy***, K. Renee Fister, Murray State University, and **Seth F. Oppenheimer**, Mississippi State University (1154-35-1578)
- 3:30PM *An existence result for a class of electrothermal drift-diffusion models with Gauss-Fermi statistics for organic semiconductors.*
▶ (564) **Annegret Glitzky**, Matthias Liero and **Grigor Nika***, Weierstrass Institute for Applied Analysis and Stochastics (WIAS Berlin) (1154-35-1556)
- 3:45PM *Topological Methods for Characterizing Snow Surface Roughness.* Preliminary report.
▶ (565) **Rachel A. Neville**, The University of Arizona (1154-35-2456)
- 4:00PM *On the existence of strong solution to the 3D incompressible Navier-Stokes equations with damping.*
(566) **Zhanerke Temirgaliyeva**, University of Southern California (1154-35-2458)
- 4:15PM *Sharp Caffarelli-Kohn-Nirenberg Type Inequalities on Iwasawa Groups.*
(567) **Joshua Lee Flynn**, University of Connecticut (1154-35-2461)
- 4:30PM *Quenching in Two Dimensional Time Fractional Reaction-Diffusion Equation.*
▶ (568) **Subhash Subedi***, Coastal Carolina University, and **Aghalaya S. Vatsala**, University of Louisiana at Lafayette (1154-35-2474)
- 4:45PM *Nonlinear diffusion equations with discontinuous nonlinearities.*
(569) **Dohyun Kwon***, University of California, Los Angeles, and **Alpár Richárd Mészáros**, Durham University (1154-35-2509)
- 5:00PM Break

- 5:15PM *Global Well-posedness and Modified Strichartz Estimates for the Fourth Order Schrödinger Equation.*
▶ (570) **Brian Jongwon Choi**, Boston University (1154-35-2663)

- 5:30PM *Positive Solutions for a Derivative Dependent p -Laplacian Equation with Riemann-Stieltjes Integral Boundary Conditions.* Preliminary report.
(571) **Jaffar Ali Shahul Hameed***, Florida Gulf Coast University, and **Seshadev Padhi**, Birla Institute of Technology (1154-35-2834)

- 5:45PM *An SDE Representation of Particle Transport for Low Power Implementation.*
▶ (572) **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

- 3:00PM *An application of entropy to genomics.* Preliminary report.
▶ (573) **Jane M. Hawkins**, Univ. of North Carolina at Chapel Hill (1154-37-1612)
- 3:30PM *Can the dimension of a fractal set or measure be inferred from projections?*
(574) **William Ott*** and **Edward Stout**, University of Houston (1154-37-2463)
- 4:00PM *Orbit equivalence and Bernoulli rigidity.*
(575) **David Kerr***, Texas A&M University, and **Hanfeng Li**, SUNY at Buffalo (1154-37-1422)
- 4:30PM *On the Ergodicity of Wojtkowski's Falling Ball System.* Preliminary report.
▶ (576) **Matthew P. Clay**, Fort Walton Beach, FL, **Michael Hofbauer** and **Nandor J Simanyi***, University of Alabama at Birmingham (1154-37-1333)
- 5:00PM *Orders of Oscillation Motivated By Sarnak's Conjecture.*
▶ (577) **Yunping Jiang**, The City UNiversity of New York-Queens College and Graduate Center (1154-37-889)
- 5:30PM *On ergodic properties for powers of finite and infinite measure-preserving transformations.* Preliminary report.
(578) **Terrence Adams**, U.S. Government, and **Cesar E. Silva***, Williams College / NSF (1154-37-2548)

Relatively Prime Live: Truthiness in the Mathematical Domain

Jody Sorensen, Augsburg University

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

3:40PM ▶ (580) *Enhancing Abstract Algebra Classes with Various Teaching Techniques and Activities.* Preliminary report.
Violeta Vasilevska, Utah Valley University (1154-A1-901)

4:00PM ▶ (581) *Bringing back the take-home exam: an experiment to assess ownership in an Abstract Algebra course.* Preliminary report.
Faun C. C. Doherty, Washington & Jefferson College (1154-A1-139)

4:20PM ▶ (582) *Incorporating Student Choice in Assessment in Abstract Algebra.* Preliminary report.
Myron Minn-Thu-Aye, University of Connecticut (1154-A1-1288)

4:40PM ▶ (583) *A Theorem Sequence Approach to Abstract Algebra for Undergraduates.* Preliminary report.
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

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

**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

**Nebraska Conference for Undergraduate
Women in Mathematics Reunion**

6:00 PM – 7:30 PM Mineral Hall F, 3rd
Floor, Hyatt Regency Denver

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

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

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

7:00PM (584) *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

(585) *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

- 8:00AM *Unlikely Intersections and Portraits of Dynamical Semigroups.*
▶ (586) **Colby Kelln***, University of Michigan, **Talia Blum**, Massachusetts Institute of Technology, and **Henry Talbott**, Brown University (1154-14-793)
- 8:30AM *Graph Universal Cycles of Combinatorial Objects.* Preliminary report.
▶ (587) **Amelia Cantwell***, University of Montana, and **Juliann Geraci**, SUNY at Oswego (1154-05-731)
- 9:00AM *Codes from Cayley Graphs.* Preliminary report.
▶ (588) **Doel A Rivera**, Pontifical Catholic University of Puerto Rico (1154-94-807)
- 9:30AM *Coevolving Network Model for the Diffusion of Opioid Dependence in a Population.*
▶ (589) **Trevor Lax***, University of Evansville, and **Gabrielle Wolf**, Rochester Institute of Technology (1154-91-62)
- 10:00AM *On the Ramsey Number $R(K_4 - e, K_8 - e)$.*
▶ (590) **Ryan Kannanaikal***, Cornell University, and **Noah Krakoff**, University of California, Berkeley (1154-05-61)
- 10:30AM *Large Rank Numbers & $(K_s - e) \times P_n$.*
▶ (591) **Marina Jacobo***, Hofstra University, and **David Shuster**, Amherst College (1154-05-60)
- 11:00AM *Modeling New Low-Energy Defibrillation Methods and Heartbeat Patterns in Canines.*
▶ (592) **Rhiannan Reuf***, California State University, Channel Islands, and **Yasa Syed**, Rutgers University (1154-37-58)
- 11:30AM *Characterizing Nearly Asymmetric Graphs.*
▶ (593) **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)

8:00 AM – 11:40 AM **Room 404, Meeting Room Level, Colorado Convention Center**

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

- 8:00AM *Lusin's Theorem: How Computability Theory Proves a Real-Analysis Result.*
▶ (594) **Russell Miller**, Queens College & CUNY Graduate Center (1154-03-227)
- 9:00AM *Exchangeable constructions via model theory.*
(595) **Rehana Patel**, African Institute for Mathematical Sciences-Senegal (1154-03-2052)

- 10:00AM *Logic and Combinatorics.*
▶ (596) **Natasha Dobrinen**, University of Denver (1154-03-1423)
- 11:00AM *Computation and universality in multidimensional symbolic dynamics.*
(597) **Linda Brown Westrick**, Penn State University (1154-03-1514)

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

- 8:00AM *Repairing codes and applications.*
(598) **Gretchen L. Matthews**, Virginia Tech (1154-12-2647)
- 8:30AM *The Minimal Euclidean function on the Eisenstein Integers.* Preliminary report.
▶ (599) **Hester Graves**, IDA/CCS, and **Lindsey-Kay Lauderdale***, Towson University (1154-11-510)
- 9:00AM *Computing curves on surfaces.* Preliminary report.
(600) **Mckenzie West**, University of Wisconsin-Eau Claire (1154-11-2325)
- 9:30AM *Non-monogenic Division Fields of Elliptic Curves.*
(601) **Hanson Smith**, University of Colorado Boulder (1154-11-832)
- 10:00AM *Computing hyperelliptic modular invariants from period matrices.* Preliminary report.
(602) **Christelle Vincent**, University of Vermont (1154-11-2124)
- 10:30AM *p -adic Properties of Böttcher Coordinates.* Preliminary report.
▶ (603) **Adriana Salerno**, Bates College, and **Joseph H Silverman***, Brown University (1154-11-121)
- 11:00AM *Computations of $GL(3)$ eigencurves.* Preliminary report.
(604) **David Pollack***, Wesleyan University, and **Avner Ash**, Boston College (1154-11-1841)
- 11:30AM *Counting n -arcs in projective planes.*
(605) **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

Program of the Sessions – Thursday, January 16 (cont'd.)

- Larry Rolen**, Vanderbilt University
Jesse Thorner, University of Florida
- 8:00AM ▶ (606) *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)
- 8:30AM (607) *Zeros of derivatives of the completed Riemann zeta function.*
Amita Malik, Rutgers University, New Brunswick (1154-11-1210)
- 9:00AM ▶ (608) *Small Scale Equidistribution of Lattice Points on the Sphere.*
Peter Christopher Leslie Humphries, University College London (1154-11-192)
- 9:30AM (609) *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)
- 10:00AM (610) *On the sparsity of positive-definite automorphic forms.*
Junehyuk Jung, Texas A&M University (1154-11-2159)
- 10:30AM (611) *A new subconvex bound for $GL(3)$ L-functions in the t -aspect.*
Keshav Aggarwal, University of Maine (1154-11-190)
- 11:00AM (612) *Open Problems in Analytic Number Theory I.*
Nickolas Andersen, Brigham Young University, and **Kyle Pratt***, All Souls College, University of Oxford (1154-11-1318)
- 11:30AM (613) *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 Level, Colorado Convention Center**

- Organizers: **Miklós Bóna**, University of Florida
Jay Pantone, Marquette University
- 8:00AM (614) *Some crossing number results using probabilistic techniques.*
Eva Czabarka, University of South Carolina (1154-05-571)
- 8:30AM (615) *Periodic Pattern-Avoiding Permutations.* Preliminary report.
Neal Madras*, York University, Toronto, Canada, and **Justin M. Troyka**, York University, Toronto, Ontario (1154-05-751)

- 9:00AM ▶ (616) *Distance sets in discrete and continuous settings.*
Alex Iosevich, University of Rochester (1154-05-171)
- 9:30AM ▶ (617) *Exact Mixing and the Thorp Shuffle.* Preliminary report.
Christopher Coscia, Dartmouth College (1154-60-762)
- 10:00AM (618) *Walks in the three-quarter plane.*
Amelie Trotignon, Institut Denis Poisson & Simon Fraser University (1154-05-722)
- 10:30AM ▶ (619) *Almost square permutations are typically squares.*
Jacopo Borga, University of Zurich, **Enrica Duchi**, University of Paris Diderot IRIF, and **Erik Slivken***, Dartmouth College (1154-60-875)
- 11:00AM (620) *Some Random Words.*
Chaim Even Zohar, 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
- 8:00AM (621) *The Cyclotomic Trace and the Characteristic Polynomial.*
Jonathan A Campbell, Duke University (1154-55-303)
- 8:30AM (622) *Strict units of commutative ring spectra.*
Jun Hou Fung, Harvard University (1154-55-587)
- 9:00AM (623) *Expanding Tools for Topological CoHochschild Homology.*
Sarah Klanderma, Michigan State University (1154-55-1818)
- 9:30AM (624) *Towards the Topological Hochschild Homology of the second truncated Brown-Peterson spectrum.* Preliminary report.
Gabe Angelini-Knoll, Freie Universität Berlin, and **Dominic Culver***, University of Illinois, Urbana-Champaign (1154-55-1817)
- 10:00AM (625) *Revisiting homotopy associative structures of Moore spectra.*
Prasit Bhattacharya, University of Virginia (1154-55-1575)
- 10:30AM (626) *Classification of $\mathcal{A}(1)$ -modules.* Preliminary report.
Katharine L Adamyk, University of Colorado Boulder (1154-55-1725)
- 11:00AM (627) *Equivariant fundamental classes in $RO(C_2)$ -graded cohomology.*
Christy Hazel, University of Oregon (1154-55-1754)

- 11:30AM (628) *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

- 8:00AM Discussion
 9:00AM (629) *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 (1154-01-1887)
 10:00AM (630) *Al-Birūnī and the mathematics of medieval Indian poetry.* Preliminary report.
Kim Plofker, Union College, NY (1154-01-1936)
 11:00AM (631) *Islamic Trigonometry: A Very Short Introduction.*
Glen R Van Brummelen, Quest University (1154-01-374)

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

- 8:00AM (632) *Positive intermediate Ricci curvature with symmetries.* Preliminary report.
Lawrence Mouillé, University of California, Riverside (1154-53-721)

- 8:30AM (633) *Positive curvature and fundamental group.*

Elahe Khalili Samani, Syracuse University (1154-53-1453)

- 9:00AM (634) *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)

- 9:30AM (635) *Convex functional and the stratification of the singular set of their stationary points.*

Zahra Sinaei, University of Massachusetts Amherst (1154-51-1308)

- 10:00AM (636) *Instabilities and bifurcations of minimal surfaces.*

Nicholas D Brubaker, California State University, Fullerton (1154-53-1729)

- 10:30AM (637) *Witten deformation on noncompact manifolds.*

Xianzhe Dai and **Junrong Yan***, UC, Santa Barbara (1154-51-166)

- 11:00AM (638) *Left-invariant metrics and submanifold geometry of noncompact symmetric spaces.*

Hiroshi Tamaru, Osaka City University (1154-53-1233)

- 11:30AM 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

- 8:00AM (639) *Local integral models of cubic del Pezzo surfaces with a nontrivial Brauer class.* Preliminary report.

Bianca Viray, University of Washington (1154-11-1236)

- 8:30AM (640) *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)

- 9:00AM (641) *On the square-freeness of elliptic divisibility sequences over function fields.*

Seoyoung Kim*, Queen's University, and **NicoleLooper**, Brown University (1154-11-531)

Program of the Sessions – Thursday, January 16 (cont'd.)

- 9:30AM (642) *Lifting of wild cyclic-by-tame covers.* Preliminary report.
Huy Dang, University of Virginia, **Soumyadip Das**, Statistics and Mathematics Unit, Indian Statistical Institute, **Kostas Karagiannis***, Aristotle University of Thessaloniki, **Andrew Obus**, Baruch College, and **Vaidehee Thatte**, Binghamton University (1154-14-526)
- 10:00AM (643) *Tamely Ramified 3-Pointed Covers with Alternating and Symmetric Monodromy.*
Renee Bell, UPenn, **Jeremy Booher***, University of Canterbury, **William Y Chen**, Columbia University, and **Yuan Liu**, University of Michigan (1154-11-349)
- 10:30AM (644) *Root stacks in characteristic p .*
Andrew Kobin, University of Virginia (1154-14-338)
- 11:00AM (645) *The arithmetic of an explicit family of superelliptic curves over function fields.* Preliminary report.
Sarah Arpin, University of Colorado, **Richard Griffon**, Universiteit Leiden, **Libby Taylor***, Stanford University, and **Nicholas Triantafillou**, University of Georgia (1154-11-503)
- 11:30AM (646) *Solving the S -unit equation in Sage: Methods, Applications, and Next Steps.*
Alejandra Alvarado, Eastern Illinois University, **Angelos Koutsianas**, University of British Columbia, **Beth Malmskog***, Colorado College, **Chris Rasmussen**, Wesleyan University, **Christelle Vincent**, University of Vermont, and **Mckenzie West**, University of Wisconsin Eau Claire (1154-11-538)
- 9:00AM (649) *Rainbow variants of the Erdős-Rothchild problem.*
Lina Li, University of Illinois at Urbana-Champaign (1154-05-1634)
- 9:30AM (650) *Extremal problems for directed graphs and hypergraphs.*
Alex Cameron, Vanderbilt University (1154-05-2279)
- 10:00AM (651) *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)
- 10:30AM (652) *Hadamard matrices are even harder to find.*
Asaf Ferber, **Vishesh Jain*** and **Yufei Zhao**, MIT (1154-05-851)
- 11:00AM (653) *Induced Turán problems for hypergraphs.*
Ruth Luo*, University of California, San Diego, and **Zoltan Füredi**, Alfred Renyi Institute of Mathematics (1154-05-1998)
- 11:30AM (654) *Super-logarithmic cliques in dense inhomogeneous random graphs.*
Gweneth McKinley, MIT (1154-05-376)

AMS Special Session on Geometric Representation Theory and Equivariant Elliptic Cohomology, I (a Mathematics Research Communities Session)

8:00 AM – 11:50 AM Room 107, Meeting Room Level, Colorado Convention Center

Organizers: **Anne Dranowski**, University of Toronto

Noah Arbesfeld, Imperial College London

Dominic Culver, University of Illinois Urbana-Champaign

8:00AM (655) *Elliptic classes of Schubert varieties.*
Richard Rimanyi*, UNC Chapel Hill, and **Andrzej Weber**, University of Warsaw Poland (1154-14-2073)

8:30AM (656) *2-groups and bundles on the moduli space of elliptic curves.* Preliminary report.
Eric Berry, Montana State University, **Daniel Berwick-Evans**, University of Illinois at Urbana-Champaign, **Emily Cliff**, University of Sydney, **Laura Wells Murray***, University of Notre Dame, **Apurva Nakade**, University of Western Ontario, **Emma Phillips**, University of New Hampshire, and **Robert Joseph Rennie**, University of Illinois at Urbana-Champaign (1154-18-2377)

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

8:00AM (647) *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)

8:30AM (648) *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)

9:00AM Irreducible representations of elliptic quantum groups. (657)

Sachin Gautam*, The Ohio State University, and **Valerio Toledano Laredo**, Northeastern University (1154-17-2328)

9:30AM Analogs of Dirichlet L-functions in $K(1)$ -local homotopy theory. (658)

Ningchuan Zhang, University of Illinois at Urbana-Champaign (1154-55-1272)

10:00AM Branes and DAHA Representations. (659)

Peter Koroteev, University of California, Berkeley (1154-51-1090)

10:30AM Elliptic Coulomb Branches. Preliminary report. (660)

Justin Hilburn*, Perimeter Institute for Theoretical Physics, **Benjamin Gammage**, University of Miami, **Mikayel Mkrтчyan**, Harvard, **Matej Penciak**, Northeastern, and **Alex Sherman**, University of California, Berkeley (1154-14-2540)

11:00AM Level Structures and Morava E-theory. (661)

Zhen Huan*, Center for Mathematical Sciences, Huazhong University of Science and Technology, and **Nathaniel Stapleton**, University of Kentucky (1154-55-935)

11:30AM On the geometric model for de Rham elliptic cohomology. (662)

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 304, Meeting Room Level, Colorado Convention Center

Organizers: **Taryn C. Flock**, Macalester College

Betsy Stovall, University of Wisconsin-Madison

8:00AM Soliton stability in higher-dimensional generalization of KdV equation. (663)

Svetlana Roudenko, Florida International University (1154-35-2507)

9:00AM Improved bounds for restricted projection families via Fourier restriction. (664)

Terry Harris, University of Illinois at Urbana-Champaign (1154-42-694)

9:30AM Discrete variants of maximal functions: spheres, primes and triangles. (665)

Preliminary report.
Theresa C Anderson, Purdue University (1154-42-2180)

10:00AM L^p improving estimates for maximal spherical and circular averages. (666)

Joris Roos, University of Wisconsin-Madison (1154-42-1692)

10:30AM Fuglede's spectrum is rational in dimension one. (667)

Chun-Kit Lai*, San Francisco State University, and **Yang Wang**, Hong Kong University of Science and Technology (1154-42-879)

11:00AM Spectral properties of pseudodifferential operators on fractals. (668)

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

8:00AM Matching component analysis for transfer learning. (669)

Dustin G. Mixon, The Ohio State University (1154-15-2300)

8:30AM On Best s -Term Approximation Guarantees for Bounded Orthonormal Product Bases in Sublinear-Time. (670)

Mark A Iwen*, Michigan State University, **Bosu Choi**, University of Texas at Austin, and **Toni Volkmer**, TU Chemnitz (1154-65-163)

9:00AM Regression of functions on low-dimensional manifolds by deep ReLU networks. (671)

Wenjing Liao*, **Minshuo Chen**, **Haoming Jiang** and **Tuo Zhao**, Georgia Institute of Technology (1154-41-1087)

9:30AM Nonlinear Approximation and (Deep) ReLU Networks. (672)

Simon Foucart, Texas A&M University (1154-41-167)

10:00AM Random Matrix Products in Deep Learning. (673)

Boris Hanin*, Texas A&M University, **Mihai Nica**, University of Toronto, and **Grigoris Paouris**, Texas A&M (1154-60-1357)

10:30AM Learning Interaction laws in particle- and agent-based systems. (674)

Mauro Maggioni*, **Fei Lu**, **Jason Miller**, **Sui Tang** and **Ming Zhong**, Johns Hopkins University (1154-60-1576)

11:00AM Graph neural networks for combinatorial optimization problems on graphs. (675)

Soledad Villar, New York University (1154-68-1257)

11:30AM Learning the Geometry of Data Through Many Representations. (676)

Tingran Gao*, University of Chicago, and **Zhizhen Zhao**, University of Illinois at Urbana-Champaign (1154-62-158)

Program of the Sessions – Thursday, January 16 (cont'd.)

**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 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 Matrices and Graphs,
I**

8:00 AM – 11:50 AM 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

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)

9:30AM (692) *The normalized distance Laplacian.*

Carolyn Reinhart, Iowa State University
(1154-05-744)

10:00AM (693) *Colin de Verdiere invariants and antipodal mappings.*

Hein van der Holst*, **Marina Arav** and
Scott Dahlgren, Georgia State University
(1154-15-820)

10:30AM (694) *The Strong Inner Product Property.*

Bryan A Curtis* and **Bryan L Shader**,
University of Wyoming (1154-15-806)

11:00AM (695) *Some graphs whose maximum nullity and zero forcing number are the same.*

Derek D Young, Mount Holyoke College
(1154-15-727)

11:30AM (696) *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 Modeling Natural Resources, I

8:00 AM – 10:50 AM Room 112, Meeting Room Level, Colorado Convention Center

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

- 8:00AM ▶ (697) *A discrete-time predator-prey model: the long-term dynamics with and without evolution to resist a toxicant.*
Azmy S. Ackleh*, **Md Istiaq Hossain**, **Amy Veprauskas** and **Aijun Zhang**, University of Louisiana at Lafayette (1154-92-759)
- 8:30AM ▶ (698) *Optimal Control of Harvest Timing in a Discrete Model.* Preliminary report.
Danielle L Burton, University of Tennessee (1154-39-1637)
- 9:00AM (699) *Dynamics of task allocation in social insect colonies: Scaling effects of colony size versus work activities.* Preliminary report.
Yun Kang*, **Tao Feng**, **Jun Chen**, Arizona State University, **Zhipeng Qiu**, Nanjing University of Science and Technology, and **Daniel Charbonneau**, School of Life Sciences, Arizona State University (1154-34-800)
- 9:30AM (700) *Modeling of Anaerobic Digestion.*
Marion Weeder mann, Dominican University (1154-34-1317)
- 10:00AM (701) *Marine reserves and optimal dynamic harvesting when fishing damages habitat.*
Michael R Kelly*, Transylvania University, **Suzanne Lenhart**, University of Tennessee, and **Michael G Neubert**, Woods Hole Oceanographic Institute (1154-49-2230)
- 10:30AM ▶ (702) *Using epidemiological theory to guide the use of pathogens in pest control.* Preliminary report.
Greg Dwyer, University of Chicago (1154-92-2064)

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 Women's University

- 8:00AM ▶ (703) *Doing Calculus to Learn Calculus.* Preliminary report.
James R. Valles, Jr.* and **Natali Hritonenko**, Prairie View A&M University (1154-97-2327)

- 8:30AM ▶ (704) *Exploring Linear Algebra Concepts Through the Lights Out Game Using SageMath.*

Boyan S. Kostadinov, New York City College of Technology, CUNY (1154-97-2777)

- 9:00AM ▶ (705) *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 ▶ (706) *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 ▶ (707) *YouTube University II: Shared upper level math courses across schools.*

Steven J Miller, Williams College (1154-97-1043)

- 10:30AM ▶ (708) *Teaching Methods of Solving Nonstandard Problems.*

Ellina Grigorieva, Texas Woman's University (1154-97-309)

- 11:00AM ▶ (709) *The students from knowledge receiver to the pivot of the group leader.* Preliminary report.

Wisam Bukaita, Lawrence Technology University (1154-97-1478)

- 11:30AM ▶ (710) *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 Rational Points on Algebraic Varieties: Theory and Computation, II (Associated with AMS Invited Address Anthony Varilly-Alvarado)

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

- 8:30AM (712) *Rational points on varieties and the unipotent Albanese map.* Preliminary report.

Daniel Rayor Hast, Boston University (1154-11-1722)

- 9:00AM (713) *Explicit arithmetic intersection theory and computation of Néron-Tate heights.*

Raymond van Bommel, Massachusetts Institute of Technology (1154-11-877)

Program of the Sessions – Thursday, January 16 (cont'd.)

- 9:30AM (714) *A database of group actions on Riemann surfaces.*
Jen Paulhus, Grinnell College (1154-11-1951)
- 10:00AM (715) *Obstructions to rational points from Galois actions on fundamental groups.* Preliminary report.
Dean Bisogno, Colorado State University, **Wanlin Li**, Massachusetts Institute of Technology, **Daniel Litt** and **Padmavathi Srinivasan***, University of Georgia (1154-11-1100)
- 10:30AM (716) *2^k -Selmer groups and Goldfeld's conjecture.*
Alexander D Smith, Harvard (1154-11-1743)
- 11:00AM (717) *Nonvanishing of hyperelliptic zeta functions over finite fields.*
Jordan S Ellenberg, University of Wisconsin-Madison, **Wanlin Li***, MIT, and **Mark Shusterman**, University of Wisconsin-Madison (1154-11-427)
- 11:30AM (718) *Hasse-Witt matrices and mirror toric pencils.*
Adriana Salerno*, Bates College, and **Ursula Whitcher**, American Mathematical Society (1154-11-990)

AMS Special Session on Recent Advances in Function and Operator Theory, I

8:00 AM – 11:50 AM Room 110, Meeting Room Level, Colorado Convention Center

Organizers: **Kelly Bickel**, Bucknell University
Alberto Condiri, Florida Gulf Coast University
William Ross, University of Richmond
Alan Sola, Stockholm University

- 8:00AM (719) *Norm-preserving extensions of bounded holomorphic functions.*
Lukasz Kosinski, Jagiellonian University, and **John E. McCarthy***, Washington University (1154-32-701)
- 8:30AM (720) *Operators with minimal pseudospectra and connections to normality.*
Samir Raouafi, Auburn University (1154-47-1341)
- 9:00AM (721) *A two-dimensional inverse problem in magnetism.*
Elodie Pozzi, Saint Louis University (1154-47-1229)
- 9:30AM (722) *Outer functions and uniform integrability.*
Javad Mashreghi, Laval University (1154-30-895)
- 10:00AM (723) *Γ -convex sets and polynomials.*
Mark E. Mancuso, Washington University in St. Louis (1154-47-239)

- 10:30AM (724) *Old Results and New Observations for Optimal Approximants on the Bidisk.*
Meredith Sargent*, University of Arkansas, and **Alan Sola**, Stockholm University (1154-46-488)
- 11:00AM (725) *Reducing Subspaces of de Branges-Rovnyak Spaces.*
Cheng Chu, Laval University (1154-47-191)
- 11:30AM (726) *Error Bounds and Singularity Degree in Semidefinite Programming.* Preliminary report.
Stefan Sremac, University of Waterloo, **Hugo J Woerdeman***, Drexel University, and **Henry Wolkowicz**, University of Waterloo (1154-90-717)

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

8:00 AM – 11:40 AM Room 108, Meeting Room Level, Colorado Convention Center

Organizers: **Tobias Johnson**, College of Staten Island
Erin Beckman, Duke University
Katelynn Kochalski, SUNY Geneseo

- 8:00AM (727) *Interval parking functions.*
Emma Christensen, University of Kansas, **Ryan DeMuse**, University of Denver, **Jeremy Martin**, University of Kansas, and **Mei Yin***, University of Denver (1154-05-383)
- 9:00AM (728) *The contact process on random graphs.*
Danny Nam*, Princeton University, **Shankar Bhamidi**, University of North Carolina, Chapel Hill, **Oanh Nguyen** and **Allan Sly**, Princeton University (1154-60-364)
- 9:30AM (729) *Survival dynamics for the contact process with avoidance on Z, Z_n , and the star graph.*
Shirshendu Chatterjee, The City College of New York, **David Sivakoff** and **Matthew Wascher***, Ohio State University (1154-60-1511)
- 10:00AM (730) *Estimation in the Sparse Popularity Adjusted Stochastic Block Model.*
Ramchandra Rimal* and **Marianna Pensky**, University of Central Florida (1154-62-1103)
- 10:30AM (731) *Community Detection on Euclidean Random Graphs.*
Abishek Sankararaman*, The University of California, Berkeley, **Emmanuel Abbe**, Princeton University, and **Francois Baccelli**, The University of Texas at Austin (1154-60-2206)

11:00AM *Approximating geodesics via random points.*

► (732) **Erik Davis**, Rigetti Computing, and **Sunder Sethuraman***, Mathematics/University of Arizona (1154-60-1320)

11:30AM *Feldman-Katok convergence, f -bar, and entropy of nonuniformly hyperbolic measures.*

(740) **Dominik Kwietniak*** and **Martha Lacka**, Jagiellonian University in Krakow (1154-37-2042)

AMS Special Session on Topological Measures of Complexity: Inverse Limits, Entropy, and Structure of Attractors, I

8:00 AM – 11:50 AM 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

8:00AM *Parametrised Families of Rotational Attractors and the Accessible Rotation Numbers.*
 (733) **Jan P Boronski***, **Jernej Cinc**, AGH Krakow, Poland & IT4Innovations, University of Ostrava, and **Xiao-Chuan Liu**, Instituto de Matemática e Estatística da Universidade de São Paulo (1154-37-1384)

8:30AM *On the Barge entropy conjecture.*
 (734) **Jan Boronski**, **Jernej Činč*** and **Piotr Oprocha**, AGH University of Science and Technology and National Supercomputing Centre IT4innovations (1154-37-1744)

9:00AM *A transitive map on a dendrite with zero topological entropy.*
 (735) **Jakub Byszewski**, Jagiellonian University (1154-37-1799)

9:30AM *Topological Entropy of Markov Set-valued Functions.*
 (736) **Lori Alvin***, Furman University, and **James Kelly**, Christopher Newport University (1154-37-725)

10:00AM *Characterizations of \mathcal{P} -like continua that do not have the fixed point property.*
 ► (737) **Iztok Banic**, University of Maribor, **Judy Anita Kennedy***, Lamar University, **Uros Milutinovic**, University of Maribor, and **Piotr Minc**, Auburn University (1154-37-2132)

10:30AM *Topological Mixing and UPE. Preliminary report.*
 (738) **Veronica Martinez de la Vega***, IMATE, UNAM, **D Darji**, University of Kentucky, **Alejandro Illanes**, IMATE, UNAM, and **Jorge Martinez Montenegro**, F. CIENCIAS, UNAM (1154-54-1377)

11:00AM *On completely scrambled systems.*
 ► (739) **Piotr Oprocha**, AGH University, Poland (1154-37-1252)

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

8:00 AM – 11:50 AM Room 103, Meeting Room Level, Colorado Convention Center

Organizers: **James Greene**, Clarkson University
Hwayeon Ryu, Elon University
Kamila Larripa, Humboldt State University

8:00AM *Patterned heterogeneity in Colon Cancer: Xenografts, scRNAseq and Mathematical Modeling.*
 ► (741) **Eric J Puttock**, University of California, Irvine (1154-92-2728)

8:30AM *Data-driven Modeling of Tumor Growth and Response to Radiotherapy.*
 (742) **Helen Byrne**, University of Oxford, **Heyrim Cho**, University of California, Riverside, **Rachel Jennings**, UnitedHealth Group, **Allison Lewis**, Lafayette College, **Angela Reynolds**, Virginia Commonwealth University, **Blerta Shtylla**, Pomona College, and **Kathleen Storey***, University of Michigan (1154-92-1023)

9:00AM *A multicompartment mathematical model of cancer stem cell-driven tumor growth dynamics.*
 ► (743) **Suzanne L Weekes**, Worcester Polytechnic Institute (1154-92-353)

9:30AM *Non-Parametric Estimation of Intratumoral Heterogeneity from Spatiotemporal Data.*
 (744) **Erica M. Rutter***, University of California, Merced, **H.T. Banks** and **Kevin B. Flores**, North Carolina State University (1154-92-1907)

10:00AM *Mathematical Models of Immune System Dynamics and Cancer.*
 ► (745) **Lisette dePillis**, Department of Mathematics, Harvey Mudd College (1154-92-541)

10:30AM *Control Structures of a Cancer Drug Resistance Model.*
 (746) **James M Greene**, Clarkson University, **Cynthia H Sanchez-Tapia***, Rutgers University, and **Eduardo D Sontag**, Northeastern University (1154-92-573)

11:00AM *The ecology and evolution of intratumoral heterogeneity.*
 ► (747) **Robert A Gatenby**, Moffitt Cancer Center (1154-92-2112)

Program of the Sessions – Thursday, January 16 (cont'd.)

11:30AM (748) *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 (749) *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 (750) *Volvox: Modeling the Synchronization of Flagella on the Exterior of a Sphere.*
Forest O Mannan*, Western Colorado University, **Karin Leiderman** and **Miika Jarvela**, Colorado School of Mines (1154-AG-1856)
- 9:00AM (751) *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 (752) *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 (753) *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 (754) *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, Information and Related Topics

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

- 8:00AM (755) *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 (756) *Model-Agnostic Linear Competitors - When Interpretable Models Compete and Collaborate with Black-box Models.* 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 (757) *Higher-order Preferential Attachment Models.*
Nicole Eikmeier, Grinnell College (1154-68-1633)
- 8:45AM (758) *Developing Hybrid PSO Algorithm Models Using the Cyclic Coordinate Descent (CCD) Local Optimizer.* Preliminary report.
Hum Nath Bhandari, Roger Williams University (1154-68-1853)
- 9:00AM (759) *Automating Artifact Detection in Video Games.* Preliminary report.
Parmida Davarmanesh*, University of Michigan, **Kuanhao Jiang**, University of Pennsylvania, **Tingting Ou**, Johns Hopkins University, **Artem Vysogrets**, New York University, **Shantanu Joshi**, University of California Los Angeles, and **Nicholas Malaya**, Advanced Micro Devices (1154-68-2599)
- 9:15AM (760) *Synthetic data augmentation with DCGANs for better diagnoses of osteoarthritis.*
Camille Moyer*, **Hannes Baukmann** and **Tim Conrad**, Zuse Institute Berlin (1154-68-2496)

- 9:30AM **►** (761) *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. I. Johnson**, Northwestern University, **John M. Pauly**, Stanford University, and **Peder Larson**, University of California, San Francisco (1154-90-492)
- 9:45AM (762) *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 **►** (763) *Efficiency of Quantum Circuits for Multiplication Operation using different algorithms.* Preliminary report. **Parshuram Budhathoki**, Cameron University (1154-94-2476)
- 10:15AM (764) *A Block Principal Pivoting Algorithm for the Vertical Generalized Linear Complementarity Problem (VGLCP) with a Vertical Block P-matrix.* **Aniekan A. Ebiefung**, The University of Tennessee at Chattanooga, Chattanooga, TN (1154-90-2170)
- 10:30AM (765) *Nash embedding: a road map to realizing quantum hardware.* **Faisal Shah Khan**, Khalifa University of Science & Technology (1154-94-567)
- 10:45AM **►** (766) *A New Algorithm for Equivalence of Cyclic Codes and Its Applications.* **R Oliver VandenBerg*** and **Nuh Aydin**, Kenyon College (1154-94-1469)
- 11:00AM (767) *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 (768) *Isometry-Dual Flags of AG Codes.* **Maria Bras-Amorós**, Universitat Rovira i Virgili, **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 **►** (769) *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 (770) *Confining Charged Particles in 3 Dimensions Using Bounded Magnetic Fields.* **Gabriel Martins**, Sacramento State University (1154-70-2178)
- 8:30AM (771) *Numerical solutions in a self-organizing inhibitory system on a torus.* Preliminary report. **Michael C. Barg**, Niagara University (1154-74-2607)
- 8:45AM (772) *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 **►** (773) *A Deterministic Model for Mammal Migration based on a Continuum Mechanics Phase-Field Approach of Fluid Flow through Porous Media.* Preliminary report. **Lynn Schreyer***, **Nikolas Voulgarakis**, **Zachary Hilliard**, **Sergey Lapin**, Department of Mathematics and Statistics, Washington State University, and **Loren Cobb**, Denver, CO (1154-76-2396)
- 9:15AM **►** (774) *Steady-states of thin film droplets on chemically heterogeneous substrates.* **Weifan Liu***, Syracuse University, and **Thomas Witelski**, Duke University (1154-76-1249)
- 9:30AM **►** (775) *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)
- 9:45AM (776) *A Numerical Study of Entropy Generation in Nanofluid Flow Over an Inclined Cylinder.* **Z. M. Mbugua***, **P - Sibanda**, University of Kwazulu -Natal, and **S - Mondal**, Amity University Kolkata (1154-76-645)
- 10:00AM (777) *Finite element analysis and simulation of surface plasmon polaritons in graphene.* **Jichun Li**, University of Nevada Las Vegas (1154-78-630)

Program of the Sessions – Thursday, January 16 (cont'd.)

- 10:15AM ▶ (778) *PT-Symmetric Systems with Real Valued Complex Potential and their Exactly Solvable wave functions and Positive Energies.*
Jamal Benbourenane, Abu Dhabi University (1154-81-2497)
- 10:30AM ▶ (779) *A Yang-Mills Approach for Conformal Invariance in Turbulence.*
Antonino Travia* and **Razvan Teodorescu**, University of South Florida (1154-81-1838)
- 10:45AM (780) *The solutions of $gl(n)$ 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)
- 11:00AM ▶ (781) *A step toward the T:O:E: with Fermion and Boson matrices; using both Transpose() and Cispose() operations:.* Preliminary report.
Michael G. Dombroski, Los Angeles City College (1154-81-112)
- 11:15AM (782) *On the $gl_{1|1}$ 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 Doree, Augsburg University
Mary R. Parker, University of Texas Austin
- Moderator: **Rebecca Segal**, Virginia Commonwealth University
- 8:00AM ▶ (783) *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)
- 8:20AM ▶ (784) *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)

- 8:40AM ▶ (785) *A Hurricane Katrina Case Study: Integrating Social Justice, Health Care, and Business through Mathematics.* Preliminary report.
Victor I. Piercey, Ferris State University (1154-G1-231)
- 9:00AM ▶ (786) *Magnifying the Role of Mathematics in the World of Sciences in Math Courses.*
Shahrooz Moosavizadeh, Norfolk State University (1154-G1-1658)
- 9:20AM ▶ (787) *Creating Calculus Activities through Interdisciplinary Collaborations.*
Jody Sorensen* and **Suzanne Dorée**, Augsburg University (1154-G1-2204)
- 9:40AM (788) *Delicious Mathematics: Contexts for Mathematical Exercises from the Science and Engineering of Food.* Preliminary report.
Artemis Karaali, Yeditepe University, and **Gizem Karaali***, Pomona College (1154-G1-343)
- 10:00AM ▶ (789) *Connecting Partner Disciplines with Mathematics through Applications in Differential Equations.* Preliminary report.
Rebecca Segal, Virginia Commonwealth University (1154-G1-654)
- 10:20AM ▶ (790) *Incorporating Dentistry Applications from Interdisciplinary Collaborations into the Classroom.*
Nicoleta Corcodel, University of Heidelberg, **Kevin Rion**, **Irina Seceleanu*** and **Wanchunzi Yu**, Bridgewater State University (1154-G1-2443)
- 10:40AM (791) *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)
- 11:00AM ▶ (792) *Collaboration between the College of Education and Department of Mathematical Sciences at Lee University.* Preliminary report.
Caroline Maher-Boulis, Lee University (1154-G1-733)
- 11:20AM ▶ (793) *Mathematics and Redistricting: Authentic Learning through Government Partnerships.*
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
- 8:00AM ▶ (794) *The ALIEN Network: An Automatic Target Recognition Algorithm.*
Travis Shrontz*, **Seth Zuckerman**, **Timothy Klein**, **Alexander Boxer** and **Amanda Steck**, Areté (1154-J1-2393)

- 8:20AM *Starting small: developing consulting experiences for mathematics students.*
 (795) **Julia Eaton**, University of Washington - Tacoma (1154-J1-2379)
- 8:40AM *General Electric Aviation Material Wear Data Analysis.*
 ► (796) **Julianna Bernardi**, Wentworth Institute of Technology, **Vincent Filardi***, The City College of New York, **Malorie Finch**, Brigham Young University, **Tanvi Shinkre**, University of California Berkeley, and **Jeffrey Zhang**, Johns Hopkins University (1154-J1-2091)
- 9:00AM *A Learning Progression for Geometric Transformations: From Research to Validation.*
 ► (797) **James H. Fife**, Educational Testing Service (1154-J1-1003)

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

- 8:00AM *Re-envisioning the Math Pathways in Massachusetts Public Higher Education.*
 ► (798) **Maura A. Murray**, Salem State University (1154-N1-1681)
- 8:20AM *Re-envisioning Calculus with Constraints: A Diverse Research State University's Ongoing Work.*
 ► (799) **Mary Nelson***, **Robert Sachs** and **Joanna Jauchen**, George Mason University (1154-N1-2479)
- 8:40AM *Rethinking Calculus Pre-requisites—What does it take for Students to be Successful in Calculus?*
 ► (800) **Frank Savina**, University of Texas – Charles A. Dana Center (1154-N1-2446)
- 9:00AM *Co-requisite and Fall-back Courses for Calculus Students.* Preliminary report.
 ► (801) **Katrina Palmer***, **Katie Mawhinney** and **Greg Rhoads**, Appalachian State University (1154-N1-174)
- 9:20AM *Re-envisioning Assessment at Scale: Curricular and Programmatic Design to Improve Outcomes, Inclusiveness, and Retention.*
 ► (802) **Hanna Bennett**, **Paul Kessenich*** and **P. Gavin LaRose**, University of Michigan (1154-N1-2119)

- 9:40AM *Pairing Mastery-based Testing and Active Based Learning to Improve Student Performance and Persistence in the Calculus Sequence.*
 ► (803) **Jessie K Lenarz**, St. Catherine University (1154-N1-2129)
- 10:00AM *Active and Applied Calculus: a SUMMIT-P collaboration.*
 ► (804) **Suzanne I. Dorée*** and **Jody Sorensen**, Augsburg University (1154-N1-2158)
- 10:20AM *Calculus in Context: An Innovative Approach to Calculus.*
 (805) **Sarah Hews*** and **Geremias Polanco**, Amherst College (1154-N1-2317)
- 10:40AM *Re-Envisioning Calculus Sequence - Example of a Challenge Based Unit.* Preliminary report.
 ► (806) **Girija Sarada Nair-Hart**, University of Cincinnati Clermont College (1154-N1-93)
- 11:00AM *A Re-Envisioning of the Calculus Sequence for the Modern Student.* Preliminary report.
 ► (807) **Joel Kilty***, **Alex M McAllister**, Centre College, **Alison Marr** and **John Ross**, Southwestern University (1154-N1-2685)
- 11:20AM *Pedagogical Advantages of Teaching Calculus Using the Hyperreal Numbers.*
 ► (808) **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

- 8:00AM *The levers beyond personal beliefs that enable inquiry-oriented instruction: Professional obligations in instructor decision-making.*
 (809) **Mollee C. Shultz*** and **Patricio Herbst**, University of Michigan (1154-N5-1567)
- 8:20AM *For whom do workshops work? Personal and contextual factors associated with college instructors' implementation of inquiry-based learning after professional development.*
 (810) **Tim Archie***, **Sandra Laursen** and **Charles N Hayward**, University of Colorado Boulder (1154-N5-899)
- 8:40AM *Purposeful placement: How to group a room full of students.*
 ► (811) **Candice M. Quinn**, Middle Tennessee State University (1154-N5-236)

Program of the Sessions – Thursday, January 16 (cont'd.)

- 9:00AM ▶ (812) *Moving towards equitable teaching: A continuum of transforming collegiate mathematics teaching.*
Ciera N Street*, **Andrea C Alt**, **Lida M.L. Bentz** and **Hortensia Soto**, University of Northern Colorado (1154-N5-870)
- 9:20AM ▶ (813) *Managing Conditions, Assumptions, and Properties: Explicating a Disciplinary Practice of Mathematics.*
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)
- 10:20AM ▶ (816) *A Study of Skills and Weakness of Incoming Mathematics Students.*
Keri Kornelson*, **Deborah Moore-Russo**, **Stacy Reeder**, **Matthew Grover**, **Justin Wollenberg** and **Randa Shehab**, University of Oklahoma (1154-N5-1807)
- 10:40AM ▶ (817) *Detecting and Filling Gaps in Preparation for College Mathematics.* Preliminary report.
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 Univeristy, **Thomas Gross**, Western Kentucky University, and **Patricia McCarroll**, 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'Andre 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)
- 8:40AM ▶ (823) *Pattern and Structure: "The Curious Incident of the Dog in the Night-Time" and Understanding a Mathematical Mind.*
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)
- 9:40AM ▶ (826) *The Search for Truth in A Certain Ambiguity.* Preliminary report.
Elizabeth A. DeWitt, Trinity Christian College (1154-R1-2725)
- 10:00AM ▶ (827) *A Novel Idea: Teaching Mathematics Using Apostolos Doxiadis's Uncle Petros and Goldbach's Conjecture.*
Bill Linderman, King University (1154-R1-1774)
- 10:20AM ▶ (828) *The Simplest Equation – Mathematical Science Fiction of Nicky Drayden.*
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)

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

- 8:00AM ▶ (831) *Ternary Pell Strings - The Palindromes.*
Ralph P Grimaldi, Rose-Hulman Institute of Technology (1154-VS-2193)
- 8:15AM ▶ (832) *Rational Polynomials Based on the Fibonacci Numbers.*
Brian Hopkins, Saint Peter's University, and **Aram Tangboonduangjit***, Mahidol University International College (1154-VS-2175)
- 8:30AM (833) *Class groups and narrow class groups of S_n -fields of even degree.*
Benjamin Kibort Breen, Dartmouth (1154-VS-1668)
- 8:45AM (834) *Automorphisms of 2-adic fields of degree twice an odd number.*
Chad Awtrey* and **Briana Brady**, Elon University (1154-VS-2094)
- 9:00AM (835) *Simultaneous Cubic and Quadratic Diagonal Equations Over the Primes.*
Alan Talmage, Pennsylvania State University (1154-VS-2088)
- 9:15AM ▶ (836) *Plus-Minus Davenport Constant - a zero-subsum problem on Finite Abelian Groups.*
Darleen S Perez-Lavin, University of Kentucky (1154-VS-835)
- 9:30AM ▶ (837) *Using Inclusion-Exclusion to find Bent and Balanced Monomial Rotation Symmetric Functions.*
Elizabeth M Reid, Marist College (1154-VS-44)
- 9:45AM (838) *Regularity Conditions on Hermitian Lattices.* Preliminary report.
Freda Li, Wesleyan University (1154-VS-1265)
- 10:00AM ▶ (839) *On Some Properties of Latin Square Determinants.*
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)
- 10:15AM (840) *Higher Reciprocity Laws, Modular Forms of Weight One and Their Galois Representations.*
John Lien, Louisiana State University (1154-VS-2597)
- 10:30AM ▶ (841) *Patterns of Primes in the Intersection of Beatty and Chebotarev Sets.*
Caleb Ji, Washington University in St. Louis, **Joshua Kazdan***, Stanford University, and **Vaughan McDonald**, Harvard University (1154-VS-978)

10:45AM ▶ (842) *Automorphisms of Rational Functions over Fields of Characteristic $p > 0$.*
Julia Cai*, Yale University, **Benjamin Hutz**, Saint Louis University, **Leopold Mayer**, Lawrence University, and **Max Weinreich**, Brown University (1154-VS-2715)

11:00AM ▶ (843) *The Modified Szpiro Conjecture and Elliptic Curves with Specified Isogeny.*
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)

11:15AM (844) *Some properties of functions behaving like Jacobi forms.* Preliminary report.
Matthew Krauel, California State University, Sacramento (1154-VS-2612)

11:30AM (845) *A Note on Polynomial Sequences Modulo Integers.*
Mohammad Javaheri, Siena College (1154-VS-1702)

11:45AM ▶ (846) *Factorization of prime powers with the same sum.*
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

9:15AM ▶ (847) *The C-complex clasp number of links.*
Eric Anderson, **Jonah Amundsen**, **Christopher Davis** and **Daniel Guyer***, University of Wisconsin-Eau Claire (1154-VU-2283)

9:30AM ▶ (848) *Stratified spaces, Directed Algebraic Topology, and State-Sum TQFTs.* Preliminary report.
Ik Jae Lee*, Rowan University, and **David N Yetter**, Kansas State University (1154-VU-2339)

9:45AM ▶ (849) *Surgery on Penrose Tilings.* Preliminary report.
Josh Thompson* and **Davin Hemmila**, Northern Michigan University (1154-VU-2674)

Program of the Sessions – Thursday, January 16 (cont'd.)

- 10:00AM *Character Varieties of a Family of 2-Bridge Knots*. Preliminary report.
▶ (850) **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.
(851) **Marion Campisi** and **Luis Torres***, San Jose State University (1154-VU-2595)
- 10:30AM *Random grid diagrams*.
▶ (852) **Max Folkers***, **Eli Marriott** and **Miguel Sanchez**, Simpson College (1154-VU-2369)
- 10:45AM *The Datasaurus and Persistent Homology*. Preliminary report.
▶ (853) **Ryan J. Jensen**, Stephen F. Austin State University (1154-VU-1624)
- 11:00AM *Using reinforcement learning to find the slice genus*.
▶ (854) **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.
(855) **Vincent Longo**, University of Nebraska-Lincoln (1154-VU-1532)
- 11:30AM *Clustering Algorithms: Stability of TDA Mapper Graphs*.
▶ (856) **Wako T Bungula**, University of Wisconsin-La Crosse (1154-VU-2835)
- 11:45AM *Compact and extremally disconnected spaces via generalized continuous functions*.
(857) **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*.
(858) **Ben Galluzzo**, Clarkson University (1154-97-2811)
- 8:30AM *Preparing for the workforce through integration of technology, modeling, and writing*.
▶ (859) **Karen M. Bliss**, Virginia Military Institute (1154-97-558)
- 9:00AM *Ecosystem Development: Supporting new programs for the next generation of applied mathematician*.
(860) **Joe Skufca**, Clarkson University (1154-97-2103)
- 9:30AM *Data science for the liberal arts*.
(861) **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*.
▶ (862) **Jacob Pichelmeyer**, Kansas State University (1154-54-1133)
- 8:30AM *Universal Knot Diagrams*.
(863) **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*.
(864) **Jared Holshouser***, University of South Alabama, and **Chris Caruvana**, Indiana University Kokomo (1154-54-2113)
- 9:00AM *Constructing Partial Configuration Spaces Using Limits*.
▶ (865) **Amy Qing Hai Li**, Wellesley College (1154-55-2321)
- 9:15AM *Sliding window embeddings of quasiperiodic functions*.
(866) **Hitesh Gakhar*** and **Jose A Perea**, Michigan State University (1154-55-483)
- 9:30AM *Coordinatizing Data With Lens Spaces and Persistent Cohomology*.
(867) **Luis G. Polanco***, Michigan State University, and **Jose Perea**, Michigan State University (1154-55-893)
- 9:45AM *Abe Homotopy Groups*.
▶ (868) **Michael A. Hill**, Kansas State University (1154-55-1670)
- 10:00AM *2-Cocycle Invariant and Oriented Singular Knots*.
(869) **Indu Rasika Churchill**, State University of New York at Oswego (1154-55-1814)

- 10:15AM (870) *On extreme Khovanov homology, the Jones polynomial, and the girth of a link.*
Daniel Scofield*, Francis Marion University, and **Radmila Sazdanovic**, North Carolina State University (1154-55-2469)
- 10:30AM (871) *Cities, voting, and spider DULs: Case studies in spatial applications of topological tools.*
Michelle H Feng* and **Mason A Porter**, University of California Los Angeles (1154-55-2536)
- 10:45AM (872) *The Alexander polynomial of a rational link.*
Kerry M. Luse*, Trinity Washington University, and **Mark E. Kidwell**, United States Naval Academy (1154-55-2671)
- 11:00AM (873) *A Note on New Separation Axioms and Their Implications in the Theory of Generalized Metrizable Spaces.* Preliminary report.
Gangadhar R Hiremath, University of North Carolina Pembroke (1154-97-2677)

MAA General Contributed Paper Session on Teaching and Learning Mathematics, I

8:15 AM – 11:40 AM Room 709, Meeting Room Level, Colorado Convention Center

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

- 8:15AM (874) *Data Science for All: The first course in Data Science.*
Rasitha R. Jayasekare, Butler University, Indianapolis, IN (1154-VI-176)
- 8:30AM (875) *Preparation is key to reading mathematics.*
Melanie Butler, Mount St. Mary's University (1154-VI-662)
- 8:45AM (876) *Revamping of College Algebra.*
Rabia Shahbaz* and **Janice Alves**, Georgia Gwinnett College (1154-VI-28)
- 9:00AM (877) *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 (878) *Teaching a Redesigned Mathematics Course for Business Majors.* Preliminary report.
Timothy B Flowers, Indiana University of Pennsylvania (1154-VI-2611)
- 9:30AM (879) *What's the Norm? Teaching Introductory Mathematics via Active Learning in Collaborative Learning Spaces.* Preliminary report.
Amy Been Bennett, University of Arizona (1154-VI-2801)

- 9:45AM (880) *An Approach to Improve Students' Participation and Performance in Introductory Math Classes.* Preliminary report.
Ganga Acharya, CNM, Albuquerque, NM (1154-VI-2019)
- 10:00AM (881) *Using an Activity to Illustrate Conditional Probability and Baye's Formula.*
Jay A Malmstrom, Oklahoma City Community College (1154-VI-129)
- 10:15AM (882) *Using Coded Messages to Teach One-to-One and Inverse Functions.*
Jenna P. Carpenter, Campbell University (1154-VI-1009)
- 10:30AM (883) *Student Perceptions on Adding Mathematical Journals into a Precalculus Course.*
Kevin Bombardier, University of Wisconsin, Platteville (1154-VI-1334)
- 10:45AM (884) *Application Projects in Calculus II.*
Yun Lu, Kutztown University (1154-VI-2294)
- 11:00AM (885) *Improving students' knowledge retention through daily quizzes in pre-calculus class: An experimental approach.* Preliminary report.
Chamila K. Ranaweera*, University of Colorado Boulder, and **Uditha N. Katugampola**, Florida Polytechnic University (1154-VI-2562)
- 11:15AM (886) *Observations from (Co)Sine Clock beyond the Unit Circle Definition.*
L Franklin Kemp, Plano Texas (1154-VI-1904)
- 11:30AM (887) *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

8:40 AM – 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 (888) *T_EX in the browser.*
Jim Fowler* and **Bart Snapp**, The Ohio State University (1154-C5-1473)
- 9:00AM (889) *Teaching Mathematics with Jupyter and Pretext.* Preliminary report.
Virgil U Pierce, University of Northern Colorado (1154-C5-1141)
- 9:20AM (890) *Open Textbooks in Mathematics: Progress and Challenges.* Preliminary report.
Kent E Morrison, American Institute of Mathematics (1154-C5-1811)

Program of the Sessions – Thursday, January 16 (cont'd.)

- 9:40AM (891) *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)
- 10:00AM (892) *PreTeXt for day-to-day teaching.*
Oscar Levin, University of Northern Colorado (1154-C5-2181)
- 10:20AM (893) *Embedding WeBWork problems anywhere.* Preliminary report.
Michael E. Gage, University of Rochester (1154-C5-1178)
- 10:40AM (894) *Making WeBWork Fun: Using Game Design to Increase Student Engagement.*
K. Andrew Parker, NYC College of Technology (1154-C5-2445)
- 11:00AM (895) *Transforming Math Documents with MathJax Version 3.*
Volker Sorge*, University of Birmingham, and **Davide P Cervone**, Union College (1154-C5-1930)
- 11:20AM (896) *The PreTeXt-Nemeth Connection: Enabling Sighted and Blind People to Share the Mathematical Experience.*
Al P. Maneki, U.S. Government Ret. (1154-C5-367)
- 11:40AM (897) *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
- 9:00AM (899) *Counting Catan Configurations.*
Jathan Austin, Salisbury University, **Brian Kronenthal***, Kutztown University, and **Susanna Molitoris Miller**, Kennesaw State University (1154-M5-1105)
- 9:20AM (900) *Applications of Graph Theory and Probability in the Board Game Ticket to Ride.*
R. Teal Witter* and **Alex Lyford**, Middlebury College (1154-M5-1147)
- 9:40AM (901) *Sequences and Patterns Arising from Mancala on an Infinite Board.*
L. Kerry Mitchell, Peoria, Arizona (1154-M5-2510)
- 10:00AM (902) *Proofs by Board Games.* Preliminary report.
Robert A. Cohen, Western Colorado University (1154-M5-2686)
- 10:20AM (903) *A bijection on maximum arrangements of nonattacking pawns.*
Tricia Muldoon Brown, Georgia Southern University (1154-M5-294)
- 10:40AM (904) *More on Equilibrium Patterns in the Three-Person Candy-Sharing Circle.* Preliminary report.
Daniel C Florentino* and **Ryan Higginbottom**, Washington & Jefferson College (1154-M5-1014)
- 11:00AM (905) *Waiting for Penney's to Turn Up.*
Robert W Vallin, Lamar University (1154-M5-1054)

11:20AM *In Search of a Card Trick.*
 ▶ (906) **John M. Harris**, Furman University
 (1154-M5-673)

11:40AM *Magic Tricks on Codes over GF(4).*
 ▶ (907) **Hideo Nagahashi**, University of Guam
 (1154-M5-2041)

Sandra Rucker, Clark
 Atlanta University

Monica Y. Stephens,
 Spelman College

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

Program of the Sessions – Thursday, January 16 (cont'd.)

- 10:20AM *Understanding Mathematics Matters*
(909) *(Umm...) Camp: Improving School Students' Perception of Mathematics.*
Ahmad Alhammouri, Jacksonville State University (1154-H5-65)
- 10:40AM *From Redesigning a Class Curriculum to Redesigning a Classroom Instead.*
(910) **Elizabeth W Schott**, Florida SouthWestern State College, and **Laurice Garrett***, Florida SouthWestern State College (1154-H5-2572)
- 11:00AM *The TA Coach: A Peer Mentoring Approach to Support GTAs in the use of Active Learning Pedagogy.* Preliminary report.
▶ (911) **Nicholas E Weaver*** and **Gary Olson**, University of Colorado Denver (1154-H5-2519)
- 11:20AM *Why Aren't We All Using IBL?*
(912) **Susan B. Crook**, Loras College (1154-H5-2622)
- 11:40AM *How to choose Topics in Liberal Arts Math for an IBL course?* Preliminary report.
▶ (913) **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

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, Colby-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**

(915) *The Mathematics of Life: Making Diffusion your Friend.*

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

1:00PM *Barren extensions.*

(917) **Natasha Dobrinen***, University of Denver, and **Daniel Hathaway**, University of Vermont (1154-03-1565)

1:30PM *Borel ideals and topological Ramsey spaces.*

(918) **Sonia Navarro Flores**, National University of Mexico (1154-03-2467)

- 2:00PM *Parametrizing the Ramsey theory of block sequences.*
(919) **Ilan B. Smythe**, Rutgers University - New Brunswick (1154-03-945)
- 2:30PM *Forcing over Cohen's symmetric model.*
(920) **Philipp Schlicht**, University of Bristol (1154-03-829)
- 3:00PM *Definable Combinatorics at the First Uncountable Cardinal.*
(921) **William Chan*** and **Stephen Jackson**, University of North Texas (1154-03-589)
- 3:30PM *The decomposability conjecture.*
(922) **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.*
(923) Preliminary report.
Holley Friedlander, Dickinson College, **Elena Fuchs**, University of California, Davis, **Piper H**, University of Hawaii at Manoa, **Catherine Hsu**, University of Bristol, **Katherine Sanden**, University of California, Davis, **Damaris Schindler**, Utrecht University, and **Katherine E Stange***, University of Colorado, Boulder (1154-11-2459)
- 1:30PM *Computing elliptic curves over \mathbb{Q} .*
(924) Preliminary report.
Adela Gherga, The University of British Columbia (1154-11-473)
- 2:00PM *Life, the universe, and everything.*
▶ (925) **Andrew R. Booker**, University of Bristol, and **Andrew V. Sutherland***, Massachusetts Institute of Technology (1154-11-1874)
- 2:30PM *Equidistribution counts abelian varieties.*
(926) **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.*
(927) **Caleb J. Springer**, The Pennsylvania State University (1154-11-1439)
- 3:30PM *Sporadic Points on Modular Curves.*
(928) **Abbey Bourdon**, Wake Forest University, **Ozlem Ejder***, Colorado State University, **Yuan Liu**, University of Michigan, **Frances Odumodu**, Institut de Mathematiques de Bordeaux, Universite de Bordeaux, and **Bianca Viray**, University of Washington (1154-11-2027)

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

1:00 PM – 3:50 PM Room 402, Meeting Room Level, Colorado Convention Center

Organizers: **Amanda Folsom**, Amherst College

Michael Griffin, Brigham Young University

Larry Rolen, Vanderbilt University

Jesse Thorner, University of Florida

- 1:00PM *Distributions of 2-Selmer groups in quadratic twist families.*
(929) **Alexander D Smith**, Harvard (1154-11-1783)
- 1:30PM *The least prime number represented by a binary quadratic form.*
(930) **Naser Talebizadeh Sardari**, Institute for Advanced Study-(IAS) (1154-11-295)
- 2:00PM *Moments of cubic L-functions over function fields.*
(931) **Chantal David**, Concordia University, **Alexandra Florea***, Columbia University, and **Matilde Lalin**, University of Montreal (1154-11-296)
- 2:30PM *Polyharmonic Maass forms and ray class zeta functions for real quadratic fields.*
(932) **Olivia Beckwith***, University of Illinois Urbana-Champaign, and **Gene Kopp**, University of Bristol (1154-11-719)
- 3:00PM *Non-random behaviour in sums of modular symbols.*
(933) **Alex Cowan**, Harvard (1154-11-929)
- 3:30PM *Quantum Unique Ergodicity of Eisenstein Series on $GL(n)$.*
(934) **Liyang Zhang**, Boston College (1154-11-656)

AMS Special Session on Analytic and Probabilistic Combinatorics, II

1:00 PM – 3:50 PM Room 403, Meeting Room Level, Colorado Convention Center

Organizers: **Miklós Bóna**, University of Florida

Jay Pantone, Marquette University

- 1:00PM *Inverses and reciprocals of thinned exponential series.*
(935) **David Galvin**, University of Notre Dame (1154-05-184)
- 1:30PM *Counting independent sets in unbalanced bipartite graphs.*
(936) **Sarah Cannon***, Claremont McKenna College, and **Will Perkins**, University of Illinois at Chicago (1154-68-786)

Program of the Sessions – Thursday, January 16 (cont'd.)

- 2:00PM *Recursive functions on conditional Galton-Watson trees.*
(937) **Nicolas Broutin**, 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.*
(938) **Torin Greenwood**, North Dakota State University (1154-05-783)
- 3:00PM *Asymptotic Results on Weighted Ordered Trees.* Preliminary report.
▶ (939) **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.*
(940) **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 Deeley**, University of Colorado Boulder
Zhuang Niu, University of Wyoming
Ping Zhong, University of Wyoming
- 1:00PM *Higher indices and cyclic cohomology.*
(941) Preliminary report.
Alexander Gorokhovsky*, University of Colorado, Boulder, and **Henri Moscovici**, Ohio State University (1154-46-1464)
- 1:30PM *Direct integral decompositions of wavelet representations for crystallographic groups.* Preliminary report.
(942) **Judith A. Packer**, University of Colorado, Boulder (1154-22-1165)
- 2:00PM *Negative Definite Functions and Matrix-valued Euler-Phi functions.* Preliminary report.
▶ (943) **Martin E. Walter**, University of Colorado, Boulder (1154-46-326)
- 2:30PM *Analytic Vectors of a Weakly-Defined Derivation.*
(944) **Lara Ismert**, Embry-Riddle Aeronautical University - Prescott (1154-46-1786)
- 3:00PM *Algebraic aspects of Hermitian Brownian motion.* Preliminary report.
(945) **Michael Anshelevich**, Texas A&M University (1154-46-1766)
- 3:30PM *Free Stein Irregularity and Dimension.*
(946) **Ian Charlesworth**, University of California, Berkeley, and **Brent Nelson***, Michigan State University (1154-46-757)

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
Haydee Lindo, Williams College
- 1:00PM *The Prime Spectra of Precompletions.*
(947) **Erica Barrett**, **Emil Graf**, **Susan Loepf***, Williams College, **Kimball Strong**, University of California, Berkeley, and **Sharon Zhang**, Princeton University (1154-13-834)
- 1:30PM *Lech's inequality, the Stückrad-Vogel conjecture, and uniform behavior of Koszul homology.*
(948) **Patricia Klein**, University of Kentucky, **Linquan Ma**, Purdue University, **Pham Hung Quy**, FPT University, **Ilya Smirnov**, Stockholm University, and **Yongwei Yao***, Georgia State University (1154-13-2116)
- 2:00PM *Generators of Koszul homology.*
(949) **Rachel N. Diethorn**, Syracuse University (1154-13-1276)
- 2:30PM *Lower bounds on s -multiplicity.*
(950) **Lance Edward Miller***, University of Arkansas, and **William D. Taylor**, Tennessee State University (1154-13-2693)
- 3:00PM *The local cohomology of a parameter ideal with respect to an arbitrary ideal.*
(951) **Monica Ann Lewis**, University of Michigan (1154-13-403)
- 3:30PM *Boundedness results in homological commutative algebra.*
(952) **Daniel Erman***, University of Wisconsin-Madison, **Steven V Sam**, University of California, San Diego, and **Andrew Snowden**, University of Michigan (1154-14-628)

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.*
(953) **Zhouli Xu**, Massachusetts Institute of Technology (1154-55-2380)
- 1:30PM *Higher categories and factorization algebras.*
(954) **Laura Wells Murray**, University of Notre Dame (1154-18-2383)

2:00PM *Twisted tangential Pin⁺-bordism.*
(955) **Meng Guo***, University of Toronto/Perimeter Institute, and **Michael J Hopkins**, Harvard University (1154-55-1888)

▶ 2:30PM *Periodic Points: Vanishing and Realizability.*
(956) **Shane Clark**, University of Kentucky (1154-55-2092)

3:00PM *A combinatorial model for an honest ∞ -operad.* Preliminary report.
(957) **Safia Chettih***, Southwestern University, **L Bonatto**, University of Oxford, **A Linton**, University of Southampton, **S Raynor**, Macquarie University, **M Roberston**, University of Melbourne, and **N Wahl**, University of Copenhagen (1154-55-1981)

3:30PM *Decomposing C_2 -equivariant spectra.*
(958) 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
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

1:00PM *Natural Γ -symmetric structures on R -spaces.* Preliminary report.
(959) **Peter Quast**, University of Augsburg, and **Takashi Sakai***, Tokyo Metropolitan University (1154-53-1970)

1:30PM *Two-numbers and applications.*
(960) **Bang-Yen Chen**, Michigan State University (1154-53-663)

2:00PM *Maximal antipodal sets related to G_2 .*
(961) **Makiko Sumi Tanaka***, Department of Mathematics, Faculty of Science and Technology, Tokyo University of Science, **Hiroyuki Tasaki**, Division of Mathematics, Faculty of Pure and Applied Sciences, University of Tsukuba, and **Osami Yasukura**, Faculty of Engineering, University of Fukui (1154-53-1067)

2:30PM *First eigenvalue estimates of p -Laplace type operators on Kahler manifolds.* Preliminary report.
(962) **Shoo Seto**, UC Irvine (1154-53-2506)

3:00PM *The p -spectra of hyperbolic spaces.* Preliminary report.
(963) **Zhiqin Lu**, University of California, Irvine (1154-53-2722)

3:30PM *V^T -Rectifying submanifolds.*
(964) **Yun Oh**, Andrews University (1154-53-1787)

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

1:00 PM – 3:50 PM **Room 109, Meeting Room Level, Colorado Convention Center**

Organizers: **Vaidehee Thatte**, Binghamton University

Sarah Arpin, University of Colorado Boulder

Nicholas Triantafillou, University of Georgia

1:00PM *Hecke Orbits and Unlikely Intersections.* Preliminary report.
(965) **Maria Fox**, University of Oregon, **Vlad Matei**, University of California, Irvine, and **Soumya Sankar***, University of Wisconsin - Madison (1154-11-534)

1:30PM *Computability of rational points on curves over function fields in characteristic p .*
(966) **Campbell Hewett**, Massachusetts Institute of Technology (1154-14-333)

2:00PM *A non-hyperelliptic curve with torsion l -adic Ceresa class.*
(967) **Dean Bisogno***, Colorado State University, **Wanlin Li**, MIT, **Daniel Litt**, University of Georgia, and **Padmavathi Srinivasan**, Georgia Institute of Technology (1154-11-552)

2:30PM *Formal Groups with Complex Multiplication.*
(968) **Caroline Matson**, University of Colorado at Boulder (1154-11-422)

3:00PM *Abelian varieties not isogenous to a hyperelliptic jacobian.*
(969) **Ravi Donepudi***, University of Illinois at Urbana-Champaign, **Edgar Costa**, Massachusetts Institute of Technology, **Ravi Fernando**, University of California Berkeley, **Valentijn Karemaker**, Utrecht University, **Caleb Springer**, The Pennsylvania State University, and **Mckenzie West**, University of Wisconsin Eau Claire (1154-11-562)

Program of the Sessions – Thursday, January 16 (cont'd.)

3:30PM (970) *Zeta functions of alternate mirror Calabi-Yau families.*
Charles F. Doran, University of Alberta, **Tyler L. Kelly**, University of Birmingham, **Adriana Salerno**, Bates College, **Steven Sperber**, University of Minnesota, **John Voight***, Dartmouth College, and **Ursula Whitcher**, Mathematical Reviews (1154-11-366)

AMS Special Session on Extremal and Probabilistic Combinatorics, II

1:00 PM – 3:50 PM **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

1:00PM (971) *Stability for maximal independent sets and its applications.*
Jeff Kahn and **Jinyoung Park***, Rutgers University (1154-05-843)

1:30PM (972) *Find Berge hypergraphs by looking at the shadow.*
Linyuan Lu and **Zhiyu Wang***, University of South Carolina (1154-05-1275)

2:00PM (973) *Extremal Configurations in Point-Line Arrangements.* Preliminary report.
Mozhgan Mirzaei* and **Andrew Suk**, UC San Diego (1154-05-134)

2:30PM (974) *On Rainbow Turán Numbers of Paths and Other Trees.*
Daniel P Johnston*, Skidmore College, and **Puck Rombach**, University of Vermont (1154-05-1914)

3:00PM (975) *The Chromatic Number of Random Lifts of Regular Graphs.*
JD Nir, University of Nebraska-Lincoln (1154-05-382)

3:30PM (976) *On the Erdős-Gyárfás distinct distances problem with local constraints.*
Cosmin Pohoata, California Institute of Technology (1154-05-856)

AMS Special Session on Geometric Representation Theory and Equivariant Elliptic Cohomology, II (a Mathematics Research Communities Session)

1:00 PM – 3:50 PM **Room 107, Meeting Room Level, Colorado Convention Center**

Organizers: **Anne Dranowski**, University of Toronto
Noah Arbesfeld, Imperial College London
Dominic Culver, University of Illinois Urbana-Champaign

1:00PM (977) *Schubert calculus beyond K-theory.*
Cristian Lenart*, State University of New York at Albany, USA, **Kirill Zainoulline**, University of Ottawa, Canada, and **Changlong Zhong**, State University of New York at Albany, USA (1154-14-1016)

2:00PM (978) *Twisted quasi-elliptic cohomology and a twisted Chern character map.* Preliminary report.
Matthew Spong*, University of Melbourne, and **Zhen Huan**, Huazhong University of Science and Technology (1154-55-1972)

2:30PM (979) *Elliptic Cohomology at the Tate Curve.*
Kiran Luecke, UC Berkeley (1154-55-1984)

3:00PM (980) *Elliptic shuffle algebras revisited.* Preliminary report.
Joshua Jeishing Wen, UIUC (1154-16-1962)

3:30PM (981) *Complex oriented cohomology of Nakajima quiver varieties.* Preliminary report.
Dominic Culver, University of Illinois, **Vitaly Lorman**, **Carl McTague**, University of Rochester, **Brian Shin**, University of Illinois, and **Dylan Wilson***, Harvard University (1154-55-1666)

AMS Special Session on Hamiltonian Systems, II

1:00 PM – 3:50 PM **Room 406, Meeting Room Level, Colorado Convention Center**

Organizers: **Sean Gasiorek**, University of California Santa Cruz
Gabriel Martins, University of California Berkeley
Andres Perico, University of California Santa Cruz

1:00PM (982) *Hamiltonian vortex-body interactions, inviscid vortex shedding, and models for aquatic locomotion.*
Scott David Kelly, University of North Carolina at Charlotte (1154-76-2723)

1:30PM (983) *Optimizing Mixing in Aref's Blinking Vortex Flow.*
James D Meiss*, University of Colorado Boulder, and **Rebecca A Mitchell**, National Renewable Energy Laboratory (1154-34-882)

2:00PM (984) *Self-similarity in the Kepler-Heisenberg problem.* Preliminary report.
Corey Shanbrom*, Sacramento State University, and **Victor Dods**, MSRI (1154-70-140)

2:30PM (985) *On the Simultaneous Binary Collision and the Curious 8/3.*
Nathan Duignan, University of Sydney (1154-70-2024)

3:00PM *Existence and Uniqueness of Solutions to the Weakly Nonlinear Schrodinger-Newton System.* Preliminary report.
(986)
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

1:00PM *NSFD Schemes: A Methodology for Constructing Structure Preserving Discretizations for Differential Equations.*
(987)
Ronald E. Mickens*, Clark Atlanta University, and **Talitha M. Washington**, Howard University (1154-65-325)

1:30PM *A hybridized discontinuous Galerkin method for the Stokes equations with symmetric stress tensor approximation.*
(988)
Jeonghun Lee, Department of Mathematics, Baylor University (1154-65-2376)

2:00PM *Propagation of light in multi-frequency moving focus model.* Preliminary report.
(989)
Alexey Sukhinin, NDSU (1154-78-2495)

2:30PM *A splitting approximation for the numerical solution of a self-adjoint quenching problem.*
(990)
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.*
(991)
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.
(992)
Qin Sheng, Baylor University (1154-65-228)

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

1:00 PM – 3:50 PM **Room 407, Meeting Room Level, Colorado Convention Center**

Organizers: **Jamie Haddock**, University of California Los Angeles

Anna Ma, University of California San Diego

1:00PM *Adaptive sketch-and-project methods for solving linear systems.*
(993)
Robert Gower, Télécom ParisTech, **Denali Molitor***, **Jacob Moorman** and **Deanna Needell**, University of California, Los Angeles (1154-65-592)

1:30PM *On Comparing Adaptive Sampling Rules for Sketch-and-Project Methods.*
(994)
Jacob D Moorman*, **Denali Molitor**, University of California, Los Angeles, **Robert M Gower**, Telecom ParisTech, and **Deanna Needell**, University of California, Los Angeles (1154-65-1212)

2:00PM *Iterative re-weighted Kaczmarz algorithm for compressed sensing.* Preliminary report.
(995)
Halyun Jeong*, **Kateryna Melnykova** and **Ozgur Yilmaz**, University of British Columbia (1154-65-2312)

2:30PM *Kaczmarz and Least Absolute Deviations.*
(996)
Anna C Aboud, Westmont College (1154-41-1980)

3:00PM *Matrix Completion for Structured Observations Using Iteratively Reweighted Algorithms.* Preliminary report.
(997)
Henry Adams, **Lara Kassab***, Colorado State University, and **Deanna Needell**, UCLA (1154-65-536)

3:30PM *Online nonnegative matrix factorization for Markovian data.*
(998)
Laura Balzano, University of Michigan, **Hanbaek Lyu*** and **Deanna Needell**, University of California, Los Angeles (1154-68-2274)

AMS Special Session on Mathematical Physics Some Open Problems for the 21st Century, 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.*
(999)
Deborah Ann Konkowski, United States Naval Academy (USNA) (1154-83-1313)

1:50PM *Friedmann's Equation and the Creation of the Universe.*
(1000)
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.*
(1001)
Sonia Mazzucchi, Department of Mathematics, University of Trento (1154-81-432)

3:30PM *Quantum Cayley Graphs of Finite Groups.*
(1002)
Erica K Swindle*, Washington and Lee University, **Jon Harrison** and **Mark Sepanski**, Baylor University (1154-81-1823)

Program of the Sessions – Thursday, January 16 (cont'd.)

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)

1:30PM (1004) *Redundant Power Dominating Sets.* Preliminary report.
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)

▶ 1:30PM (1016) *Growth Through Outreach: How I Became A Better Mathematician & Educator Through Outreach Programs.*

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.**
 ► (1017) **Sarah Trebat-Leder**, Art of Problem Solving (1154-97-2514)
- 2:30PM **Lessons from A Multi-Tiered Approach to Mathematics Enrichment.**
 ► (1018) **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.**
 ► (1019) **Demi Dubois*** and **Li-Mei Lim**, Boston University (1154-97-2692)
- 3:30PM **Panel on Reaching Underrepresented Students at the Pre-College Level.**
 ► (1020) **Li-Mei Lim***, Boston University/PROMYS, **Max Warshauer**, Texas State University, **Dan Zaharopol**, **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.**
 (1021) **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.**
 (1022) **Sarah Frei**, Rice University (1154-14-1486)
- 2:00PM **Conic bundles over positive rank elliptic curves.** Preliminary report.
 (1023) **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.
 (1024) **Vishal Arul**, Massachusetts Institute of Technology (1154-11-735)
- 3:00PM **Resultants of division polynomials and their derivatives, and singular torsion on elliptic curves.**
 (1025) **David Grant**, University of Colorado Boulder (1154-11-1123)

- 3:30PM **Local-global principles in circle packings.**
 (1026) **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.**
 (1027) **Constanze Liaw**, University of Delaware (1154-47-276)
- 1:30PM **An invitation to analytic variable exponent function spaces.**
 (1028) **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.**
 (1029) **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.**
 (1030) **Rachael M. Norton**, Fitchburg State University (1154-47-1367)
- 3:00PM **The zero sets of ℓ_A^p are nested.**
 (1031) **Ray Cheng**, Old Dominion University (1154-46-243)
- 3:30PM **Nonvanishing Minors and Uncertainty Principles.**
 (1032) **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

Program of the Sessions – Thursday, January 16 (cont'd.)

- 1:00PM *Geodesics in inhomogeneous exponential last passage percolation.* Preliminary report.
Christopher Janjigian*, University of Utah, **Elnur Emrah**, KTH Royal Institute of Technology, and **Timo Seppalainen**, University of Wisconsin - Madison (1154-60-1785)
- 1:30PM *Geometry of geodesics through Busemann measures in directed last-passage percolation.*
Christopher Janjigian, **Firas Rassoul-Agha***, University of Utah, and **Timo Seppalainen**, University of Wisconsin at Madison (1154-60-2020)
- 2:30PM *Chase-escape with death on trees.*
Erin Beckman, Concordia University, **Keisha Cook**, Tulane University, **Nicole Eikmeier**, Grinnell College, **Sarai Hernandez-Torres***, The University of British Columbia, and **Matthew Junge**, Bard College (1154-60-1342)
- 3:00PM *The q -voter model on the torus.*
Pooja Agarwal, Brown University, **Mackenzie Simper***, Stanford University, and **Rick Durrett**, Duke University (1154-60-1826)
- 3:30PM *Recent results on the phase transition for activated random walk.*
Jacob Richey, University of Washington (1154-60-1143)

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

- ▶ 1:00PM *Internal Chain Transitivity and ω -limit sets in Baire space.*
Jonathan Meddaugh* and **Brian Raines**, Baylor University (1154-37-2271)
- ▶ 1:30PM *Folding points for inverse limits generated by a sequence of unimodal maps.*
Brian E Raines, Baylor University (1154-54-2220)
- 2:00PM *Folding points in inverse limits.*
Ana Anusic, University of Sao Paulo, Brazil (1154-37-1679)

- 2:30PM *Exploding endpoints and a positive entropy conjecture.*
David Sumner Lipham, Auburn University at Montgomery (1154-37-1868)
- 3:00PM *Some recent advances in the theory of generalized covering spaces.* Preliminary report.
James Keesling*, University of Florida, **Jerzy Dydak**, University of Tennessee, and **Joanna Furno**, University of Houston (1154-37-1768)
- 3:30PM *Nonstationary Coupled Map Lattices.*
Duong Nguyen*, Kalamazoo College, and **William Ott**, University of Houston (1154-37-2676)

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 *The Mathematics of the COMAP Modeling Contests - Problem A.*
Elizabeth W Schott, Florida SouthWestern State College (1154-AC-1587)
- ▶ 1:30PM *Perspectives on Student's Mathematical Approaches for the "B Problem" (Discrete) of COMAP's Mathematical Modeling Contest.*
William C. Bauldry, Appalachian State University (1154-AC-2255)
- ▶ 2:00PM *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 *Time to Leave the Louvre: Student Modeling Approaches.*
Michelle Lynn Isenhour, Naval Postgraduate School (1154-AC-2417)
- ▶ 3:00PM *Simple Models for the Complex Problem of Measuring and Improving Sustainable Development.*
Jessica M. Libertini, Virginia Military Institute (1154-AC-993)
- ▶ 3:30PM *Who should we send to colonize Mars?*
Amanda Beecher*, Ramapo College of New Jersey, and **Chris Arney**, COMAP, Inc. (1154-AC-1390)

MAA Minicourse #8: Part A

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 Group Theory and Related Topics

1:00 PM – 3:10 PM Room 206, Meeting Room Level, Colorado Convention Center

▶ 1:00PM *Finite coverings of algebraic structures I.* (1050) **Casey Donovan** and **Luise-Charlotte Kappe***, Binghamton University (1154-20-113)

▶ 1:15PM *Finite coverings of algebraic structures II.* (1051) **Casey Donovan*** and **Luise-Charlotte Kappe**, Binghamton University (1154-20-114)

▶ 1:30PM *Dual Pairs in Complex Reductive Groups.* Preliminary report. (1052) **Marisa Gaetz**, Massachusetts Institute of Technology (1154-22-609)

1:45PM *Constructing simple groups using dynamical systems.* Preliminary report. (1053) **Volodymyr Nekrashevych**, Texas A&M University (1154-20-1719)

▶ 2:00PM *Using group-like interactions to motivate undergraduate research projects.* Preliminary report. (1054) **Meghan M. De Witt**, St. Thomas Aquinas College (1154-20-1876)

2:15PM *Four-dimensional Einstein Lie groups.* (1055) **Manoj B Karki***, Prairie View A&M University, and **Gerard Thompson**, University Of Toledo (1154-22-1974)

2:30PM *Trees, dendrites, and the Cannon-Thurston map.* (1056) **Elizabeth Field**, University of Illinois at Urbana-Champaign (1154-20-1938)

▶ 2:45PM *On Inverse Semigroups of Self-Similar Graph Actions.* (1057) **Trevor Arrigoni**, University of Kansas, **Alexander Black**, University of California Davis, **Jessica Harter**, University of Wisconsin Milwaukee, **David Milan** and **Yansy Perez***, University of Texas at Tyler (1154-20-2121)

3:00PM *Numerical analysis on the growth of free quasigroup words.* (1058) **Jonathan DH Smith**, Iowa State University, and **Stefanie G Wang***, Smith College (1154-20-2508)

AMS Contributed Paper Session on Mechanics, Mathematical Physics and Other Applications, II

1:00 PM – 3:40 PM Room 202, Meeting Room Level, Colorado Convention Center

1:00PM *Hyper-Dimensional Space-Time Topology and the Riemann Zeta Function: Applications in a Dimensional Field Theory.* (1059) **Demond C. Adams**, Miami, FL (1154-85-814)

▶ 1:15PM *Understanding Asteroid 16 Psyche's Composition through 3D Hydrocode Impact Crater Models.* (1060) **Wendy K. Caldwell***, **Abigail Hunter**, **Catherine S. Plesko**, Los Alamos National Laboratory, and **Stephen Wirkus**, Arizona State University (1154-85-766)

▶ 1:30PM *Automated Identification of Landslides.* Preliminary report. (1061) **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)

1:45PM *On ellipticity of balance equations for atmospheric dynamics.* (1062) **Andrei Bourchtein*** and **Ludmila Bourchtein**, Institute of Physics and Mathematics, Pelotas Federal University, Brazil (1154-86-1323)

▶ 2:00PM *Tracking the Evolution of a Large Ice Disk in Westbrook, Maine, USA.* Preliminary report. (1063) **Darrell Jarrett Valenti***, Roger Williams University, Bristol, Rhode Island, and **Christopher Horvat**, Institute at Brown for Environment and Society (1154-86-2401)

▶ 2:15PM *Physical characterization of string stability with applications to automobile platoons.* (1064) **Lance Dengelegi*** and **Hasala Gallolu Kankanamalage**, Roger Williams University (1154-93-2687)

▶ 2:30PM *A Model for the Influence of Media on the Ideology of Content in Online Social Networks.* (1065) **Heather Zinn Brooks*** and **Mason A Porter**, University of California Los Angeles (1154-91-209)

▶ 2:45PM *Implementation of Toyota's e-Palette Mobility System to Develop Data-driven Optimization of Transportation Networks.* (1066) **Julia E Vasile**, Stony Brook University (1154-91-2838)

Program of the Sessions – Thursday, January 16 (cont'd.)

- 3:00PM *Using Markov-Chain Monte Carlo methods to study gerrymandering in Utah.*
▶ (1067) **Annika King***, **Cristina Lange** and **Tyler J Jarvis**, Brigham Young University (1154-62-2795)
- 3:15PM *Overdose Prevention Site Placement Informed by Agent-Based Modeling.* Preliminary report.
▶ (1068) **Joanna R. Wares***, University of Richmond, **Jana L. Gevertz**, The College of New Jersey, **Ami Radunskaya**, Pomona College, **Sara Solomon** and **Douglas Wiebe**, The University of Pennsylvania Injury Science Center (1154-91-2609)
- 3:30PM *A new approach to solve 2-tuple linguistic matrix games based on linguistic scale functions.*
▶ (1069) **Rajkumar Verma***, University of Chile, Santiago, **Abha Aggarwal**, Guru Gobind Singh Indraprastha University, and **José M. Merigó**, University of Chile (1154-91-2367)

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.*
▶ (1070) **Taylor Meredith***, **Iddo Ben-Ari**, **Hugo Panzo**, **Xioran Tan** and **Jonah Green**, University of Connecticut (1154-60-2732)
- 1:15PM *Hyperpfaffian descriptions of β -ensembles when β is a perfect square.* Preliminary report.
(1071) **Jonathan M. Wells**, Reed College (1154-60-2455)
- 1:30PM *Non-existence results for space-time fractional stochastic partial differential equations.*
(1072) **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.*
(1073) **Thomas J. Faulkenberry**, Tarleton State University (1154-62-1142)
- 2:00PM *Probabilistic models on fibre bundles.*
(1074) **Shan Shan***, **Douglas M Boyer**, **Sayan Mukherjee** and **Ingrid Daubechies**, Duke University (1154-60-1663)
- 2:15PM *Chip-Firing in Abelian Sandpiles.*
(1075) **Jiajun Hoo**, Sam Houston State University (1154-60-1034)

- 2:30PM *Some properties of the First Return to the Origin (FRO) Distribution.* Preliminary report.
▶ (1076) **Aradhana Soni*** and **Anant Godbole**, East Tennessee State University (1154-62-1673)
- 2:45PM *Markovian Consistency of Multivariate Markov Processes.* Preliminary report.
(1077) **Yu-Sin Chang**, Milwaukee School of Engineering (1154-60-128)
- ▶ 3:00PM *On the range of the transient frog model on \mathbb{Z} .*
(1078) **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.
(1079) **Ryo Ohashi**, King's College (1154-57-186)
- ▶ 1:15PM *The multi-variable affine index polynomial.*
(1080) **Nicolas Petit**, Oxford College of Emory University (1154-57-495)
- 1:30PM *Virtual Rational Tangles.*
▶ (1081) **Blake Mellor*** and **Sean Nevin**, Loyola Marymount University (1154-57-519)
- ▶ 1:45PM *Artworks and Articles Meet Mapper and Persistent Homology.*
(1082) **H. Zhang*** and **A. Ledesma Alonso**, Grinnell College (1154-54-323)
- ▶ 2:00PM *The tunnel number of all 11 and 12 crossing alternating knots.*
(1083) **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.*
(1084) **Eleni Panagiotou***, 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.
(1085) **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.
(1086) **Scott Baldridge**, Louisiana State University (1154-57-1353)
- ▶ 3:00PM *Coloring invariants of knots and links are often intractable.*
(1087) **Eric Samperton**, University of Illinois at Urbana-Champaign (1154-57-2757)

3:15PM (1088) *An introduction to the normalized set-theoretic Yang-Baxter homology theory.*
Seung Yeop Yang, Kyungpook National University (1154-57-1526)

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

1:00 PM – 4:15 PM Room 503, Meeting Room Level, Colorado Convention Center

Organizers: **Jessie Lenarz**, St. Catherine University

Kristi Meyer, Wisconsin Lutheran College

- ▶ 1:20PM (1089) *Connecting Course Content to Professional Publications.* Preliminary report.
Vicky Klima, Appalachian State University (1154-A1-1351)
- 1:40PM (1090) *From Small to Large: Adapting Techniques in the Face of Increasing Class Sizes.*
Kristi Meyer, Wisconsin Lutheran College (1154-A1-1419)
- 2:00PM (1091) *An Active Learning Approach to Abstract Algebra.* Preliminary report.
Melinda Schulteis, Concordia University Irvine (1154-A1-2709)
- 2:20PM (1092) *A blended approach to active learning in an abstract algebra course.*
Peri Shereen, California State University, Monterey Bay (1154-A1-2164)
- ▶ 2:40PM (1093) *Teaching Abstract Algebra: Lessons from my Children.*
Sara Jensen, Carthage College (1154-A1-1958)
- ▶ 3:00PM (1094) *Project-based abstract algebra using Office Hours with a Geometric Group Theorist.*
Robert Kelvey* and **Jennifer Bowen**, The College of Wooster (1154-A1-1935)
- ▶ 3:20PM (1095) *An odd (or even?) inquiry-based approach to quotient groups.*
Jill E. Jordan, Houghton College (1154-A1-1676)
- 3:40PM (1096) *An Open Source Inquiry-Based Abstract Algebra Text.*
Mike Janssen, Dordt University (1154-A1-965)
- ▶ 4:00PM (1097) *Including Applications in a Theoretical Course.*
Jeremy Muskat, Western Colorado University (1154-A1-2335)

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 Vandebussche**, **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)

Program of the Sessions – Thursday, January 16 (cont'd.)

- 3:40PM ▶ (1106) *Ready for Change - Institutional and departmental factors supporting active learning recitations.* Preliminary report. **Joanna G. Jauchen***, **Bob Sachs** and **Catherine A Sausville**, George Mason University (1154-A5-2641)

MAA Contributed Paper Session on Innovations in Complex Analysis

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 ▶ (1107) *The Beautiful Chaotic Dynamics of i^z .* **Joseph Previte** and **Michelle Previte***, Penn State Erie, The Behrend College (1154-G5-2330)
- 1:20PM (1108) *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)
- 1:40PM ▶ (1109) *Finding roots of a class of harmonic polynomials.* Preliminary report. **Beth Schaubroeck**, U. S. Air Force Academy (1154-G5-2148)
- 2:00PM ▶ (1110) *Visual Explorations for a 1-Parameter Family of Harmonic Trinomials.* Preliminary report. **Michael A. Brilleslyper**, U.S. Air Force Academy (1154-G5-2130)
- 2:20PM ▶ (1111) *Complex Hearts: a game of complex numbers.* Preliminary report. **Stephen Deterding**, West Liberty University (1154-G5-1132)

MAA Contributed Paper Session on Recreational Mathematics: Puzzles, Card Tricks, Games, and Gambling, II

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 ▶ (1112) *Snakes: Legal, Illegal and Dodecahedral.* **Therese Aglialoro** and **Robert Hochberg***, University of Dallas (1154-M5-2576)

- 1:20PM ▶ (1113) *New Developments on the Benjamin Franklin Magic Squares.* **Hossein Behforooz**, Mathematics Department, Utica College, Utica, New York (1154-M5-1764)

- 1:40PM ▶ (1114) *A New Take on Classic Pen Problems.* Preliminary report. **David A Nash**, Le Moyne College (1154-M5-1608)

- 2:00PM ▶ (1115) *Colonel Blotto, 10 Years Later.* Preliminary report. **Andrew Niedermaier**, Jane Street Capital (1154-M5-761)

- 2:20PM ▶ (1116) *Making Money on Scratch Tickets—The Impact of Prize Structures.* **Michael Czekanski*** and **Alex Lyford**, Middlebury College (1154-M5-1770)

- 2:40PM ▶ (1117) *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

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 ▶ (1118) *Celebrating the Career of Dr. Fern Hunt.* **Bonita V Saunders**, National Institute of Standards & Technology (1154-D5-2766)

- 1:20PM ▶ (1119) *Dr. Roselyn Williams: The Work and Influence of a Woman Math Warrior.* **Talitha Washington**, Howard University (1154-D5-2575)

- 1:40PM ▶ (1120) *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 ▶ (1121) *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)

- 2:20PM (1122) *Stochastic modeling in cellular internalization and transport.* Preliminary report. **Keisha Cook**, Tulane University (1154-D5-896)

- 2:40PM ▶ (1123) *Solving the Word Problem for Euclidean Artin Groups*. Preliminary report.
Ashlee Keolalaulani Kalauli, University of California, Santa Barbara (1154-D5-2761)
- 3:00PM ▶ (1124) *Length Space Skeletonization in 2-Dimensions*.
Melanie R. King, The University of Iowa (1154-D5-2605)
- 3:20PM ▶ (1125) *The Game of Cycles and the Filled Board Theorem*.
Mary Leah Karker*, Providence College, **Ryan Alvarado**, Amherst College, **Maia Averett**, Mills College, **Benjamin Gaines**, Iona College, **Christopher Jackson**, Coleman, FL, **Malgorzata Aneta Marciniak**, LaGuardia Community College of the City University of New York, **Francis Edward Su**, Harvey Mudd College, and **Shanise Walker**, University of Wisconsin - Eau Claire (1154-D5-2397)
- 3:40PM (1126) *Beyond Cyclotomics: Polynomial Roots, Vandermonde Matrices, and RLWE Cryptography*. Preliminary report.
Katharine Ahrens, North Carolina State University (1154-D5-1862)

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)
- 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 Tabanjeh, New York University-Abu Dhabi (1154-VN-2828)
- 3:00PM Break
- 3:15PM ▶ (1135) *Stability of cosmological models in modified gravity*.
Parth Mukeshbhai Shah* and **G. C. Samanta**, BITS Pilani, K K Birla Goa Campus (1154-VN-150)
- 3:30PM (1136) *Solving Black-Scholes Equation using Exponentially-Fitted Backward Differentiation Formula*. Preliminary report.
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 H Nzokem* and **Neal Madras**, York University (1154-VN-287)

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 ▶ (1139) *On the ordered size Ramsey number of paths*.
Jozsef Balogh, **Felix Clemen**, **Emily Heath*** and **Mikhail Lavrov**, University of Illinois at Urbana-Champaign (1154-VP-2503)
- 1:15PM ▶ (1140) *Sequentially Embeddable Graphs*.
Jackson Autry*, Texas A&M University, and **Christopher O'Neill**, San Diego State University (1154-VP-2551)

Program of the Sessions – Thursday, January 16 (cont'd.)

- ▶ 1:30PM (1141) *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 (1142) *Hunters and Rabbits on Graphs.*
Jay Cummings, California State University, Sacramento (1154-VP-2724)
- ▶ 2:00PM (1143) *Characterize Sandpiles on Two and Three Vertices Graphs.*
Julianna Doo Ree Kim, California State University, Long Beach (1154-VP-1310)
- ▶ 2:15PM (1144) *Diffusion of PageRank on graphs.*
Paul Horn, University of Denver, and **Lauren M. Nelsen***, University of Indianapolis (1154-VP-881)
- ▶ 2:30PM (1145) *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 McCreedy***, King's College, PA, **Kathleen Ryan**, DeSales University, **Jill Stifano**, Brandeis University, and **Nathaniel Sauerberg**, Carleton College (1154-VP-2779)
- ▶ 2:45PM (1146) *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 (1147) *A Few Questions on Color-Critical Subgraphs.*
N A Newman*, Troy University, and **Matt Noble**, Middle Georgia University (1154-VP-773)
- ▶ 3:15PM (1148) *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 (1149) *Iterated Line Graphs of Graphs with Regular and Bi-Regular Partitions.*
Zachary Tyler King, University of Central Oklahoma (1154-VP-1398)
- ▶ 3:45PM (1150) *Peripheral convex expansions of resonance graphs.* Preliminary report.
Zhongyuan Che, Penn State University, Beaver Campus (1154-VP-202)
- ▶ 4:00PM (1151) *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 (1152) *Iterated Circular Convolutions in the Binomial Options Pricing Model.*
Boyan S. Kostadinov, New York City College of Technology, CUNY (1154-VC-2688)
- ▶ 1:15PM (1153) *A generative model-based deconvolution of bulk expression data using single-cell references.* Preliminary report.
Jonathan Fischer*, **Dan D. Erdmann-Pham** and **Yun S. Song**, University of California, Berkeley (1154-VC-2544)
- ▶ 1:30PM (1154) *Analyzing Facial Expression Data in Autism Research.*
Chris Fagin*, Christian Brothers University, **Yudong Tao**, Department of Electrical and Computer Engineering, University of Miami, **Yejin Amy Ahn**, **Laura Vitale** and **Daniel Messinger**, Child Division, Department of Psychology, University of Miami (1154-VC-2336)
- ▶ 1:45PM (1155) *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-710)
- ▶ 2:00PM (1156) *A Survey of Proportional Apportionment Methods Used in the Republican Presidential Primary.*
Michael Jones, American Mathematical Society, **David McCune***, William Jewell College, and **Jennifer Wilson**, Eugene Lang College, The New School (1154-VC-1314)
- ▶ 2:15PM (1157) *Iterative Methods and Preconditioners for Finite Element Method Based Simulations of Transcranial Direct Current Stimulation.*
Edward Dougherty*, Roger William University, **James Turner**, Virginia Tech, and **Frank Vogel**, InuTech GmbH (1154-VC-2783)
- ▶ 2:30PM (1158) *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 (1159) *A naive mathematician's approach to finding asteroids.*
James D. Martin, Hardin-Simmons University (1154-VC-1293)

- 3:00PM *The Cutoff Paradox in the Kansas Presidential Caucuses.*
 ► (1160) **David McCune**, William Jewell College, **Lori McCune***, Missouri Western State University, and **Dalton Nelson**, Vanderbilt University (1154-VC-2635)
- 3:15PM *Modeling Vascular Congestion in the Microcirculation.*
 (1161) **Sarah Ritchey Patterson**, Virginia Military Institute (1154-VC-484)
- 3:30PM *The Quantum Mechanical Approach to the Riemann Hypothesis.* Preliminary report.
 ► (1162) **Steven M Deckelman**, University of Wisconsin-Stout (1154-VC-1177)
- 3:45PM *Open and Closed Convexity in 3-Sparse Neural Codes.* Preliminary report.
 ► (1163) **Brianna Gambacini***, University of Connecticut, and **Sam Macdonald**, Willamette University (1154-VC-101)

SIAM Minisymposium on Mathematical Modeling and Simulation of Complex Biological Systems

1:00 PM – 3:55 PM Room 301, Meeting Room Level, Colorado Convention Center

- Organizer: **Karin Leiderman**, Colorado School of Mines
- 1:00PM *Estimating Kinetic Rates of Prion Replication from a Structured Population Model.*
 ► (1164) **Suzanne Sindi*** and **Fabian Santiago**, University of California, Merced (1154-92-1245)
- 1:30PM *Stochastic and continuum dynamics in cellular transport.*
 ► (1165) **Maria-Veronica Ciocanel***, MBI/The Ohio State University, **Bjorn Sandstede**, Applied Mathematics/Brown University, and **Scott McKinley**, Mathematics/Tulane University (1154-37-417)
- 2:00PM *Can you hear me now? A PDE Model for Stochastic Properties of the Auditory Neuron.*
 (1166) **Rebecca E. Gasper**, Creighton University (1154-92-2796)
- 2:30PM *Enhanced electrodiffusive transport across a mucus layer.*
 ► (1167) **Owen L Lewis***, Florida State University, and **James P Keener**, University of Utah (1154-92-1480)
- 3:00PM *A Regularized Stokeslet Approach to the Motion and Behavior of Microscopic Swimmers.*
 ► (1168) **A P Hoover***, University of Akron, and **R Cortez**, Tulane University (1154-76-1403)
- 3:30PM *Modeling decision-making in honey bee swarm formation.*
 ► (1169) **Gary K Nave***, **Hadley Tallackson** and **Orit Peleg**, University of Colorado Boulder (1154-92-2569)

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.)

Tarik Aougab, Haverford College

Megan Wawro, Virginia Tech

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-C5-2774)

▶ 1:35PM *Open Educational Resources in Active Learning Classrooms.*

Mike Weimerskirch*, Univ. of Minnesota, and **Shelley Kandola**, Michigan State University (1154-C5-1477)

▶ 1:55PM *A preview of the Distributed Open Education Network (Doenet).*

Duane Q. Nykamp, University of Minnesota (1154-C5-1756)

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

1:20PM (1173) *Student-Use of Internet Resources in Undergraduate Mathematics Courses.*

Abigail Higgins* and **Jessamyn Minners**, Sacramento State University (1154-N5-2720)

▶ 1:40PM (1174) *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 (1175) *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 (1176) *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 (1177) *A Case of Defining as a Way to Learn about Mathematical Language.* Preliminary report.

Kristen Vroom, Portland State University (1154-N5-1728)

▶ 3:00PM (1178) *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 (1179) *Affect Toward Unusual Mathematical Tasks in Mathematically Experienced Adults on the Autism Spectrum.*

J. Victoria Truman, Virginia Tech (1154-N5-2675)

3:40PM (1180) *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 (1181) *Fourier Restriction to a Hyperbolic Cone.*

Benjamin Baker Bruce, University of Wisconsin - Madison (1154-42-1835)

- 2:00PM (1182) *Optimal $L^p \rightarrow L^q$ Estimates for Euclidean Averages Over Prototypical Hypersurfaces in \mathbb{R}^3 .*
Jeremy Schwend, University of Wisconsin-Madison (1154-42-2134)
- 2:30PM (1183) *Explicit Salem Sets in Euclidean Space.*
Kyle Hambrook*, San Jose State University, and **Robert Fraser**, University of Edinburgh (1154-42-131)
- 3:00PM (1184) *Discrete directional maximal function along the primes.*
Laura Cladek, UCLA, **Polona Durcik***, Caltech, **Ben Krause**, Princeton University, and **Jose Madrid**, UCLA (1154-42-2135)
- 3:30PM (1185) *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)
- 2:00PM (1190) *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 (1191) *URI Robert Noyce Teacher Scholarship Program.*
Anne Seitsinger*, **Theresa Deeney**, **Bryan Dewsbury**, **Cornelis de Groot**, **Jay Fogelman**, **Kathy Peno** and **Victor Fay-Wolfe**, University of Rhode Island
- 2:00PM (1192) *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

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 (1186) *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 (1187) *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 (1188) *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 (1189) *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 (1193) *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 Mangram**, University of Hawai'i at Manoa
- 2:00PM (1194) *Calculus and Virtual Reality (CalcVR).*
Nicholas Long* and **Jeremy Becnel**, Stephen F. Austin State University
- 2:00PM (1195) *Passion-Driven Statistics.*
Robin Donatello*, California State University, Chico, and **Lisa Dierker**, Wesleyan University
- 2:00PM (1196) *Heartland: The Carver Bridge to STEM Success Program.*
Heidi Berger*, **Mark Brodie**, **Derek Lyons** and **Clint Meyer**, Simpson College
- 2:00PM (1197) *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

Program of the Sessions – Thursday, January 16 (cont'd.)

- 2:00PM (1198) *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 (1199) *Discovering the Art of Mathematics.*
Christine Von Renesse*, **Philip Hotchkiss**, **Julian Fleron** and **Volker Ecke**, Westfield State University
- 2:00PM (1200) *Collaborative Research: Maplelets 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 (1201) *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 (1202) *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 (1203) *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 **Hollylynn S. Lee**, North Carolina State University
- 2:00PM (1204) *New Futures in Science and Mathematics: Supporting Engagement, Retention, Graduation, and Entry of Women into STEM careers.*
Susan Pustejovsky*, **Angela Frey** and **Lauralee Guilbault**, Alverno College
- 2:00PM (1205) *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 (1206) *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 (1207) *Experiences of Mathematics Faculty in Learning to Teach Future Elementary School Teachers.*
Shandy Hauk*, San Francisco State University, **Jenq Jong Tsay**, University of Texas Rio Grande Valley, and **Billy Jackson**, University of Louisville
- 2:00PM (1208) *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 (1209) *Applications from Partner Disciplines in Differential Equations (a SUMMIT-P collaboration).*
Rebecca Segal* and **Afroditi Filippas**, Virginia Commonwealth University
- 2:00PM (1210) *Tracking the Longitudinal Development of STEM Majors' Autonomy and Agency in Mathematical Proof and Proving.*
Shiv Smith Karunakaran*, Michigan State University, **Mariana Levin**, Western Michigan University, and **John Smith III**, Michigan State University
- 2:00PM (1211) *South Plains Mathematics Fellows.*
Raegan Higgins Siwatu* and **G. Brock Williams**, Texas Tech University
- 2:00PM (1212) *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 Turkey**, University of New Haven, and **Gulden Karakok**, University of Northern Colorado, Greeley
- 2:00PM (1213) *Designing Learning Activities.*
Ivona Grzegorzcyk, California State University Channel Islands
- 2:00PM (1214) *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 (1215) *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

Thursday, January 16 – Program of the Sessions

- 2:00PM (1216) *The MAA Instructional Practices Guide.*
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
- 2:00PM (1217) *Computing with R for Mathematical
Modeling.*
Ben Galluzzo*, Clarkson University, **Jie
Chao**, Concord Consortium, and **Eric
Simoneau**, Boston Latin School and
33sigma Learning Labs, LLC
- 2:00PM (1218) *STEM UP New York (Robert Noyce
Teacher Scholarship Program).*
Ben Galluzzo*, **Katie Kavanagh**, **Jan
DeWaters**, **Mike Ramsdell** and **Seema
Rivera**, Clarkson University
- 2:00PM (1219) *Transforming Instruction in
Undergraduate Mathematics via Primary
Historical Sources (TRIUMPHS).*
Janet Barnett*, Colorado State University
- Pueblo, **Kathleen Clark**, Florida 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
- 2:00PM (1220) *Collaborative Research: PROfessional
Development and Uptake through
Collaborative Teams (PRODUCT)
Supporting Inquiry Based Learning in
Undergraduate Mathematics.*
Sandra Laursen*, **Tim Archie** and **Chuck
Hayward**, University of Colorado Boulder
- 2:00PM (1221) *Developing STEM Professionals as
Educators and Teacher Leaders (DSPETL).*
Christine D. Thomas* and **Natalie S.
King**, Georgia State University
- 2:00PM (1222) *Advancing Students' Proof Practices
in Mathematics through Inquiry,
Reinvention, and Engagement.*
Tenchita Alzaga Elizondo*, **Kristen
Vroom**, **Sean Larsen**, Portland State
University, and **Stephen Strand**,
California State University, Chico
- 2:00PM (1223) *Fostering Student Success and Diversity
in STEM by Combining Scholarship
Support with Mentoring and Research
Engagement.*
James R. Valles, Jr.*, Prairie View A&M
University, **Fred Bonner**, Prairie View
A&M University, **Orion Ciftja**, **Alphonso
Keaton** and **E. Gloria C. Regisford**,
Prairie View A&M University
- 2:00PM (1224) *PROfessional Development and Uptake
through Collaborative Teams (PRODUCT)
Supporting Inquiry Based Learning in
Undergraduate Mathematics.*
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
- 2:00PM (1225) *SSTEM: Using Computational Science to
Enhance Learning and Commitment to
STEM.*
Maria Zack*, **Katherine Maloney**, **Lori
Carter**, **Paul Schmelzenbach** and **Dawne
Page**, Point Loma Nazarene University
- 2:00PM (1226) *The Ohio Northern University
Engineering Education and Mathematics
Education Noyce Program.*
Tena Roepke* and **Todd France**, Ohio
Northern University
- 2:00PM (1227) *Making math more effective for business
students, making adjustments from both
sides (a SUMMIT-P collaboration).*
Mike May, Saint Louis University
- 2:00PM (1228) *Cultivating Undergraduate Research with
S-STEM Scholars (SMART Texas).*
Keith Hubbard* and **Nola Schmidt**,
Stephen F. Austin State University
- 2:00PM (1229) *Effective Mentorships for Talented
Teachers in Training for Texas.*
Lesla Beverly*, **Keith Hubbard**, **Dennis
Gravatt**, **Chrissy Cross** and **Jonathan
Mitchell**, Stephen F. Austin State
University
- 2:00PM (1230) *The Tuskegee Partnership for Personal
Authenticity in College Mathematics.*
Kelly Bragan-Guest* and **Byunghoon
Lee**, Tuskegee University
- 2:00PM (1231) *Building Community Through Systemic
Initiative for Modeling Investigations and
Opportunities with Differential Equations
(SIMIODE).*
Patrice Tiffany*, Manhattan College,
Richard C. Harwood, George Fox
University, **Audrey Malagon**, Virginia
Wesleyan University, **Therese Shelton**,
Southwestern University, and **Brian
Winkel**, SIMIODE, U.S. Military Academy
- 2:00PM (1232) *Partnership in Action: Promoting
STE Applications in M courses Via
Team-Teaching.*
Shahrooz Moosavizadeh*, **Maila
Brucal-Hallare** and **Makarand Deo**,
Norfolk State University
- 2:00PM (1233) *Mentoring Math Scholars for Success
(M²S²) Program at Fresno State.*
Oscar Vega*, California State University,
Fresno, **Jenna Tague**, Clovis Community
College, and **Sarah Hough Pattison**,
University of California, Santa Barbara

Program of the Sessions – Thursday, January 16 (cont'd.)

- 2:00PM (1234) *MPWR 2016 and Beyond: Fostering Sustainable Networks for Women in RUME.*
Jess Hagman*, Colorado State University, and **Megan Wawro**, Virginia Tech
- 2:00PM (1235) *Noyce@FGCU: Supporting Scholars Pre & Post-Graduation.*
Katie Johnson*, **Susan Cooper**, **Laura Frost**, **Diane Kratt**, **Brian Johnson** and **Tanya Kunberger**, Florida Gulf Coast University
- 2:00PM (1236) *A-PLUS in Math (Alabama's Practitioner Leaders for Underserved Schools in Mathematics).*
Jeremy Zelkowski*, **Jim Gleason**, **Martha Makowski**, **Philip Westbrook** and **Tye Campbell**, The University of Alabama
- 2:00PM (1237) *Building a Pathway for CS Principles Teachers: A Two-course Sequence for Secondary Education Mathematics Pre-service Teachers.*
Jeremy Zelkowski*, **Jeff Gray** and **Rebecca Odom-Bartel**, The University of Alabama
- ▶ 2:00PM (1238) *A Collaborative Approach to Building Capacity for Interdisciplinary Quantitative Reasoning Instruction.* Preliminary report.
Andrea Young* and **McKenzie Lamb**, Ripon College
- ▶ 2:00PM (1239) *Active and Applied Calculus at Augsburg University (a SUMMIT-P collaboration).*
Suzanne I Dorée*, **Jody Sorensen**, **Pavel Belik**, **Joan Kunz** and **Stella Hofrenning**, Augsburg University
- 2:00PM (1240) *Mathematics Graduate Student Peer-Mentorship Program: Impact and Adaptability in Year 3.*
Kimberly Cervello Rogers*, Bowling Green State University, **Sean P. Yee**, University of South Carolina, **Jessica Deshler**, West Virginia University, and **Jeremiah Southwick**, University of South Carolina
- 2:00PM (1241) *Maplets for Calculus (and MYMathApps Calculus).*
Douglas B. Meade*, University of South Carolina—Columbia, and **Philip B. Yasskin**, Texas A&M University
- 2:00PM (1242) *Using Do It Yourself Interactive Simulations, Assessments that Drive Learning, and the Space Program as a Theme in First Two Year College Math Classes.*
Kristin Arney, **Kayla Blyman**, United States Military Academy, **Marianna Bonanome**, New York City College of Technology, CUNY, and **Frank Wattenberg***, United States Military Academy
- 2:00PM (1243) *Raising Calculus to the Surface.*
Aaron Wangberg*, Winona State University, **Jason Samuels**, City University of New York – BMCC, **Brian Fisher**, Lubbock Christian University, **Elizabeth Gire**, Oregon State University, and **Tisha Hooks**, Winona State University
- 2:00PM (1244) *Raising Physics to the Surface.*
Aaron Wangberg*, Winona State University, **Robyn Wangberg**, Saint Mary's University of Minnesota, and **Elizabeth Gire**, Oregon State University
- 2:00PM (1245) *Collaborative Research: Solving Problems of Mathematics Accessibility with Process-Driven Math.*
Matthew Ragland*, **Ann Gulley**, **Luke Smith**, Auburn University at Montgomery, **Yvette Pearson**, **Joshua Eyler** and **Canek Phillips**, Rice University
- 2:00PM (1246) *Enhancing Explorations in Functions for Preservice Secondary Mathematics Teachers.*
James A. M. Alvarez*, **Theresa Jorgensen** and **Janessa Beach**, The University of Texas at Arlington
- 2:00PM (1247) *Advancing STEM Teaching in Mathematics and Biology.*
Dhanapati Adhikari*, **Michael Kiel** and **Christine Fryer**, Marywood University
- 2:00PM (1248) *NSF Scholarship Program in Science and Mathematics at Kennesaw State University.*
Ana-Maria Croicu, Kennesaw State University
- 2:00PM (1249) *The Biology and Mathematics Educator Scholarship Project to Prepare Future Secondary Education STEM Teachers.*
Andrew Lazowski, Sacred Heart University
- 2:00PM (1250) *GP-IMPACT: Integrating Geoscience to Engage Majors with Mathematics (iGEM²).*
Theresa Jorgensen*, The University of Texas at Arlington, **W. Ashley Griffith** and **Elizabeth Griffith**, The Ohio State University
- 2:00PM (1251) *The Impact of ASSURE Project on AAMU's STEM Undergraduate Program.*
Mohammed R Karim*, **Marius P Schamschula**, **Nesar Ahmed**, **Linda Skeete McClellan**, Alabama A&M University, Huntsville, Alabama, and **R. Keith Esch**, Horizon Research Inc., Chapel Hill, NC
- 2:00PM (1252) *Scaling Up: Implementing a Comprehensive Graduate Training Model at Multiple Institutions.*
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

2:00PM (1253) *Implementing Techtivities 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 (1254) *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 (1255) *Extending the Reach of Mathematics Teacher Leaders.*
Jodie Novak* and **Frieda Parker**, University of Northern Colorado

2:00PM (1256) *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 (1257) *STEM Teaching Scholars for High Need Chicago-Area Schools.*
Melanie Pivarski*, **Byoung Sug Kim**, **John McDermott** and **Emily Dangremond**, Roosevelt University

2:00PM (1258) *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 (1259) *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 (1260) *STEM Transfers and the "What year are you?" question.*
Rebekah Dupont, Augsburg University

2:00PM (1261) *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 (1262) *Holyoke Community College STEM Scholars' Program.*
leana Vasu*, **Emily Rabinski** and **Steve Winters**, Holyoke Community College

2:00PM (1263) *Using Bricklayer Coding and Visual Art to Engage Students in Learning Mathematics*
Betty Love*, **Michael Matthews**, **Victor Winter** and **Michelle Friend**, University of Nebraska - Omaha

2:00PM (1264) *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

(1265) *Differential operators and the geometry of domains in Euclidean space.*
Tatiana Toro, University of Washington (1154-35-25)

National Academies' Roundtable on Data Science Postsecondary Education

2:30 PM – 3:30 PM Room 201, Meeting Room Level, Colorado Convention Center

Organizer: **Tyler Kloefkorn**, Committee on Applied & Theoretical Statistics, Nat'l Academies of Sciences, Engineering, & Medicine

Moderator: **Tyler Kloefkorn**, Committee on Applied & Theoretical Statistics, Nat'l Academies of Sciences, Engineering, & Medicine

Panelists: **Jeff Brock**, Yale University

Michelle Schwalbe, Board on Mathematical Sciences & Analytics National Academies of Sciences, Engineering, and Medicine

Uri Treisman, University of Texas at Austin

MAA Workshop

2:35 PM – 3:55 PM Room 605, Meeting Room Level, Colorado Convention Center

A Classroom Experience with Inquiry-Based Learning.

Organizers: **Susan Crook**, Loras College

Carl Mummert, Marshall University

Program of the Sessions – Thursday, January 16 (cont'd.)

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.*
Kenneth 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 *Calling bull (with R).*
(1267) **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: **Bori 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 *Reflections on diversity and undergraduate research.*
(1268) **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

7:00PM (1269) *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 Wierman, The Johns Hopkins University

8:00AM (1270) *Viral infection rates of *Micromonas pusilla* under contrasting nutrient and light conditions.* Preliminary report.

Margaret Knight*, National Institute for Mathematical and Biological Synthesis (NIMBioS), Colorado College, **Priscilla Cho**, National Institute for Mathematical and Biological Synthesis (NIMBioS), Emory University, **Lucas Fiet**, National Institute for Mathematical and Biological Synthesis (NIMBioS), University of Tennessee Knoxville, **Aaron Lin**, National Institute for Mathematical and Biological Synthesis (NIMBioS), Emory University, **Audra Hinson** and **David Talmy**, National Institute for Mathematical and Biological Synthesis (NIMBioS), University of Tennessee Knoxville (1154-92-1018)

8:30AM (1271) *Modeling the Effect of Social Networks on the Spread of Opioid Use.* Preliminary report.

Vincent J. Jodoin*, University of Tennessee, Knoxville, **M. Todd**, Virginia Tech University, **S. Payne**, Bellarmine University, **J. Bintz**, Johnson University, **S. Lenhart** and **C. Strickland**, University of Tennessee (1154-92-501)

9:00AM (1272) *Entropy of S-graph shifts.* Preliminary report.

Travis A Dillon, Lawrence University (1154-37-107)

9:30AM (1273) *A Reverse Sidorenko Inequality.*
Mehtaab Sawhney*, **Ashwin Sah**, Massachusetts Institute of Technology, **David Stoner**, Stanford University, and **Yufei Zhao**, Massachusetts Institute of Technology (1154-05-1713)

10:00AM (1274) *On Howard's main conjecture and the Heegner point Kolyvagin system.*

Murilo Zanarella, Massachusetts Institute of Technology (1154-11-2560)

10:30AM (1275) *Zeros of Optimal Functions in the Cohn-Elkies Linear Program.*

Nina Zubrilina, Princeton University (1154-52-2403)

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

8:00AM (1276) *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.
 ► (1277) **Katie V. Johnson**, Florida Gulf Coast University (1154-05-469)
- 9:00AM *Undergraduates count.*
 ► (1278) **Steve Butler**, Iowa State University (1154-05-378)
- 9:30AM *Rainbow Problems in Groups.*
 ► (1279) **Michael Young**, Iowa State University (1154-05-2100)
- 10:00AM *Undergraduate research topics in tropical geometry.*
 ► (1280) **Ralph Morrison**, Williams College (1154-52-792)
- 10:30AM *Numerical semigroups - a sales pitch.*
 ► (1281) **Christopher O'Neill**, 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.*
 (1282) **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.*
 (1283) **Greg Knese**, Washington University in St. Louis (1154-47-1620)
- 9:00AM *Spectral Properties of Model d -Tuples.*
 (1284) **Edward J Timko**, University of Manitoba (1154-47-1385)
- 9:30AM *Automorphism groups of unit balls of intertwiners.* Preliminary report.
 (1285) **Rene Ardila**, Grand Valley State University (1154-47-156)
- 10:00AM *Twisted Steinberg Algebras.*
 (1286) **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 Advances in Operator Algebras, I

8:00 AM – 10:50 AM **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

- 8:00AM *K-theory of the commutant mod trace-class of a hermitean operator.*
 (1287) **Dan-Virgil Voiculescu**, Department of Mathematics UC Berkeley (1154-47-514)
- 8:30AM *Variations of the Graph Isomorphism Game.*
 (1288) **Kari Eifler**, Texas A&M (1154-47-885)
- 9:00AM *On a Question of D. Shlyakhtenko.* Preliminary report.
 (1289) **Ionut Chifan** and **Sayan Das***, The University of Iowa (1154-46-408)
- 9:30AM *Pinsker algebras for 1-bounded entropy I.*
 (1290) **Ben Hayes***, University of Virginia, **David Jekel**, University of California, Los Angeles, **Brent Nelson**, Michigan State University, and **Thomas Sinclair**, Purdue University (1154-46-370)
- 10:00AM *Pinsker Algebras for 1-bounded Entropy II.* Preliminary report.
 (1291) **David A Jekel**, University of California, Los Angeles (1154-46-547)
- 10:30AM *The Covariant Stone-von Neumann Theorem for Actions of Abelian Groups on C^* -algebras of Compact Operators.*
 (1292) **Leonard Huang**, University of Nevada, Reno, and **Lara Ismert***, Embry-Riddle Aeronautical University - Prescott (1154-47-1731)

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.*
 (1293) **Harrison Chapman***, Colorado State University, and **Andrew Rechnitzer**, University of British Columbia (1154-57-1905)

- 8:30AM (1294) *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)
- 9:00AM (1295) *Double branched cover of knotoids and applications to proteins.*
Agnese Barbensi, Mathematical Institute, University of Oxford (1154-57-724)
- 9:30AM (1296) *Modeling pathways of DNA unlinking by site-specific recombination.*
Robert H Stolz, University of California, Davis (1154-55-1794)
- 10:00AM (1297) *Computation of tunnel numbers for low crossing knots.*
Felipe Castellano-Macias, Northeastern University, and **Nicholas Owad***, Colby College (1154-57-610)
- 10:30AM (1298) *Slice obstructions in the lower central series of the extended virtual knot group.* Preliminary report.
Micah Chrisman, The Ohio State University (1154-57-971)

AMS Special Session on Applied Topology, I

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

Organizers: **Henry Adams**, Colorado State University
Mikael Vejdemo-Johansson, CUNY College of Staten Island

- 8:00AM (1299) *Topological Data Analysis for Detecting Dynamic State Changes via Nodal Networks.*
Audun Myers, **Elizabeth Munch** and **Firas A Khasawneh***, Michigan State University (1154-55-1564)
- 8:30AM (1300) *Featurization of Persistence Diagrams using Template Functions for Machine Learning Tasks.*
Elizabeth Munch*, **Jose Perea** and **Firas A Khasawneh**, Michigan State University (1154-55-949)
- 9:00AM (1301) *Approximate triangulations of Grassmannians.* Preliminary report.
Kevin P Knudson, University of Florida (1154-55-454)
- 9:30AM (1302) *A Bayesian Framework for Persistent Homology.*
Vasileios Maroulas*, **Farzana Nasrin** and **Christopher Oballe**, University of Tennessee (1154-62-1201)
- 10:00AM (1303) *Limit theorems of persistent homology.*
Yasuaki Hiraoka, Kyoto University (1154-55-822)
- 10:30AM Discussion

AMS Special Session on Arithmetic Dynamics, I (Associated with AMS Retiring Presidential Address Kenneth A. Ribet)

8:00 AM – 10:50 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

- 8:00AM (1304) *Uniform Bounds for Periods of Endomorphisms of Varieties.* Preliminary report.
Keqing Huang, University of Rochester (1154-11-137)
- 8:30AM (1305) *Totally T-adic functions of small height.* Preliminary report.
Xander Faber*, IDA / Center for Computing Sciences, and **Clayton Petsche**, Department of Mathematics, Oregon State University (1154-11-393)
- 9:00AM (1306) *Post-Critically Finite Bicritical Polynomials over Number Fields.* Preliminary report.
Bella Tobin, Oklahoma State University (1154-11-1619)
- 9:30AM (1307) *Multiplier spectra of PCF rational maps.*
Sarah Koch, University of Michigan (1154-37-1328)
- 10:00AM (1308) *Portrait spaces for dynamical semigroups and unlikely intersections.* Preliminary report.
Trevor Hyde*, University of Chicago, **John Doyle**, Louisiana Tech University, **Max Weinreich**, Brown University, **Colby Kelln**, University of Michigan, **Talia Blum**, MIT, and **Henry Talbott**, Brown University (1154-37-1015)
- 10:30AM (1309) *A dynamical Néron symbol.* Preliminary report.
Patrick Ingram, York University (1154-11-653)

AMS Special Session on Aspects and Applications of Algebraic Combinatorics, I

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

Organizers: **William J. Martin**, Worcester Polytechnic Institute
Jason Williford, University of Wyoming

- 8:00AM (1310) *The alternating central extension for the positive part of the quantum group $U_q(\widehat{\mathfrak{sl}}_2)$.*
Paul M Terwilliger, Math Department, U. Wisconsin-Madison (1154-05-697)

Program of the Sessions – Friday, January 17 (cont'd.)

- 8:30AM (1311) *Tridiagonal pairs of Racah type and the universal enveloping algebra $U(\mathfrak{sl}_2)$.*
Sarah Bocking-Conrad, DePaul University (1154-15-884)
- 9:00AM (1312) *Distance-regular graphs and degenerate DAHAs.*
Jae-Ho Lee, University of North Florida (1154-05-1049)
- 9:30AM (1313) *Character tables of the association schemes coming from the action of the groups $GU_n(q)$ on n -dimensional vectors over $GF(q^2)$.* Preliminary report.
Sung Y Song, Iowa State University (1154-05-842)
- 10:00AM (1314) *New advances in quantum walks.*
Hanmeng Zhan, York University (1154-05-1445)
- 10:30AM (1315) *Critical groups of strongly regular graphs.*
Eric S. Piato*, SUNY College at Geneseo, **Josh Ducey**, **David Duncan**, **Liz Engelbrecht**, James Madison University, **Jawahar Madan**, Harvey Mudd College, **Christina Shatford**, Connecticut College, and **Angela Vichitbandha**, University of Kentucky (1154-05-2515)

AMS Special Session on C^* -Algebras, Dynamical Systems and Applications, II

8:00 AM – 10:50 AM Room 712, Meeting Room Level, Colorado Convention Center

Organizers: **Robin Deeley**, University of Colorado Boulder
Zhuang Niu, University of Wyoming
Ping Zhong, University of Wyoming

- 8:00AM (1316) *The classification problem for amenable C^* -algebras.*
George A. Elliott, University of Toronto (1154-46-2385)
- 8:30AM (1317) *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)
- 9:00AM (1318) *Pure infinite dynamical systems and their C^* -algebras.*
Xin Ma, State University of New York at Buffalo (1154-37-197)
- 9:30AM (1319) *Group actions on C^* -algebras of a vector bundle.* Preliminary report.
Valentin Deaconu, University of Nevada, Reno (1154-46-674)
- 10:00AM (1320) *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)

- 10:30AM (1321) *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

- 8:00AM (1322) *Covers of rational double points in mixed characteristic.*
Javier Carvajal-Rojas, EPFL Lausanne, **Linquan Ma**, Purdue University, **Thomas Polstra**, **Karl Schwede***, University of Utah, and **Kevin Tucker**, University of Illinois at Chicago (1154-13-1992)
- 8:30AM (1323) *Frobenius and Homological Dimensions of Complexes.*
Taran H Funk* and **Thomas Marley**, University of Nebraska - Lincoln (1154-13-864)
- 9:00AM (1324) *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)
- 9:30AM (1325) *Local to global principles for generation time over commutative rings.*
Janina C. Letz, University of Utah (1154-18-906)
- 10:00AM (1326) *Relating matrix factorizations and totally acyclic complexes.*
Petter Andreas Bergh and **Peder Thompson***, Norwegian University of Science and Technology (1154-13-1542)
- 10:30AM (1327) *Homological conjectures, perfectoid spaces, and singularities in all characteristic.*
Linquan 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

- George Wilkens**, University of Hawaii
- 8:00AM (1328) *On solitons for the closed G_2 -Laplacian flow*. Preliminary report.
Robert L. Bryant, Duke University (1154-53-234)
- 8:30AM (1329) *Geometric Structures on Manifolds with Special Holonomy*. Preliminary report.
Sema Salur, University of Rochester (1154-53-574)
- 9:00AM (1330) *Isometric Immersions of Pseudo-Spherical Surfaces via PDEs*.
Nabil Kahouadji, Northeastern Illinois University (1154-53-91)
- 9:30AM (1331) *Bäcklund Transformations and Darboux Integrability, Revisited*. Preliminary report.
Thomas A. Ivey, College of Charleston (1154-53-361)
- 10:00AM (1332) *A Generalization of an Integrability Theorem of Darboux*.
Michael Benfield, Mythic, Redwood City, California, **Helge Kristian Jensen**, Pennsylvania State University, and **Irina A Kogan***, North Carolina State University (1154-35-279)
- 10:30AM (1333) *Darboux Integrable Systems of Class $s = 2$* . Preliminary report.
Brandon P. Ashley, Utah State University (1154-35-539)

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 Academy
Volodymyr Nekrashevych, Texas A&M University
Dmytro Savchuk, University of South Florida
- 8:00AM (1334) *Bireversible automata generating lamplighter groups*.
Rachel Skipper, Ohio State University, and **Benjamin Steinberg***, The City College of New York (1154-20-1167)
- 8:30AM (1335) *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)
- 9:00AM (1336) *Twisted Brin-Thompson groups*. Preliminary report.
James Belk, University of St Andrews, and **Matthew C. B. Zaremsky***, University at Albany (SUNY) (1154-20-551)
- 9:30AM (1337) *On the rigidity of rank gradient in a group of intermediate growth*.
Rostyslav Kravchenko, University of Texas at Austin (1154-20-1950)

- 10:00AM (1338) *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)
- 10:30AM (1339) *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

- 8:00AM (1340) *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, Karaoli and Dimitriou Str, 18534, Piraeus, (1154-35-226)
- 8:30AM (1341) *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)
- 9:00AM (1342) *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)
- 9:30AM (1343) *Structure-Preserving Exponential Integrators with Applications for Damped-Driven NLS*.
Brian E. Moore, University of Central Florida (1154-65-760)
- 10:00AM (1344) *Flux based finite element methods*.
JaEun Ku, Oklahoma State University (1154-65-984)
- 10:30AM (1345) *A nonlinear splitting algorithm for preserving asymptotic features of stochastic singular differential equations*.
Joshua Lee Padgett, Texas Tech University (1154-65-1965)

Program of the Sessions – Friday, January 17 (cont'd.)

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

- 8:00AM (1346) *Classifications of minuscule Kac-Moody representations built from colored posets.*
Michael C. Strayer, Hampden-Sydney College (1154-05-1058)
- 8:30AM (1347) *Generalized nil Temperley-Lieb algebras and particle configurations.*
Richard M. Green, University of Colorado Boulder (1154-16-1174)
- 9:00AM (1348) *Full heaps and their convex subheaps.* Preliminary report.
Sarah K. Salmon, University of Colorado Boulder (1154-05-1061)
- 9:30AM (1349) *Order structure of infinite d -complete posets.*
Kento Nakada, Okayama university, Faculty of education (1154-05-940)
- 10:00AM (1350) *On elements of a -value 2 in Coxeter groups.*
Tianyuan Xu* and **Richard M. Green**, University of Colorado Boulder (1154-05-1443)
- 10:30AM (1351) *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

- 8:00AM (1352) *An existence theorem for Brakke flow with fixed boundary condition.*
Yoshihiro Tonegawa, Tokyo Institute of Technology (1154-49-476)
- 9:00AM (1353) *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)
- 9:30AM (1354) *A capillarity theory approach to the analysis of soap films.*
Salvatore Stuard, The University of Texas at Austin (1154-49-1206)

- 10:00AM (1355) *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

- 8:00AM (1356) *Random Processes of the Form $X_{n+1} = AX_n + B_n \pmod{p}$.*
Kseniya Klyachko, University at Albany (1154-60-1472)
- 8:30AM (1357) *A multiplicatively symmetrized version of the Chung-Diaconis-Graham random process.* Preliminary report.
Martin V. Hildebrand, University at Albany, State University of New York (1154-60-1044)
- 9:00AM (1358) *Tight bounds of performance metrics computed on Markovian queuing models.* Preliminary report.
Gerardo Rubino, INRIA, France (1154-60-1397)
- 9:30AM (1359) *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 Elroyd Fernandez** and **Jeffrey Yeh**, Department of Mathematics and Statistics/California State Polytechnic University, Pomona (1154-15-1394)
- 10:00AM (1360) *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

- 8:00AM (1361) *Sparse Metric Repair.*
Anna C Gilbert, University of Michigan (1154-68-2036)

- 8:30AM (1362) *Robust Synchronization via Cycle Consistency Inference*. Preliminary report. **Gilad Lerman*** and **Yunpeng Shi**, University of Minnesota (1154-94-1239)
- 9:00AM (1363) *Phase Retrieval from Locally Supported Measurements: Improved Algorithms and Robustness*. **Rayan Saab***, University of California San Diego, and **Brian P Preskitt**, Pure Storage (1154-65-1274)
- 9:30AM (1364) *A Rigorous Framework for Data Clustering*. **Thomas Strohmer**, University of California (1154-68-2284)
- 10:00AM (1365) *Dimensionality Reduction via tSNE: an analysis via large-scale ODE systems*. **Stefan Steinerberger**, Yale (1154-70-165)
- 10:30AM (1366) *Permutation Invariant Representations*. Preliminary report. **Radu Balan*** and **Naveed Haghani**, University of Maryland, College Park (1154-43-1493)

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 (1367) *Towards a Global Digital Mathematics Library*. **Ingrid Daubechies**, Duke University (1154-00-957)
- ▶ 8:30AM (1368) *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 (1369) *The Neverending Story of a Holistic Research Infrastructure for Mathematics*. **Mila Runnwerth**, Leibniz Information Centre for Science and Technology (1154-00-953)
- ▶ 9:30AM (1370) *Writing Mathematics in the Digital Age*. Preliminary report. **Bruce R Miller**, National Institute of Standards and Technology (1154-33-1352)
- ▶ 10:00AM (1371) *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 (1372) *MFG vs. Directed Chain Game*. Preliminary report. **Jean-Pierre Fouque**, University of California Santa Barbara (1154-60-1154)
- 8:30AM (1373) *Stochastic Graphon Game Models as Extensions of Mean Field Games*. **Rene A. Carmona**, Princeton University (1154-91-904)
- 9:00AM (1374) *Machine Learning Methods for Mean Field Control and Mean Field Games*. **Rene Carmona** and **Mathieu Lauriere***, ORFE, Princeton University (1154-65-1537)
- 9:30AM (1375) *MFGs and GANs*. Preliminary report. **Haoyang Cindy Cao**, **Xin Guo***, UC Berkeley, and **Mathieu Lauriere**, Princeton University (1154-49-2006)
- 10:00AM (1376) *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 (1377) *Restoration of uniqueness for mean field games on a finite state space with a common noise*. **E. Bayraktar**, University of Michigan, **A. Cecchin**, Universite Cote d'Azur, France, **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 (1378) *Additions and the Toda Hierarchy*. **Dylan J Murphy**, University of Arizona (1154-37-2249)
- ▶ 8:30AM (1379) *Producing and Understanding Quaternion-valued Solutions to the KdV Equation*. **Alex Kasman**, College of Charleston (1154-35-546)
- 9:00AM (1380) *Multiple-pole solutions of the nonlinear Schrodinger equation*. **Robert Buckingham**, University of Cincinnati (1154-35-1496)

Program of the Sessions – Friday, January 17 (cont'd.)

- 9:30AM (1381) *Integrable Geometric Flows for Curves in Pseudoconformal S^3 .*
Annalisa Calini*, College of Charleston and National Science Foundation, and
Thomas Ivey, College of Charleston (1154-35-1994)

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 (1382) *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)
- 8:30AM (1383) *Pricing Variance Swaps for the Discrete BN-S Model.* Preliminary report.
Semere Gebresilasie, Wentworth Institute of Technology (1154-60-1916)
- 9:00AM (1384) *Real Options with the General Investment Cost.*
Subas Acharya*, **Alain Bensoussan**, **Dmitry Rachinskiy** and **Alejandro Rivera**, University of Texas at Dallas (1154-35-2583)
- 9:30AM (1385) *Hidden Markov Model for Weather Forecast.*
Nguyet Nguyen*, Youngstown State University, Ohio, and **Paa Kwesi Mensah**, Progressive Insurance, Cleveland Ohio (1154-60-2097)
- 10:00AM (1386) *An Optimal Portfolio Control Problem.* Preliminary report.
Serges Love Teutu Talla* and **Isabelle Kemajou-Brown**, Morgan State University (1154-60-1204)
- 10:30AM (1387) *Long-Term Bayesian Analysis of Stock and Bond Markets.* Preliminary report.
Andrey Sarantsev*, **Taran Grove** and **Akram Reshad**, University of Nevada in Reno (1154-62-1699)

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 (1388) *Data Science for Election Oversight.* Preliminary report.
Stephanie Frank Singer, Portland State University (1154-AD-819)
- 8:30AM (1389) *Risk-Limiting Audits.*
Philip B. Stark, University of California, Berkeley (1154-AD-372)
- 9:00AM (1390) *Auditing elections in "other ways".*
Ronald L. Rivest, Massachusetts Institute of Technology (1154-AD-2577)
- 9:30AM (1391) *Redistricting for the Next Decade.*
Karen Saxe, American Mathematical Society (1154-AD-357)
- 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 (1392) *Combinatorial Proof of Jackson's Transformation via Overpartitions.*
Thomas Morrill, UNSW Canberra (1154-05-198)
- 8:15AM (1393) *Regular Polygonal Partitions of a Tverberg Type.*
Steven Simon*, Bard College, and **Leah Leiner**, Temple University (1154-05-274)
- 8:30AM (1394) *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 (1395) *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)
- 9:00AM (1396) *Minimal Zero Blocking Sets of Rectangular, Cylindrical, and Mobius Grids.*
Matthew Beaudouin-Lafon, **Margaret Crawford**, **Serena Chen**, Olin College, **Nathaniel Karst***, Babson College, **Louise Nielsen**, Olin College, and **Denise Sakai Troxell**, Babson College (1154-05-937)
- 9:15AM (1397) *Bounds on expected propagation time of probabilistic zero forcing.*
Shyam Narayanan and **Alec Sun***, Harvard University Department of Mathematics (1154-05-561)
- 9:30AM (1398) *Split graphs: Combinatorial species and asymptotics.*
Justin M. Troyka, York University (1154-05-635)
- 9:45AM (1399) *k-Configurations and Superconfigurations.* Preliminary report.
Benjamin Peet, St. Martin's University (1154-05-695)

- 10:00AM *Super totient numbers and the super totient index of graphs.*
 ▶ (1400) **Wing Hong Tony Wong***, Kutztown University of Pennsylvania, and **Joshua Harrington**, Cedar Crest College (1154-05-927)

AMS Contributed Paper Session on Harmonic Analysis, Applications and Related Topics

8:00 AM – 9:55 AM Room 206, Meeting Room Level, Colorado Convention Center

- 8:00AM *Some harmonic analysis problems arising from Kirillov's character formula.*
 (1401) **Ehssan Khanmohammadi**, Union College (1154-43-2654)
- ▶ 8:15AM *Utilizing advanced probabilistic object in cost cutting when building a smart grid and identifying problem areas + recommend viable approach to solutions.*
 (1402) **Tefera Worku**, Addis Ababa, Ethiopia (1154-43-38)
- ▶ 8:30AM *Some estimates on the Hausdorff operator.*
 (1403) **Lijing Sun***, University of Wisconsin-Milwaukee, and **Xiaoying Lin**, Gateway Technical College (1154-47-2642)
- 8:45AM *Integral Geometry on Contact Manifolds.*
 (1404) **Steven Patrick Flynn**, University of California, Santa Cruz (1154-44-1708)
- 9:00AM *Optimizing constrained reconstruction in magnetic resonance imaging for signal detection.*
 (1405) **Angel R Pineda**, Manhattan College (1154-62-2046)
- ▶ 9:15AM *Fast Phase Retrieval from Masked Phaseless Fourier Measurements.*
 (1406) **Brendan Marshall Williams***, University of Michigan - Dearborn (University of Michigan - Dearborn REU), and **Cyril Cordor**, University of Michigan - Ann Arbor (University of Michigan - Dearborn REU) (1154-42-2670)
- 9:30AM *Real Zeros of Random Sums with I.I.D. Coefficients.*
 (1407) **Aaron Michael Yeager**, College of Coastal Georgia (1154-41-66)
- ▶ 9:45AM *Extension of Rough Set Based on Positive Transitive Relation.*
 (1408) **Min Shu***, Department of Statistics / University of Connecticut, and **Wei Zhu**, Department of Applied Mathematics & Statistics / Stony Brook University (1154-41-2539)

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.*
 ▶ (1409) **Ali Pirhadi**, Oklahoma State University (1154-26-20)
- 8:15AM *On the left fractional local general M-derivative.*
 (1410) **George A. Anastassiou**, University of Memphis (1154-26-144)
- 8:30AM *The starlikeness of a generalized Bessel function.*
 (1411) **See Keong Lee**, Universiti Sains Malaysia (1154-30-217)
- 8:45AM *Sampling in Analytic Tent Spaces.*
 (1412) Preliminary report.
Caleb G Parks, University of Arkansas (1154-30-738)
- ▶ 9:00AM *Non-PCF Fractals: The Octacarpets and other 4N-Carpets.*
 (1413) **Claire Marilynn Canner**, Rochester Institute of Technology (1154-32-2209)
- ▶ 9:15AM *On differential independence of ζ and Γ .*
 (1414) **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.*
 (1415) **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.
 (1416) **Jared E Hoppis**, Kansas State University (1154-30-2192)
- 10:00AM *On the Compositions of Infinitely Many Holomorphic Functions.*
 (1417) **Kourosh Tavakoli**, Oklahoma City University (1154-30-2561)
- 10:15AM *Extensions of the notions of polynomial and rational hull.*
 (1418) **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-Gelasch, Eastern Michigan University
- ▶ 8:00AM *David Zitarelli: A Short Introduction.*
 (1419) Preliminary report.
Amy Shell-Gelasch, Eastern Michigan University (1154-F1-1155)

Program of the Sessions – Friday, January 17 (cont'd.)

- ▶ 8:20AM *Hassler Whitney and Fire Control in WWII.*
(1420) **John McCleary**, Vassar College
(1154-F1-2340)
- ▶ 8:40AM *The best mathematician in the state of Missouri (in 1897)?*
(1421) **Leon M. Hall**, Missouri S&T
(1154-F1-765)
- ▶ 9:00AM *In Search of Lillian Lieber: Google, Serendipity, and Ancestry.com.*
(1422) **David Lindsay Roberts**, Prince George's Community College (1154-F1-2221)
- ▶ 9:20AM *A Brief History of the Mathematics Honor Society Kappa Mu Epsilon.*
(1423) **Cynthia J Huffman**, Pittsburg State University (1154-F1-148)
- ▶ 9:40AM *Helping to build the American mathematical community - two early journals.*
(1424) **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.
(1425) **Lawrence A. D'Antonio**, Ramapo College (1154-F1-67)
- ▶ 10:20AM *David Zitarelli and Historical Methods: Mathematics in Early 19th-Century American Colleges.*
(1426) **Amy Ackerberg-Hastings**, Rockville, MD (1154-F1-31)
- ▶ 10:40AM *Preserving the Legacy: An Update and Preview of the Zitarelli Volumes.*
(1427) **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.
(1428) **McKenzie Lamb**, Ripon College (1154-C1-2298)
- ▶ 8:20AM *Teaching all the Math for Data Science, AI, and Beyond.*
(1429) **Tyler J Jarvis**, Brigham Young University (1154-C1-2324)
- ▶ 8:40AM *Calculus Through a Data Lens: Broadening Scope Through Data and Modeling.*
(1430) **Rachel Grotheer**, Goucher College (1154-C1-1010)

- ▶ 9:00AM *Calculus and Epidemics.* Preliminary report.
(1431) **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.*
(1432) **Chris Oehrlein**, Oklahoma City Community College (1154-C1-2072)
- ▶ 9:40AM *Using Smartphone Sensor Data in the Mathematics Classroom.*
(1433) **Albert W Schueller**, Whitman College (1154-C1-1662)
- ▶ 10:00AM *Adding data analysis to a mathematical statistics course.*
(1434) **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.*
(1435) **Erin E Martin**, William Jewell College (1154-E5-2147)
- ▶ 8:40AM *Design - 3D Print - Calculate: Student Created 3D Printed Solids of Revolution.*
(1436) **Lucy Spardy Oremland*** and **Csilla Szabo**, Skidmore College (1154-E5-2270)
- ▶ 9:00AM *Art Gallery Design: Where's the Math in That?!?* Preliminary report.
(1437) **Lucas Castle**, Virginia Military Institute (1154-E5-2624)
- ▶ 9:20AM *Leveraging Wonder to Increase Accessibility in Calculus.*
(1438) **Emerald Tatiana Stacy**, Washington College (1154-E5-43)
- ▶ 9:40AM *Students Co-Authoring Problems for Class Activities and Assessments.* Preliminary report.
(1439) **Lori Carmack** and **Veera Holdai***, Salisbury University (1154-E5-1077)
- ▶ 10:00AM *Unleashing student creativity and mathematics in Math 100: Survey of Mathematics.*
(1440) **Aaron D Wangberg**, Winona State University (1154-E5-2215)

10:20AM ▶ (1441) *Developing and Evaluating a Course that Prepares Students as Creative Problem Solvers.*

Kayla K Blyman* and **Kristin M Arney**, United States Military Academy - West Point (1154-E5-2520)

10:40AM ▶ (1442) *A Framework for Equitable Mathematics Instruction: Broadening What is Considered Mathematical.*

Nancy Emerson Kress, University of Colorado at Boulder (1154-E5-2714)

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

8:00AM ▶ (1443) *Assessing Preparedness for Business Calculus.* Preliminary report.

Stephanie R. Branham, University of Tampa (1154-I5-967)

8:20AM ▶ (1444) *Strengthening the Connection between Business Calculus and Business Courses.* Preliminary report.

Leslie Jones*, University of Tampa, and **Britney Hopkins**, University of Central Oklahoma (1154-I5-161)

8:40AM ▶ (1445) *A Cooperatively Designed Decision-Focused Approach to Business Calculus.*

Steven Hetzler* and **Robert Barber**, Salisbury University (1154-I5-2169)

9:00AM ▶ (1446) *A Peek into the Minds of Business Calculus Students.*

Deborah L. Gochenaur* and **Ji Young Choi**, Shippensburg University (1154-I5-2468)

9:20AM ▶ (1447) *Real life projects in Business Calculus.* Preliminary report.

Wojciech K Kossek, University of Denver (1154-I5-1710)

9:40AM ▶ (1448) *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-I5-2366)

10:00AM ▶ (1449) *A complete CRAFTY inspired Business Calculus Course.*

Mike May, Saint Louis University (1154-I5-1253)

MAA Contributed Paper Session on Mathematics and Sports, I

8:00 AM – 10:55 AM **Room 506, Meeting Room Level, Colorado Convention Center**

Organizers: **Diana Cheng**, Towson University

John David, Virginia Military Institute

8:40AM ▶ (1450) *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)

9:00AM ▶ (1451) *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)

9:20AM ▶ (1452) *Analyzing Shot Expectation Through Spatial Data Collection Applications.*

Adam F Childers, Roanoke College (1154-L1-2125)

9:40AM ▶ (1453) *Creating a High School Sports Rating System.* Preliminary report.

Jeffrey W Heath*, **Will Britt**, **Shelby Montgomery** and **Jackson Norris**, Centre College (1154-L1-2682)

10:00AM ▶ (1454) *A Logistic Regression/Markov Chain Model for the NFL.* Preliminary report.

Nicholas Gorgievski* and **Brianna T Doherty**, Nichols College (1154-L1-2141)

10:20AM ▶ (1455) *Decision Forest, Partial Dependency and Matching Method Analysis of NFL Play-by-Play Data in 2018.*

John A David, Virginia Military Institute (1154-L1-664)

10:40AM ▶ (1456) *Dynamically Scheduling National Football League Games to Reduce Strength of Schedule Variability.*

Elizabeth L. Bouzarth*, **Andrew W. Cromer**, **William J. Fravel**, **Benjamin C. Grannan** and **Kevin R. Hutson**, Furman University (1154-L1-1944)

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, Pomona College

Victor Piercey, Ferris State University

Samuel L. Tunstall, Trinity University

Program of the Sessions – Friday, January 17 (cont'd.)

- ▶ 8:00AM (1457) *When Equity is Conditional: Social Justice Topics and Contingency Tables for Teaching Probability.*
Carrie Muir, Whatcom Community College (1154-M1-784)
- ▶ 8:20AM (1458) *Developing a social justice math course using publicly-available materials.*
Kenan Ince, Westminster College (Salt Lake City) (1154-M1-155)
- ▶ 8:40AM (1459) *Math and Social Justice: Some Great Class Activities.* Preliminary report.
Patti Frazer Lock, St. Lawrence University (1154-M1-2256)
- ▶ 9:00AM (1460) *Redlining in an Applied Calculus Course.* Preliminary report.
Lisa A Oberbroeckling, Loyola University Maryland (1154-M1-2296)
- ▶ 9:20AM (1461) *The mathematics of Gerrymandering in the classroom?* Preliminary report.
E Cabral Balreira, Trinity University (1154-M1-1171)
- ▶ 9:40AM (1462) *When All of the Above Isn't the Answer: Examining Mathematics Pedagogy through a Lens of Social Justice.*
Erin R Moss*, Millersville University of Pennsylvania, **Allison Toney** and **Caitlin L Ryan**, University of North Carolina Wilmington (1154-M1-2656)
- 10:00AM Discussion.
- ▶ 10:20AM (1463) *Creating a Social Justice Pathway.*
Gary Hagerty, Baise State University (1154-M1-1146)
- ▶ 10:40AM (1464) *The Possibility, Necessity and Urgency for Bayes' Rule in Elementary Statistics classes.*
Aris B Winger, Georgia Gwinnett College (1154-M1-930)

MAA General Contributed Paper Session on Algebra, II

8:00 AM – 10:55 AM Room 707, Meeting Room Level, Colorado Convention Center

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

- ▶ 9:30AM (1465) *A Correspondence Between Central Extensions and Homotopy Classes of Maps.* Preliminary report.
Michael Evan Niemeier, Florida State University (1154-VL-622)
- ▶ 9:45AM (1466) *The word problem for one relation Adian inverse semigroups.*
Muhammad Inam, Alabama A&M University (1154-VL-1535)
- ▶ 10:00AM (1467) *Graded Hecke algebras for the symmetric group acting in positive characteristic.*
Naomi Krawzik, University of North Texas (1154-VL-2557)
- ▶ 10:15AM (1468) *Jeux de taquin.*
O'Neill Kingston, Iowa State University (1154-VL-1566)

- ▶ 10:30AM (1469) *The Natural Middle of a Complete Resolution.* Preliminary report.
Rebekah J. Aduddell* and **David A. Jorgensen**, University of Texas at Arlington (1154-VL-2658)

- ▶ 10:45AM (1470) *Approximations of Totally Acyclic Complexes.* Preliminary report.
Tyler D. Anway, University of Texas at Arlington (1154-VL-2610)

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

- ▶ 8:00AM (1471) *Backward Bifurcation in vector-borne model with direct transmission.*
Sunil Giri* and **Necibe Tuncer**, Florida Atlantic University (1154-VN-85)
- ▶ 8:15AM (1472) *Sparse Sampling and Fully-3D Fast Total Variation Based Imaging Reconstruction for Chemical Shift Imaging in Magnetic Resonance Spectroscopy.*
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)
- ▶ 8:30AM (1473) *Asymptotic Analysis of Resonances of Small Volume High Contrast Linear and Nonlinear Scatterers.*
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)
- ▶ 8:45AM (1474) *On the spectral theory of 1-D Schrödinger operator with random sparse potentials.*
Thomas Andrew Cook, Pfeiffer University (1154-VN-1541)
- ▶ 9:00AM (1475) *The diffusion Frechet function and its application in classifying ECG waveforms.* Preliminary report.
Uyen-Minh Le*, **Mehmet Aktas** and **Emily Hendryx**, University of Central Oklahoma (1154-VN-1508)
- ▶ 9:15AM (1476) *Identifying damage in sea ice from sparse laser strain measurements.*
Victor Churchill, Dartmouth College (1154-VN-2281)

- 9:30AM (1477) *Assessing the Role of Temperature in Dengue Fever Outbreak Dynamics with Wolbachia Transinfection Control Methods.* Preliminary report.
Vinodh Kumar Chellamuthu, Jisun Otterson and Ammon Taylor*, Dixie State University, Saint George, Utah (1154-VN-1269)
- 9:45AM (1478) *Diagnosis and Prediction of the 2015 Chinese Stock Market Bubble.*
Wei Zhu*, Department of Statistics / University of Connecticut, and **Wei Zhu**, Department of Applied Mathematics & Statistics / Stony Brook University (1154-VN-2552)
- 10:00AM (1479) *Real-time prediction of cryptocurrency Bubble Crashes.*
Min Shu*, Department of Statistics / University of Connecticut, and **Wei Zhu**, Department of Applied Mathematics & Statistics / Stony Brook University (1154-VN-2615)
- 10:15AM (1480) *Variance Reduction Methods Based on Multilevel Monte Carlo for Option Pricing.* Preliminary report.
Lu Duc Vy* and **Yaning Liu**, University of Colorado, Denver (1154-VN-2334)
- 10:30AM (1481) *A new algorithm for fast approximation of the diameter of a sparse very large graph.* Preliminary report.
Robert Erra*, **Alexandre Letois** and **Mark Angoustures**, EPITA (1154-VN-2026)
- 10:45AM (1482) *Polynomial multiplication using Karatsuba and Toom-Cook algorithms and their applications.* Preliminary report.
Goodness Agboola* and **Parshuram Budhathoki**, Cameron University, Lawton, OK (1154-VN-1665)

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

- 8:15AM (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)
- 8:30AM (1484) *Normal Vectors and Space Curves.*
Alan R Parry, Utah Valley University (1154-VO-1903)
- 8:45AM (1485) *The path from Fermat point to Steiner points.*
Cecilia C Fitzgerald* and **Roman Wong**, Washington & Jefferson College (1154-VO-1170)

- 9:00AM (1486) *Rigidity of Hyperbolic space.*
Daniel Martin*, Trinity college, **Lan-Hsuan Huang** and **Hyun Chul Jang**, University of Connecticut (1154-VO-2662)
- 9:15AM (1487) *Staircase metric tori.*
Anh Tran, Kyle Andrie and J Mealy*, Austin College (1154-VO-159)
- 9:30AM Break.
- 9:45AM (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)
- 10:00AM (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)
- 10:15AM (1490) *Improved Upper Bound for Three Dimensional Universal Covering Problem.*
Yuxuan Zheng, Princeton International School of Mathematics and Science (1154-VO-2066)
- 10:30AM (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

- 8:00AM (1492) *A Theoretical and Empirical Comparison of Gradient Approximations in Derivative-Free Optimization: Algorithms, Convergence Analysis and Noise.*
Albert Berahas, Lehigh (1154-65-2059)
- 8:40AM (1493) *A Theoretical and Empirical Comparison of Gradient Approximations in Derivative-Free Optimization: Gradient Approximations, Noise and Numerical Experiments.*
Katya Scheinberg, Cornell (1154-65-2061)
- 9:20AM (1494) *Stochastic Subspace Descent.*
Stephen Becker, Cu Boulder (1154-65-2057)
- 10:00AM (1495) *A Stochastic Derivative Free Optimization Method with Momentum.*
Peter Richtarik, KAUST (1154-65-2054)
- 10:40AM (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

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

Swatee Naik, National
Science Foundation, Division
of Mathematical Sciences

Sandra Richardson,
National Science Foundation,
Division of Undergraduate
Education

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 *Unipotent Representations Attached to
(1497) Principal Nilpotent Orbits.*

Lucas Mason-Brown, Massachussets
Institute of Technology (1154-22-284)

9:00AM *Computing Unipotent Representations.*
(1498) Preliminary report.

Jeffrey D Adams, University of Maryland
(1154-22-1625)

10:00AM *A program for branching problems in the
(1499) 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 *“Mathematical tools for automated
(1500) detection of antimicrobial peptides”.*

Long Nguyen*, **Maria Emelianenko**,
Amy C and **Barney Bishop**, George
Mason University (1154-00-2549)

9:00AM *Modeling the risk of HIV infection for
(1501) drug abusers.*

Angelica Bloomquist* and **Naveen K
Vaidya**, San Diego State University
(1154-92-2516)

9:30AM *Hyperparameters for Convolutional
(1502) Neural Networks.*

M Tyler Moncur*, **Michael Nelson** and
Tyler Jarvis, Brigham Young University
(1154-49-2699)

10:00AM *Exact and Nonstandard Finite Difference
(1503) 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)

10:30AM (1504) *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 #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 #2: Part B

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 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

Program of the Sessions – Friday, January 17 (cont'd.)

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**

- (1516) *Mathematical Frameworks for Signal and Image Analysis. Lecture III: Adaptive time-frequency methods.*
Ingrid Daubechies, Duke University (1154-94-13)

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 (1519) *Geometry, Inference, and Democracy.*
▶ **Jordan S. Ellenberg**, University of Wisconsin-Madison (1154-60-1680)
- 2:00PM (1520) *A p-adic approach to rational points on curves.*
Bjorn Poonen, Massachusetts Institute of Technology (1154-11-1340)
- 3:00PM (1521) *Recent Progress on Moving Boundary Problems.*
Suncica Canic, University of California Berkeley (1154-35-2268)
- 4:00PM (1522) *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

Organizers: **Hannah Highlander**, University of Portland
Pamela E. Harris, Williams College
Erik Insko, Florida Gulf Coast University
Aaron Wootton, University of Portland

- ▶ 1:00PM *Guiding principles for supervising undergraduate research.*
Stephan Ramon Garcia, Pomona College (1154-97-104)
- ▶ 1:30PM *Promoting Equity in Undergraduate Research with Work Study.*
Michael Ferrara, University of Colorado Denver (1154-97-1554)
- ▶ 2:00PM *Mathematics Education Research Ideas for Undergraduate Research.*
Gulden Karakok, University of Northern Colorado (1154-97-1613)
- ▶ 2:30PM *"I did it my way": making undergraduate research work for you.*
Lola Thompson, Oberlin College (1154-00-2345)
- ▶ 3:00PM *On student-centered tiling research.*
Michael P Hitchman, Linfield College (1154-52-1854)
- ▶ 3:30PM *Folding words around trees: Combinatorics inspired by biology.*
Elizabeth Drellich*, Haverford College, and **Heather Smith**, Davidson College (1154-05-1028)
- ▶ 4:00PM *The Effect of External Perturbations on Ecological Oscillators.*
Eli E Goldwyn, University of Portland (1154-34-2018)
- ▶ 4:30PM *Network Structure and Dynamics of Biological Systems.*
Deena R Schmidt, University of Nevada, Reno (1154-60-880)
- ▶ 5:00PM *Exploring modeling by programming: a technique for involving undergraduates in mathematical biology research.*
Brittany Bannish* and **Sean Laverty**, University of Central Oklahoma (1154-92-132)
- ▶ 5:30PM *Simulating Antibiotic Resistance in the Computer and Biology Labs: Ideas for Undergraduate Research.*
Anne E. Yust* and **Davida S. Smyth**, Eugene Lang College of Liberal Arts at The New School (1154-92-2505)

AMS-MAA Special Session on History of Mathematics, I

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

- ▶ 1:00PM *Ancient Greek Mathematics as Philosophy.*
Jacqueline Feke, University of Waterloo (1154-01-985)
- ▶ 1:30PM *Erudition and Algebraic Practice at the End of the Sixteenth Century.*
Abram Kaplan, Society of Fellows, Harvard University (1154-01-2333)
- ▶ 2:00PM *Standing on the Shoulders of Scripture.* Preliminary report.
Thomas Drucker, University of Wisconsin-Whitewater (1154-01-1778)
- ▶ 2:30PM *How to "strain at a Gnat and swallow a Camel:" 'The Analyst Controversy' Reconsidered.*
Julia C Tomasson, Columbia University (1154-01-2571)
- ▶ 3:00PM *Taking stock of the last 30 years : a project to survey the cultural history of mathematics.* Preliminary report.
Thomas Archibald, Simon Fraser University (1154-01-208)
- 4:00PM Discussion
- ▶ 4:30PM *Notational Norms in Charles Sanders Peirce's Circle of Logicians.*
David E. Dunning, Princeton University (1154-01-222)
- ▶ 5:00PM *Mathematics as Discourse: A Commognitive View of Late 19th-Century Algebra.* Preliminary report.
Janet Heine Barnett, Colorado State University - Pueblo (1154-01-706)
- ▶ 5:30PM *Illustrating the Impact of the Mathematical Sciences: Opportunities in Mathematical Policy.*
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 Cafilisch**, New York University (1154-00-2261)

AMS-AWM Special Session on Mathematical and Computational Research in Data Science, I

1:00 PM – 5:40 PM Room 407, Meeting Room Level, Colorado Convention Center

Organizers: **Linda Ness**, DIMACS, Rutgers University
F. Patricia Medina, Yeshiva University
Kathryn Leonard, Occidental College

1:00PM *Mathematics of Deep Learning.* (1541) **Rene Vidal**, Mathematical Institute for Data Science, Johns Hopkins University (1154-49-1969)

2:00PM *The loss function of overparameterized neural networks.* (1542) **Y Cooper**, IAS (1154-68-1109)

2:30PM *Learning Convolutional Sparse Representations.* (1543) **Cristina Garcia-Cardona**, Los Alamos National Laboratory (1154-68-1176)

▶ 3:00PM *Topological Data Analysis of Collective Behavior.* (1544) **Chad M. Topaz**, Williams College (1154-55-151)

4:00PM *ReLU-Singular Values and Gaussian Mean Width in Neural Networks.* (1545) **Emily J King***, Colorado State University, **Sören Dittmer** and **Peter Maass**, University of Bremen (1154-15-1114)

▶ 4:30PM *Analyzing Hybrid Randomized and Greedy Projection Methods.* Preliminary report. (1546) **Jamie Haddock***, UCLA, and **Anna Ma**, UC Irvine (1154-65-670)

5:00PM *Graphical Models in Machine Learning, Networks, and Uncertainty Quantification.* (1547) **Andrea Louise Bertozzi**, University of California, Los Angeles (1154-65-1101)

AMS-AWM Special Session on Representation Theory Inspired by the Langlands Conjectures, II (Associated with Joint AWM-AMS Noether Lecture Birgit Spoh)

1:00 PM – 5:40 PM Room 402, Meeting Room Level, Colorado Convention Center

Organizers: **Birgit Spoh**, Cornell University
Peter Trapa, University of Utah

1:00PM *On Dirac Cohomology for Complex Simple Lie Groups.* (1548) **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. (1549) **David Vogan**, MIT (1154-20-1571)

2:30PM *When Algebraicity Meets Orthogonality: Emergent Phenomena.* (1550) **Brian Hwang**, Cornell University (1154-22-1524)

3:00PM *Local Langlands parametrization for G_2 .* (1551) **Michael Harris**, Department of Mathematics, Columbia University (1154-11-824)

4:00PM *On multiplicativity of gamma factors via Braverman-Kazhdan program.* (1552) **William Sokurski*** and **Freydoon Shahidi**, Department of Mathematics, Purdue University (1154-11-331)

5:00PM *Computing unramified orbital integrals.* Preliminary report. (1553) **Bill Casselman**, University of BC (1154-22-285)

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

1:00 PM – 5:40 PM Room 109, Meeting Room Level, Colorado Convention Center

Organizers: **Joseph A. Ball**, Virginia Tech
Paul S. Muhly, University of Iowa

1:00PM *Multi-Toeplitz Operators Associated With Noncommutative Domains.* (1554) **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. (1555) **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.* (1556) **J E Pascoe**, University of Florida (1154-46-1701)

2:30PM *Rational nc power series around a matrix centre and the free skew field.* (1557) **Victor Vinnikov**, Ben Gurion University of the Negev (1154-47-2772)

3:30PM *Free Analysis and Free Rational Automorphisms.* Preliminary report. (1558) **Méric Augat**, Washington University in St. Louis (1154-47-2308)

4:00PM *Approximation Properties of Matrix Convex Sets and Operator Systems.* (1559) **Benjamin W. Passer*** and **Vern I. Paulsen**, University of Waterloo (1154-46-1124)

- 4:30PM (1560) *Noncommutative polynomials describing convex sets.*
 ▶ **J. William Helton**, University of California, San Diego, **Igor Klep**, University of Ljubljana, **Scott McCullough**, University of Florida, and **Jurij Volčič***, Texas A&M University (1154-47-220)
- 5:00PM (1561) *Partial Matrix Convexity.* Preliminary report.
Michael Jury, Department of Mathematics, University of Florida, **Igor Klep**, Department of Mathematics, University of Ljubljana, Slovenia, **Mark E. Mancuso**, Department of Mathematics and Statistics, Washington University in St. Louis, **Scott McCullough*** and **James E. Pascoe**, Department of Mathematics, University of Florida, Gainesville (1154-47-1847)

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 (1562) *Dynamical alternating groups and property Gamma.*
David Kerr* and **Robin Tucker-Drob**, Texas A&M University (1154-46-1585)
- 1:30PM (1563) *E-theory spectra.*
Sarah L Browne, University of Kansas (1154-19-1279)
- 2:00PM (1564) *On Product Rigidity.*
Krishnendu Khan, VANDERBILT UNIVERSITY (1154-46-1179)
- 2:30PM (1565) *Groups with infinite FC-center have the Schmidt property.*
Robin D Tucker-Drob, Texas A&M University (1154-20-2710)
- 3:00PM (1566) *Non-commutative Poincaré duality of the irrational rotation algebra.*
Anna Duwenig* and **Heath Emerson**, University of Victoria (1154-19-860)
- 3:30PM (1567) *Pure extension property for étale groupoid crossed product C^* -algebras.* Preliminary report.
Danny W Crytser, Saint Lawrence University (1154-46-1901)
- 4:00PM (1568) *Special constructions of k -graphs and their properties.*
 ▶ **Benjamin E Lighthartke**, Kansas State University (1154-47-2589)

- 4:30PM (1569) *Applications of Large Subalgebras of C^* -Algebras.*
Dawn E. Archey, University of Detroit Mercy (1154-46-2667)
- 5:00PM (1570) *Spectral operators in finite von Neumann algebras.*
Amudhan Krishnaswamy-Usha* and **Ken Dykema**, Texas A&M University (1154-47-2258)
- 5:30PM (1571) *Braided tensor categories from finite von Neumann algebras.*
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 (1572) *Topological and Geometric Analysis of Discrete Random Growth Models.*
 ▶ **Erika B Roldan-Roa**, The Ohio State University (1154-60-2354)
- 1:30PM (1573) *On the Dynamics of Solvent-excluded Surface Topology under Protein Flexing.* Preliminary report.
David F. Snyder, Texas State University (1154-92-2511)
- 2:00PM (1574) *Probabilistic Convergence and Stability of Random Mapper Graphs.* Preliminary report.
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)
- 2:30PM (1575) *Data analysis with continuously parametrized zigzag modules and beyond.* Preliminary report.
Haibin Hang and **Washington Mio***, Florida State University (1154-55-1450)
- 3:00PM (1576) *Applied topology methods in knot theory.* Preliminary report.
Radmila Sazdanovic*, NC State University, and **Pawel Dłotko**, Swansea University (1154-57-2025)
- 3:30PM (1577) *Morse theory for Wasserstein spaces.*
Joshua R Mirth, Colorado State University (1154-54-2228)
- 4:00PM (1578) *Vietoris-Rips homology through the looking glass.*
 ▶ **Antonio Rieser**, CONACYT - CIMAT (1154-55-2120)
- 4:30PM (1579) *The Relationship Between the Intrinsic Cech and Persistence Distortion Distances for Metric Graphs.*
Ellen Gasparovic, Union College (1154-68-1370)

Program of the Sessions – Friday, January 17 (cont'd.)

- 5:00PM *Computational topology techniques for characterizing time-series data.*
 ► (1580) **Elizabeth Bradley***, Varad Deshmukh, Department of Computer Science, University of Colorado at Boulder, and **James D Meiss**, Department of Applied Mathematics, University of Colorado at Boulder (1154-37-337)
- 5:30PM *Spatio-temporal persistent homology for dynamic metric spaces.*
 (1581) **Woojin Kim*** and **Facundo Mémoli**, The Ohio State University (1154-55-515)

- 5:00PM *Isolation of postcritically finite parameters in p -adic dynamical moduli spaces.*
 (1590) **Robert L. Benedetto***, Amherst College, and **Su-Ion Ih**, University of Colorado (1154-11-221)
- 5:30PM *Post-critically finite cubic polynomials.*
 (1591) 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 Arithmetic Dynamics, II (Associated with AMS Retiring Presidential Address Kenneth A. Ribet)

1:00 PM – 5:50 PM 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

- 1:00PM *The Galois-dynamics correspondence for unicritical polynomials.*
 ► (1582) **Robin Zhang**, Columbia University (1154-11-1831)
- 1:30PM *The Arakelov-Zhang pairing and Julia sets.*
 (1583) **Andrew Bridy**, Yale University (1154-11-1840)
- 2:00PM *Arboreal Cantor actions.*
 (1584) **Olga Lukina**, University of Vienna (1154-37-215)
- 2:30PM *Misiurewicz polynomials and irreducibility.*
 (1585) **Vefa Goksel**, University of Wisconsin-Madison (1154-11-172)
- 3:00PM *A gap conjecture for heights of iterates.*
 (1586) **Jason P Bell***, University of Waterloo, **Dragos Ghioca**, University of British Columbia, and **Matthew Satriano**, University of Waterloo (1154-11-479)
- 3:30PM *A transcendental dynamical degree.*
 (1587) **Jason Bell**, University of Waterloo, **Jeffrey Diller***, University of Notre Dame, and **Mattias Jonsson**, University of Michigan (1154-32-999)
- 4:00PM *A non-archimedean λ -lemma and J -stability.*
 (1588) **Thomas Silverman**, University of Michigan (1154-37-1539)
- 4:30PM *Dynamical height growth: left, right, and total orbits.* Preliminary report.
 (1589) **Wade Hindes**, Texas State University (1154-11-130)

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

- 1:00PM *Filtrations of Ideals Arising from Hierarchical Models.* Preliminary report.
 (1592) **Aida Maraj*** and **Uwe Nagel**, University of Kentucky (1154-13-426)
- 1:30PM *The Roots of Rook Polynomials and Connected Graphs.*
 (1593) **Kenneth Barrese**, Bucknell University (1154-05-491)
- 2:00PM *The antipode of the noncrossing partition lattice.*
 (1594) **Richard Ehrenborg**, University of Kentucky, and **Alex Happ***, Christian Brothers University (1154-06-1307)
- 2:30PM *Cyclic Sieving, Necklaces, and Bracelets.*
 (1595) **Eric Stucky**, University of Minnesota – Twin Cities (1154-05-1457)
- 3:00PM *Unconditional Reflexive Polytopes.*
 (1596) **Florian Kohl**, Aalto University, **McCabe Olsen***, The Ohio State University, and **Raman Sanyal**, Goethe-Universität, Frankfurt (1154-05-647)
- 3:30PM *Minimally dependent matroids.*
 (1597) Preliminary report.
Oliver Clarke, **Kevin Grace***, **Fatemeh Mohammadi** and **Leonid Monin**, University of Bristol (1154-05-528)
- 4:00PM *Cubical arrays of projective planes.*
 ► (1598) Preliminary report.
G Eric Moorhouse, University of Wyoming (1154-05-809)
- 4:30PM *Maximal arcs and special point sets in partial geometries.* Preliminary report.
 ► (1599) **Stefaan De Winter**, Michigan Technological University (1154-05-1745)
- 5:00PM *On q -lifts: Finite Geometries and Algebraically Defined Graphs.* Preliminary report.
 (1600) **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.*
(1601) **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.*
(1602) **Zach Greif** and **Jason McCullough***, Iowa State University (1154-13-648)

1:30PM *What Makes a Complex Virtual.*
(1603) **Michael C. Loper**, University of Minnesota (1154-13-1752)

2:00PM *Maximum Betti Numbers when fixing partial data about Hilbert functions.*
(1604) **Jay White**, University of Kentucky (1154-13-2550)

▶ 2:30PM *A bound on the Hilbert function of a quadratic ideal.* Preliminary report.
(1605) **Sema Gunturkun***, Amherst College, and **Mel Hochster**, University of Michigan (1154-13-2037)

▶ 3:00PM *Homogeneous Liaison and the Sequentially Bounded Licci Property.*
(1606) **Jesse Keyton**, University of Arkansas (1154-13-1773)

3:30PM *Semi-Ample Asymptotic Syzygies.*
(1607) **Juliette Bruce**, University of Wisconsin - Madison (1154-13-988)

4:00PM *On the conjecture of Vasconcelos for Artinian almost complete intersection monomial ideals.*
(1608) **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.*
(1609) **Laura Felicia Matusevich** and **Aleksandra Sobieska***, Texas A&M University (1154-13-1190)

5:00PM *Containment-Tight Ideals from Singular Loci of Reflection Arrangements.*
(1610) **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.
(1611) **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.*
(1612)

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.
(1613)

Christopher G Moseley, Calvin University (1154-53-705)

2:00PM *Beltrami fields with nonconstant proportionality factor.* Preliminary report.
(1614)

Jeanne N. Clelland*, University of Colorado, Boulder, and **Taylor J. Klotz**, University of Colorado, Boulder (1154-53-2409)

2:30PM *Aspects of the Theory of Cascade Linearization.* Preliminary report.
(1615) **Taylor J Klotz**, University of Colorado at Boulder (1154-53-626)

3:00PM *Absolute Equivalence and Linearization via a Cartan Formalism.*
(1616) **Yuhao Hu**, University of Colorado Boulder (1154-58-568)

3:30PM *Conservation laws and parabolic Monge-Ampere equations.*
(1617) **Benjamin Blake McMillan**, University of Adelaide (1154-35-1346)

4:00PM *Symmetries of the Eikonal Equation.*
(1618) **Ryad Ghanam***, Virginia Commonwealth University in Qatar, and **Gerard Thompson**, University of Toledo (1154-53-886)

4:30PM *A survey of the monster tower.*
(1619) **Corey Shanbrom**, Sacramento State University (1154-58-266)

▶ 5:00PM *The stationary train and the runaway train.* Preliminary report.
(1620) **Susan Jane Colley**, Oberlin College, and **Gary Kennedy***, Ohio State University (1154-70-474)

5:30PM *Twisted polygonal evolutions in $\mathbb{R}P^m$ and discretizations of Adler-Gel'fand-Dikii flows.*
(1621)

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

- 1:00PM (1622) *Groups of homeomorphisms of mapping tori over the Cantor set.*
Nicolás Matte Bon*, École polytechnique fédérale de Lausanne (EPFL), and **Michele Triestino**, Université de Bourgogne (1154-20-1530)
- 1:30PM (1623) *Continuous orbit equivalence, entropy, and sparse connectivity.*
David Kerr*, Texas A&M University, and **Hanfeng Li**, SUNY at Buffalo (1154-37-1597)
- 2:00PM (1624) *Representations of products of free groups.* Preliminary report.
Peter Burton, UT Austin, and **Kate Juschenko*** (1154-20-1942)
- 2:30PM (1625) *Branch groups with (non)-trivial rigid kernel.* Preliminary report.
Zoran Sunic, Hofstra University (1154-20-2416)
- 3:00PM (1626) *Superrigidity, Measure Equivalence, and Weak Pinsker Entropy.*
Robin D Tucker-Drob, Texas A&M University (1154-20-2701)
- 3:30PM (1627) *On the abundance of (non)tame group actions.*
Dominik Kwietniak*, Jagiellonian University in Krakow, and **Gabriel Fuhrmann**, Imperial College London (1154-37-2028)
- 4:00PM (1628) *Free and totally non-free boundary actions.* Preliminary report.
Vadim Kaimanovich, University of Ottawa (1154-37-1446)
- ▶ 4:30PM (1629) *Generalized Grigorchuk's Overgroups.*
Supun T Samarakoon, Texas A&M University (1154-20-2153)
- ▶ 5:00PM (1630) *Some new tools and examples for automaton groups of intermediate growth.*
Thibault Godin, IECL, CNRS & U. de Lorraine, and **IMAG, CNRS & U. de Montpellier** (1154-20-956)
- 5:30PM (1631) *Periodic groups via orbital graphs.*
Justin Cantu, Texas A&M University (1154-20-1248)

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

- ▶ 1:00PM (1632) *An Introduction to How to Relate Coding Theory and d -complete Posets.*
Manabu Hagiwara, Chiba University (1154-94-1192)
- ▶ 1:30PM (1633) *A certain code correcting two deletions with specified position.*
Kento Nakada, Okayama university (1154-05-942)
- 2:00PM (1634) *Architecture of braid classes in Coxeter systems.*
Dana C. Ernst, Northern Arizona University (1154-05-1035)
- ▶ 2:30PM (1635) *Braid shadows in simply-laced Coxeter systems.* Preliminary report.
Jadyn V. Breland, University of California, Santa Cruz (1154-05-1071)
- ▶ 3:00PM (1636) *Recent results on Choi Seok-Jeong's orthogonal Latin squares.*
Jon-Lark Kim, Sogang University (1154-94-936)
- ▶ 3:30PM (1637) *Weight q -Multiplicities for Representations of the Exceptional Lie Algebra \mathfrak{g}_2 .* Preliminary report.
Melissa Gutierrez González*, **Jerrell Cockerham**, **Amaury Minino**, Mathematical Sciences Research Institute, and **Pamela E Harris (Mentor)**, Williams College (1154-05-1060)
- 4:00PM (1638) *Positivity for symplectic Q -functions.*
Soichi Okada, Graduate School of Mathematics, Nagoya University (1154-05-387)
- 4:30PM (1639) *Binary Codes from the Projective Symplectic Group $S_8(2)$.*
Lydia K. Rukaria*, **Lucy Chikamai W** and **Ileri .. Kamuti**, Kibabii University, Mathematics Department (1154-05-2827)
- 5:00PM (1640) *Webs of type P .* Preliminary report.
Nicholas Davidson*, Reed College, **Jonathan Kujawa**, University of Oklahoma, and **Robert Muth**, Washington and Jefferson College (1154-17-2741)
- 5:30PM (1641) *Weight Enumerators and Cardinalities for Non-binary VT Codes.*
Takayuki Nozaki, Yamaguchi University (1154-05-932)

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 *Elliptic measure and Green function on domains with lower dimensional boundaries.* Preliminary report.
Svitlana Mayboroda, University of Minnesota (1154-35-2640)
- 2:00PM *Parabolic Measure.*
 (1643) **Alyssa D Genschaw***, University of Connecticut, and **Steve Hofmann**, University of Missouri (1154-35-1186)
- 2:30PM *Weak maximum principle for biharmonic equations in quasiconvex Lipschitz domains.*
 (1644) **Jinping Zhuge**, University of Chicago (1154-35-737)
- 3:00PM *Rectifiability of measures: the identification problem.*
 (1645) **Matthew Badger**, University of Connecticut (1154-28-1551)
- 4:00PM *Singular integral operators in Carnot groups.*
 (1646) **Vasileios Chousionis**, **Sean Li** and **Scott Zimmerman***, University of Connecticut (1154-28-1098)
- 4:30PM *A Marstrand Theorem for Polynomial Norms.*
 (1647) **Bobby Wilson**, University of Washington (1154-28-2466)

5:00—6:00—Discussionj

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 *The Voter Model on Bipartite Graphs.*
 ► (1648) **Philip Speegle***, University of Alabama, and **R. Oliver VandenBerg**, Kenyon College (1154-60-2431)
- 1:30PM *Quasi-Stationary Distributions in the context of continuous time Markov Processes with time-varying periodic transition rates.* Preliminary report.
 (1649) **Barbara H Margolius***, Cleveland State University, and **Yiqiang Zhao**, Carleton University (1154-60-998)

- 2:00PM *Finite birth-death-like Markov chains with generalized catastrophe transitions.* Preliminary report.
 ► (1650) **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 (1154-60-2039)
- 2:30PM *A Feynman Approach to Dynamic Rate Markov Processes.*
 ► (1651) **William A Massey**, ORFE Department / Princeton University (1154-60-185)
- 3:30PM *Approximating linear functionals of transient Markov chains.* Preliminary report.
 ► (1652) **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 *Using particle-distribution duality to determine mixing time.*
 ► (1653) **Mark Huber**, Claremont McKenna College (1154-60-1130)
- 4:30PM *Numerically Solving a Rank-Based Forward Backward Stochastic Differential Equation by Applying the Least-Squares Monte Carlo Method.*
 (1654) **Mark D. Dela**, Cal Poly Pomona (1154-60-795)
- 5:00PM *Asymptotic Properties of Interacting Stochastic Processes on Large Sparse Graphs.* Preliminary report.
 (1655) **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 *A hybrid IBL-lecture design for a freshman honors single variable calculus course.* Preliminary report.
 ► (1656) **Richard J Brown**, Johns Hopkins University (1154-00-2326)
- 1:30PM *Increasing students' conceptual understanding of linear algebra through active discussion sessions.* Preliminary report.
 ► (1657) **Alessandra Pantano*** and **Daniel R Bergman**, University of California, Irvine (1154-00-1884)
- 2:00PM *The Big Picture of Linear Algebra.*
 (1658) **W. Gilbert Strang**, Massachusetts Institute of Technology (1154-15-686)

Program of the Sessions – Friday, January 17 (cont'd.)

- 3:00PM *When Novel Instructional Practices Go To Scale: A Case Study*. Preliminary report.
 ▶ (1659) **Uri Treisman***, The University of Texas at Austin - Charles A. Dana Center, **Michael O'Sullivan**, Department of Mathematics, California State University, San Diego, and **Borbala Mazzag**, Department of Mathematics, California State University, Humboldt (1154-97-2419)
- 4:00PM Discussion
- 4:30PM *Attention Is the Beginning of Devotion: Noticing and Acculturative Routines in a Large Freshman Calculus Course*. Preliminary report.
 ▶ (1660) **Erica Winterer**, The University of Texas at Austin - Charles A. Dana Center (1154-97-2425)
- 5:00PM *A Project-based Promulgation of Computational Thinking in Mathematics*.
 ▶ (1661) **Boyan S. Kostadinov**, New York City College of Technology, CUNY (1154-97-2742)
- 5:30PM *Using Manipulables to Teach Non-linear Scaling*. Preliminary report.
 ▶ (1662) **Dylan P Noack***, Yuba College, and **David Weisbart**, University of California, Riverside (1154-97-2414)

AMS Special Session on Quantum Theory of Matter Meets Noncommutative Geometry and Topology, I

1:00 PM – 6:00 PM Room 210/212, Meeting Room Level, Colorado Convention Center

- Organizers: **Masoud Khalkhali**, University of Western Ontario
Markus Pflaum, University of Colorado, Boulder
- 1:00PM *A numerical approach to Chern numbers and unbounded Fredholm modules*. Preliminary report.
 (1663) **Terry A Loring**, University of New Mexico (1154-19-598)
- 2:00PM *Twisted K-theory and the classification of topological insulators*.
 (1664) **Hessel Posthuma**, Korteweg-de Vries Institute for Mathematics, University of Amsterdam (1154-55-1527)
- 3:00PM *The standard model of particle physics: from noncommutative geometry or Jordan geometry?*
 (1665) **Latham Boyle**, Perimeter Institute for Theoretical Physics (1154-17-816)
- 4:00PM *Quantum materials and symmetries*.
 (1666) **Ralph M Kaufmann**, **Sergei Khlebnikov** and **Erika Birgit Wehefritz-Kaufmann***, Purdue University (1154-81-1889)
- 5:00PM *Higher form symmetry, topological order, and fractons*.
 (1667) **Michael Hermele** and **Marvin Qi***, University of Colorado Boulder (1154-82-2565)

- 5:30PM *Bridge Cohomology: Generalizing Hochschild and Cyclic Cohomologies*.
 (1668) **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
- 1:00PM *Consistency on a cuboctahedron*.
 ▶ (1669) **Nalini Joshi***, University of Sydney, and **Nobutaka Nakazono**, Tokyo University of Agriculture and Technology (1154-39-68)
- 1:30PM *Recurrence coefficients for discrete orthogonal polynomials with hypergeometric weight and discrete Painlevé equations*.
 (1670) **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)
- 2:00PM *A Non-Autonomous Discrete Painlevé Equation and Counting Maps*. Preliminary report.
 (1671) **Brandon M. Tippings**, University of Arizona (1154-39-1954)
- 2:30PM *Combinatorial Dynamics: From Patience Sorting to the Discrete-Time Toda Lattice*.
 (1672) **Jonathan Ramalheira-Tsu*** and **Nicholas M Ercolani**, University of Arizona (1154-05-1559)
- 3:00PM Discussion
- 3:30PM *Dimer Model: Full Asymptotic Expansion of the Partition Function*.
 (1673) **Pavel Bleher**, Indiana University-Purdue University Indianapolis (1154-82-267)
- 4:00PM *A tale of two matrix integrals*.
 ▶ (1674) **Jonathan Novak**, UC San Diego (1154-33-283)
- 4:30PM *Random matrices in the general linear group*.
 ▶ (1675) **Brian C Hall***, University of Notre Dame, **Bruce K Driver** and **Todd Kemp**, University of California, San Diego (1154-60-883)
- 5:00PM *Soliton Quantization and Random Partitions*.
 (1676) **Alexander Moll**, Northeastern University (1154-60-557)

AMS Special Session on Research in Mathematics by Early Career Graduate Students, II

1:00 PM – 5:50 PM 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

- 1:00PM *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)
- ▶ 1:30PM *Minimal Lattice Tiled Torus Surfaces Embedding Lattice Tiled Torus Knots.* Preliminary report.
Nicholas Cazet, University of California at Davis, and **Jane Park***, San José State University (1154-54-2717)
- ▶ 2:00PM *Multivariate Rootfinding Using Chebyshev Approximation and Möller-Stetter Matrices.*
Hayden J Ringer, Brigham Young University (1154-65-2646)
- 2:30PM *Variable Lebesgue Spaces: A Comparison.* (1680)
Michael Penrod, Sam Houston State University (1154-46-1706)
- ▶ 3:00PM *Isometric copies of l_∞^n and l_1^n in transportation cost spaces on finite metric spaces.* Preliminary report.
Mutasim Mim*, **Mikhail Ostrovskii** and **Seychelle S Khan**, St. John's University, New York (1154-46-788)
- 3:30PM *The Non-Star-Shaped Regime of Inverse Mean Curvature Flow.* (1682)
Brian D Harvie, University of California, Davis (1154-53-559)
- 4:00PM *Walls for G-Hilb via Reid's recipe.* (1683)
Ben Wormleighton, UC Berkeley (1154-14-146)
- ▶ 4:30PM *Characterizations of Infinitesimal Non-Crossing Bi-Free Probability.* Preliminary report.
Ian Charlesworth, UC Berkeley, **Zhiheng Li**, Montreal, Canada, **Kyle P Meyer**, UC San Diego, **Drew T Nguyen**, San Diego, CA, **Jennifer Pi*** and **Annie K Raichev**, UC Irvine (1154-60-1096)
- 5:00PM *Gender Differences in the Use and Effectiveness of Adaptive Learning in Calculus I at a Private HBCU.* Preliminary report. (1685)
Cameisha Clark*, **Daniel Teodorescu** and **Torina Lewis**, Clark Atlanta University (1154-97-2719)
- 5:30PM *Spanning tree modulus for secure broadcast games.* (1686)
Kapila Kottegoda, Kansas State University (1154-15-1949)

AMS Special Session on Stochastic Analysis and Applications in Finance, Actuarial Science and Related Fields, II

1:00 PM – 5:50 PM 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

- ▶ 1:00PM *A Time-lagged Penalized Regression Model and Applications to Economic Modeling.* (1687)
Mingwei Sun*, Samford University, and **Patrick Wang**, University of Alabama (1154-62-1865)
- ▶ 1:30PM *Dynamically Adoptive Mahalanobis Based k-Nearest Neighbor Forecasting in Time Series Data.* Preliminary report. (1688)
Vindya Kumari Pathirana, University of Connecticut (1154-62-2460)
- 2:00PM *Dynamic Contagion in a Banking System.* (1689)
Andrey Sarantsev*, University of Nevada in Reno, **Tomoyuki Ichiba** and **Michael Ludkovski**, University of California in Santa Barbara (1154-60-1690)
- 2:30PM *Hypothesis Testing of Lévy Processes from Two Streams of Data.* (1690)
Michael Roberts, North Dakota State University (1154-60-90)
- 3:00PM *Exponential inequalities for exit times of stochastic Navier-Stokes equations.* (1691)
Po-Han Hsu* and **Padmanabhan Sundar**, Louisiana State University (1154-60-980)
- 3:30PM *Stochastic Differential Equations with Anticipating Initial Conditions.* (1692)
Hui-Hsiung Kuo, **Sudip Sinha***, Louisiana State University, and **Jiayu Zhai**, University of Massachusetts Amherst, Amherst (1154-60-1474)
- 4:00PM *The Volatility Change-Point Problem for Diffusion Processes.* (1693)
Cory Ball* and **Hongwei Long**, Florida Atlantic University (1154-60-203)
- 4:30PM *Quasi-Limiting Behavior of a Drifted Brownian Process.* (1694)
SangJoon Lee, University of Connecticut (1154-60-2264)
- 5:00PM *Switching Stochastic Approximation and Applications to Networked Systems.* (1695)
George Yin, **Le Yi Wang** and **Thu Thi Le Nguyen***, Wayne State University (1154-60-2695)
- 5:30PM *Risk Sensitive Markov Regime-switching Portfolio Optimization with Partial Information.* Preliminary report. (1696)
Isabelle Kemajou-Brown, Morgan State University (1154-60-1218)

AMS Special Session on Stochastic Differential Equations and Application of Mathematical Biology, I

1:00 PM – 5:50 PM Room 106, 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 *Most Probable Transition Pathways in Stochastic Dynamical Systems*. Preliminary report.
Jinqiao Duan, Illinois Institute of Technology, Chicago, IL 60616 (1154-60-1026)
- ▶ 1:30PM *Coevolution of Habitat Use in Stochastic Environments*.
Sebastian J. Schreiber*, University of California, Davis, **Alexandru Hening**, Tufts University, and **Dang H. Nguyen**, University of Alabama, Tuscaloosa (1154-92-2299)
- ▶ 2:00PM *Dynamics of Zika Virus Epidemic in Random Environment*.
Xiaoying Han*, Auburn University, **Yusuke Asai**, Hokkaido University, and **Peter E Kloeden**, University of Tuebingen (1154-34-1149)
- 2:30PM *Anomalous Diffusion of Foreign Particles in Biological Fluids*.
Scott A McKinley*, Tulane University, and **Christel Hohenegger**, University of Utah (1154-60-2802)
- ▶ 3:00PM *Molecular Motor Proteins: Designing experiments through stochastic inference*.
J Darby Smith*, Sandia National Laboratories, **Scott A McKinley**, Tulane University, and **William O Hancock**, Pennsylvania State University (1154-60-318)
- 3:30PM *A basic model of stochastic type for tumor virotherapy*.
Tuan A Phan* and **Jianjun P Tian**, New Mexico State University, Las Cruces, NM 88001, USA. (1154-92-789)
- 4:00PM *Stochastic Partial Differential Equation Models for Spatially Dependent Predator-Prey Equations*.
Nhu N, Nguyen*, Wayne State University, Detroit, MI, USA, and **George Yin**, Wayne State University, Detroit, MI, USA. (1154-60-952)
- ▶ 4:30PM *A finite volume method for infiltration dynamics in tumor growth models*.
Xianyi Zeng*, **Mashriq Saleh**, University of Texas at El Paso, and **Jianjun Paul Tian**, New Mexico State University (1154-65-821)

- ▶ 5:00PM *Using Stochastic Differential Equations to Model the Immune System Response to Bacterial Infection on the Surface of a Medical Implant Device*.
Shelby R Stanhope*, Department of Mathematical Sciences, United States Air Force Academy, and **Isaac Klapper**, Department of Mathematics, Temple University (1154-92-2756)
- 5:30PM *Random Dynamics for Stochastic Hindmarsh-Rose Equations with Multiplicative Noise*.
Chi Phan, University of South Florida (1154-35-2829)

AMS Special Session on The Kaczmarz Algorithm with Applications in Harmonic Analysis and Data Science

1:00 PM – 5:50 PM Room 404, Meeting Room Level, Colorado Convention Center

Organizers: **Xuemei Chen**, New Mexico State University
Palle E.T. Jorgensen, University of Iowa
Eric Weber, Iowa State University

- 1:00PM *Randomized Kaczmarz for Tensors*.
Anna Ma*, University of California, Irvine, and **Denali Molitor**, University of California, Los Angeles (1154-15-1225)
- 1:30PM *Regularized Random Kaczmarz Algorithm*. Preliminary report.
Xuemei Chen*, New Mexico State University, and **Jing Qin**, University of Kentucky (1154-65-2250)
- 2:00PM *Random products of projections in Hilbert space: Regularity, absolute convergence, statistics of displacements*.
C. Sinan Gunturk*, Courant Institute, NYU, and **Nguyen T. Thao**, City College, CUNY (1154-46-2241)
- 2:30PM *Dimension Reduction and Kernel Principal Component Analysis*.
Palle E. T. Jorgensen, The University of Iowa, **Sooran Kang**, Choongang University, **Myung-Sin Song***, Southern Illinois University Edwardsville, and **Feng Tian**, Mathematical Reviews (1154-46-543)
- 3:00PM *Stochastic Markov gradient descent for training low-bit neural networks*.
Alexander M. Powell* and **Jonathan Ashbrock**, Vanderbilt University (1154-65-1584)
- 3:30PM *Fourier Scattering Transforms as Efficient Feature Extractors*.
Wojciech Czaja, University of Maryland College Park (1154-43-2632)
- 4:00PM *Orthonormal bases generated by Cuntz algebras*.
Dorin Ervin Dutkay, University of Central Florida (1154-47-950)

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 Makdad**, Butler University, **Jay Mayfield**, Iowa State University, **Randal 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-2844)

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 #9: Part B

1:00 PM – 3:00 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 B

1:00 PM – 3:00 PM Room 708, Meeting Room Level, Colorado Convention Center

Visual Complex Analysis- GeoGebra Tools and Mapping Diagrams.

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.*
Natanael 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.)

- 2:30PM *Binary Goppa Codes from Trace Polynomials*. Preliminary report.
▶ (1729) **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)
- 2:45PM *Arithmetic Galois Theory*. Preliminary report.
▶ (1730) **Lucian Miti Ionescu**, Illinois State University (1154-12-2837)
- 3:00PM *Gradations of Cyclic Rings and Homogeneity of their Nil and Jacobson Radicals*.
(1731) **Mohammad Obiedat**, Gallaudet University (1154-13-17)
- 3:15PM *Generic Links of Determinantal Varieties*.
(1732) **Youngsu Kim***, **Lance Edward Miller** and **Wenbo Niu**, University of Arkansas (1154-13-443)
- 3:30PM *On Betti numbers of toric algebras of certain bipartite graphs*.
(1733) **Rimpa Nandi***, Senior research scholar, Indian Institute of Technology, Kharagpur, and **Ramakrishna Nanduri**, Assistant Professor, Indian Institute of Technology, Kharagpur (1154-13-631)
- 3:45PM *On the Frobenius Complexity Sequence of Stanley-Reisner Rings*. Preliminary report.
(1734) **Irina Ilioaea**, Georgia State University (1154-13-322)
- 4:00PM *Invariants of the symbolic powers of edge ideals*.
(1735) **Bidwan Chakraborty***, Senior Research Scholar, Indian Institute of Technology Kharagpur, and **Mousumi Mandal**, Assistant Professor, Indian Institute of Technology Kharagpur (1154-13-827)
- 4:15PM *Two-option magmas*. Preliminary report.
(1736) **Majed Zailaee***, **Sergio Lopez**, Ohio University, and **Rebin Muhammad**, OH (1154-13-1401)
- 4:30PM *When are permutation invariants Cohen-Macaulay over all fields?*
(1737) **Ben Blum-Smith***, NYU Center for Data Science, and **Sophie Marques**, Stellenbosch University (1154-13-1873)
- 4:45PM *On the inductive construction of rank 1, 2, and 3 valuations on $K(x, y)$ and their associated structures*.
(1738) **Reeve M. Garrett**, The Ohio State University (1154-13-1912)
- 5:00PM *How to tell the torsion a tensor takes*.
(1739) **Neil E Steinburg**, Drake University (1154-13-2151)
- 5:15PM *Representation Theory of the Space of Holomorphic Polydifferentials*.
(1740) **Adam Wood**, University of Iowa (1154-16-2531)
- 5:30PM *Differential geometry on matrix groups*.
(1741) **Luyining Gan***, Auburn University, **Tin-Yau Tam**, University of Nevada, Reno, and **Ming Liao**, Auburn University (1154-15-913)

AMS Contributed Paper Session on Combinatorics and Graph Theory, II

1:00 PM – 4:55 PM Room 202, Meeting Room Level, Colorado Convention Center

- 1:00PM *Balanced spiders*. Preliminary report.
▶ (1742) **Ravi Cho***, **Tim Hsu** and **Ardak Kapbasov**, Department of Mathematics and Statistics, San José State University (1154-05-973)
- 1:15PM *Cops and Robbers and the SURIEM REU Program*. Preliminary report.
▶ (1743) **Robert W Bell**, Michigan State University (1154-05-996)
- 1:30PM *Sum Index and Difference Index of Graphs*. Preliminary report.
▶ (1744) **Joshua Harrington**, Department of Mathematics, Cedar Crest College, **Eugene Henninger-Voss***, Department of Mathematics, Tufts University, **Kedar Karhadkar**, Department of Mathematics, the Pennsylvania State University, **Emily Robinson**, Department of Mathematics and Statistics, Mount Holyoke College, and **Tony W. H. Wong**, Department of Mathematics, Kutztown University of Pennsylvania (1154-05-1164)
- 1:45PM *C - (k, ℓ) -Sum-Free Sets*. Preliminary report.
▶ (1745) **Rachel Zhang**, Massachusetts Institute of Technology (1154-05-1358)
- 2:00PM *Domination in direct products of complete graphs*.
▶ (1746) **Harish Vemuri**, Yale University (1154-05-1278)
- 2:15PM *Extending Hansel's Theorem to Hypergraphs*.
(1747) **Greg Churchill***, SUNY Oswego, and **Brendan Nagle**, University of South Florida (1154-05-1298)
- 2:30PM *Essential components in vector spaces over finite fields*.
(1748) **Zhenchao Ge*** and **Thái Hoàng Lê**, University of Mississippi (1154-05-1816)
- 2:45PM *The structure of 4-connected $K_{2,t}$ -minor-free graphs*.
(1749) **Mark Ellingham***, Vanderbilt University, **J. Zachary Gaslowitz**, Proof School, and **Ryan Solava**, Saint Mary's College, Indiana (1154-05-1404)
- 3:00PM *Markov chain sampling for connected graph partitions*.
▶ (1750) **Daryl R. DeFord**, MIT - CSAIL (1154-05-1463)
- 3:15PM *Tight Bounds for the Split Domination Number of Regular and Nearly Regular Tournaments*.
▶ (1751) **K. A. S. Factor**, Marquette University, **L. J. Langley** and **S. K. Merz***, University of the Pacific (1154-05-1470)

- 3:30PM (1752) *On the ℓ_∞ Distance between Two Random Permutations.*
 ► **Zwei Li***, Department of Applied Mathematics and Statistics, Johns Hopkins University, Baltimore, MD 21218, USA, and **Hongkang Yang**, Courant Institute of Mathematical Sciences, NYU, New York, NY 10012, USA (1154-05-1516)
- 3:45PM (1753) *Laminar Matroids and their Generalizations.*
Tara Fife* and **James Oxley**, Louisiana State University (1154-05-1759)
- 4:00PM (1754) *Cubic binary matroids. Preliminary report.*
Zachary Gershkoff* and **James Oxley**, Louisiana State University (1154-05-1643)
- 4:15PM (1755) *Latin Squares from Polygonal Tiles. Preliminary report.*
 ► **Stephen M Gagola, Jr**, Kent State University (1154-05-1659)
- 4:30PM (1756) *Distributive Mendelsohn triple systems and the Eisenstein integers.*
Alex W Nowak, Iowa State University (1154-05-1730)
- 4:45PM (1757) *An Index-Preserving Bijection Between Marked Tableaux and $P_{n,2}$ -Tableaux.*
 ► **Matthew D Welz*** and **Samuel Fulton**, Fort Lewis College (1154-05-1741)

AMS Contributed Paper Session on Dynamical Systems and Ergodic Theory

1:00 PM – 5:25 PM **Room 208, Meeting Room Level, Colorado Convention Center**

- 1:00PM (1758) *Special Sensitive maps in Measure Dynamical Systems of type $F_{ip} \cap F_{ps} \cap F_{pubd}$ in uniform spaces.*
Mauricio Andrés Díaz Raby, Universidad del Bio Bio (1154-37-517)
- 1:15PM (1759) *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)
- 1:30PM (1760) *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)
- 1:45PM (1761) *A fractional nonlinear Schrödinger-Poisson system.*
Michail E. Filippakis*, Department of Digital Systems, University of Piraeus, 80, Karaoli and Dimitriou Str, 18534, Piraeus,, and **Marilena Poulou**, Department of Mathematics, National Technical University of Athens, Greece (1154-37-1425)
- 2:00PM (1762) *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)
- 2:15PM (1763) *Pressure metrics for Teichmüller spaces of punctured surfaces.*
Lien-Yung Kao, The University of Chicago (1154-37-1604)
- 2:30PM (1764) *Cantor sets arising from laminations on homothety surfaces.*
 ► **Joshua P. Bowman**, Pepperdine University (1154-37-2014)
- 2:45PM (1765) *Inverse Magnetic Billiards: A Survey.*
Sean Gasiorek, University of Sydney (1154-37-2022)
- 3:00PM (1766) *Mechanistically 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)
- 3:15PM (1767) *(Relatively) Contractive Actions of Lattices and Lie Groups.*
Darren Creutz, US Naval Academy (1154-37-2375)
- 3:30PM (1768) *Data-Driven State Space Discovery of Physical and Chemical Systems. Preliminary report.*
 ► **Carlos M. Ortiz Marrero**, Pacific Northwest National Laboratory (1154-37-2538)
- 3:45PM (1769) *Infected Host-Feeding in Semi-Discrete Host-Parasitoid Population Dynamics. Preliminary report.*
 ► **Brooks Emerick**, Kutztown University (1154-37-2706)
- 4:00PM (1770) *Magnetic Billiard on Polygons: The Square case. Preliminary report.*
 ► **A Perico**, University of California, Santa Cruz (1154-37-2748)
- 4:15PM (1771) *Comparison and machine classification of limit cycles from ODE and delayed oscillator models. Preliminary report.*
 ► **Lauren Lazarus**, Trinity College (1154-37-2754)
- 4:30PM (1772) *Mass distribution and persistent periodicity in no-slip billiards.*
 ► **Christopher L Cox**, Tarleton State University (1154-37-2767)
- 4:45PM (1773) *Parameterizing the canopy and the boundary of the connectedness locus of the IFS of two distinct affine maps.*
Nicholas Mandler, University of San Francisco (1154-37-2788)

Program of the Sessions – Friday, January 17 (cont'd.)

5:00PM *New Fractional-like Derivative with Dynamic Memory: Theory and Applications*. Preliminary report.
▶ (1774) **Udita N. Katugampola**, Department of Mathematical Sciences, Florida Polytechnic University, Lakeland, FL 33805. (1154-45-2644)

5:15PM *Lyapunov Characterizations of String Stability of Interconnected Systems with Delays*.
(1775) **Hasala Gallolu Kankanamalage**, Roger Williams University (1154-93-2718)

AMS Contributed Paper Session on Mathematical Biology and Related Fields, I

1:00 PM – 4:55 PM **Room 204, Meeting Room Level, Colorado Convention Center**

1:00PM *Global analysis of a model of dendritic cell therapy for melanoma*. Preliminary report.
(1776) **Lauren R Dickman**, **Evan Milliken*** and **Yang Kuang**, School of Mathematical and Statistical Sciences, Arizona State University (1154-92-116)

1:15PM *Linking Functional and Structural Neuronal Network Connectivity using Incomplete Observation Data and Leveraging the Spectral Properties to Characterize Network Structure*.
(1777) **Paulina Volosov*** and **Gregor Kovacic**, Rensselaer Polytechnic Institute (1154-92-270)

▶ 1:30PM *A Three Tropic-Level Model of Interacting Populations*.
(1778) **Ronald E Mickens***, Clark Atlanta University, Atlanta, GA, and **Kale Oyedeji**, 5343 Fox Valley Trace, Stone Mountain, GA 30088-2615 (1154-92-308)

▶ 1:45PM *Modeling Agricultural Timber Risks and Southern Pine Beetle Aggregation*. Preliminary report.
(1779) **John G. Alford***, **Abigail Miller**, **William I. Lutterschmidt**, **William Godwin** and **Justin Williams**, Sam Houston State University (1154-92-544)

▶ 2:00PM *Agent-based modeling of multi-species biofilm and its optimization*. Preliminary report.
(1780) **Sherli Koshy-Chenthittayil***, **Reinhard Laubenbacher**, **Pedro Mendes**, Center for Quantitative Medicine, UConn Health, and **Anna Dongari-Bagtzoglou**, Dept. Oral Health Sciences, UConn Health (1154-92-480)

▶ 2:15PM *A mathematical model to investigate the risk and prevention of future Southern Pine Beetle infestations in East Texas*. Preliminary report.
(1781) **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)

▶ 2:30PM *Mathematics of an epidemiology-genetics model for assessing the role of insecticides resistance on malaria transmission dynamics*.
(1782) **Jemal Mohammed-Awel***, Valdosta State University, and **Abba Gumel**, Arizona State University (1154-92-699)

▶ 2:45PM *Theory of Resource Competition Incorporating Preferential Uptake in a Water Column*. Preliminary report.
(1783) **Thomas G Stojsavljevic**, Drexel University (1154-92-923)

3:00PM *Novel compartmental models of infectious disease transmission*.
(1784) **Scott Greenhalgh***, Siena College, and **Carly Rozins**, University of California Berkeley (1154-92-964)

3:15PM Break

▶ 3:30PM *A Mixed Lattice Approach for Determination of the Areas of Cellular and Subcellular Structures*. Preliminary report.
(1785) **Rithika Narayan**, Elwood John Glenn High School (1154-92-1442)

3:45PM *Structural parameter identifiability in age-structured epidemic models*. Preliminary report.
(1786) **Marissa Renardy***, **Denise Kirschner** and **Marisa Eisenberg**, University of Michigan (1154-92-750)

4:00PM *Transition Fronts of Monostable Lattice Differential Equations in Locally Spatially Inhomogeneous Patchy Environments: Existence and Non-Existence*.
(1787) **Aijun Zhang***, University of Louisiana at Lafayette, and **Erik S. Van Vleck**, University of Kansas (1154-92-1479)

▶ 4:15PM *Building a Mathematical Model of the Merkel Cell*. Preliminary report.
(1788) **Paulina Czarnecki***, University of Michigan, **Jennifer Crodelle**, Courant Institute of Mathematical Sciences, NYU, and **Calina Copos**, Courant Institute of Mathematical Sciences (1154-92-1481)

- 4:30PM (1789) *Mathematical model of the Emerging Fungal Pathogen Batrachochytrium Salamandrivorans transmission on the Eastern Newt with multiple stages of infections.*
Md Rafiul Islam*, Texas Tech University, **Mathew Gray**, University of Tennessee Institute of Agriculture, and **Angela Peace**, Texas Tech University (1154-92-1577)
- 4:45PM (1790) *Conceptual Model for “Replicator – Genetic Parasite” Dynamics: Bifurcation Approach.*
Faina S. Berezovskaya*, Howard University, and **Georgy P Karev**, National Center for Biotechnology Information, NIH (1154-92-1751)

AMS Contributed Paper Session on Mathematics Education

1:00 PM – 4:40 PM Room 602, Meeting Room Level, Colorado Convention Center

- 1:00PM (1791) *Object-Label-Order effect when learning from an inconsistent source.*
Timmy Ma, Dartmouth College (1154-91-742)
- 1:15PM (1792) *Successful and sustainable undergraduate research in statistics through vertical integration of experience and horizontal integration of disciplines.*
Audrey E Hendricks, University of Colorado Denver (1154-97-102)
- 1:30PM (1793) *The Design and Implementation of a Course in Mathematical Research and Communication.* Preliminary report.
Chad Estabrooks*, USMA West Point, and **David McArdle**, University of Connecticut (1154-97-289)
- 1:45PM (1794) *College Algebra Students’ Understanding of Rational Functions Using Computer-Aided-Instruction (CAI).*
Avijit Kar, Georgia State University (1154-97-306)
- 2:00PM Break
- 2:15PM (1795) *Email Correspondence: Reaching Out Individually for Student Success.* Preliminary report.
Jasmine H. Hocutt, University of Alabama (1154-97-334)
- 2:30PM (1796) *Impacts of a cross-institutional undergraduate research experience workshop on student understanding of and self-efficacy for research.*
Megan Olivia Powell*, University of North Carolina Asheville, **Angela Antonou**, University of St. Francis, and **Sara Liesman**, Illinois State University (1154-97-1356)
- 2:45PM (1797) *Two models for blended learning in mathematics courses using online content.* Preliminary report.
Kristin M. Kurianski* and **Jennifer French**, Massachusetts Institute of Technology (1154-97-1594)

- 3:00PM (1798) *Creating Community-Responsive Mathematical Outreach Programs.*
Brandy S Wieggers, Central Washington University (1154-97-2002)
- 3:15PM (1799) *Investigating college algebra students’ current pre-requisite understandings and testing the effects of an alternative pre-requisite algebra curriculum: A mixed-methods study.* Preliminary report.
Volkan Sevim, University of South Carolina Beaufort (1154-97-2205)
- 3:30PM (1800) *Trends in pre-college advanced mathematics preparation and access for historically marginalized groups.*
Daniel Zaharopol, The Art of Problem Solving Initiative / Bridge to Enter Advanced Mathematics (BEAM) (1154-97-2244)
- 3:45PM (1801) *Montana Math Circle.* Preliminary report.
Monte S Meyerink*, **Fenqjen Luo** and **Ciara D Burgal**, Montana State University (1154-97-2316)
- 4:00PM (1802) *Creating Interactive Classrooms Using the Flipped Model with Supplemental Instructors.* Preliminary report.
Rhonda D Fitzgerald* and **Anne Fernando**, Norfolk State University (1154-97-2832)
- 4:15PM (1803) *Supportive environment in a mathematically rigorous co-requisite lab course ensures student success in the Introduction to Proofs.*
Ekaterina (Katya) Yurasovskaya, Seattle University (1154-97-2705)
- 4:30PM (1804) *Alliance of Indigenous Math Circles (AIMC) as a study in network building.*
Tatiana Shubin*, San Jose State University, and **Bob Klein**, Ohio University (1154-97-2734)

AMS Contributed Paper Session on Ordinary Differential Equations, Applications and Related Topics.

1:00 PM – 4:55 PM Room 604, Meeting Room Level, Colorado Convention Center

- 1:00PM (1805) *Effects of Excess Food-Nutrient Content on the Coexistence of Competing Consumers.*
Lale Asik* and **Angela Peace**, Department of Mathematics and Statistics, Texas Tech University (1154-34-247)
- 1:15PM (1806) *Some Epidemic Models on Time Scales.*
Gulsah Yeni* and **Elvan Akin**, Missouri University of Science and Technology (1154-39-2541)
- 1:30PM (1807) *Mathematical Modeling of an Immune Checkpoint Inhibitor and Its Synergy with an Immunostimulant.*
Elpiniki Nikolopoulou, Arizona State University (1154-34-866)

Program of the Sessions – Friday, January 17 (cont'd.)

- 1:45PM (1808) *Generalized Monotone Method for Nonlinear Caputo Fractional Impulsive Differential Equations*. Preliminary report.
Yunxiang Bai* and **Aghalaya Vatsala**, University of Louisiana at Lafayette (1154-34-891)
- 2:00PM (1809) *Upper semi-continuous convergence of attractors for a Hop field-type lattice model*.
Basiru Usman*, Auburn University, Auburn AL, **Xiaoying Han** and **Peter E. Kloeden**, Auburn University, Auburn, AL (1154-34-1062)
- ▶ 2:15PM (1810) *Long-lasting Insecticidal Nets and the Quest for Malaria Eradication: A Mathematical Modeling Approach*.
Enahoro A. Iboi*, **Abba B Gumel**, **Steffen Eikenberry**, **Silvie Huijben** and **Krijn Paaijmans**, Arizona State University (1154-34-915)
- ▶ 2:30PM (1811) *Modeling the interplay between hepatitis D virus (HDV) and hepatitis B virus (HBV) during anti-HDV treatment*. Preliminary report.
Preeti Dubey* and **Harel Dahari**, Loyola University Chicago (1154-34-1427)
- 2:45PM (1812) *Optimal Control Treatment Analysis for the Predator-Prey Chemotherapy Model*.
Ismail Abdulrashid*, Auburn University, **Hakim Ghazzai**, Stevens Institute of Technology, **Xiaoying Han**, Auburn University, and **Yehia Massoud**, Stevens Institute of Technology (1154-34-1661)
- 3:00PM (1813) *Mixed-mode oscillations as long transient dynamics in a predator-prey model with timescale separation*.
Susmita Sadhu, Georgia College and State University (1154-34-1832)
- 3:15PM (1814) *Boundary Triples and Weyl m -functions for Powers of the Jacobi Differential Operator*. Preliminary report.
Dale Frymark* and **Annemarie Luger**, Stockholm University (1154-34-2032)
- 3:30PM (1815) *Program- positional strategies for a Lotka -Volterra type cancer control model*.
Ellina Grigorieva*, Texas Woman's University, and **Evgenii Khailov**, Lomonosov Moscow State University, Moscow, Russia (1154-49-1331)
- 3:45PM (1816) *On the dynamics of certain classes of nonlinear discrete discontinuous population models*.
Vlajko L Kocic, Xavier University of Louisiana (1154-39-1082)
- ▶ 4:00PM (1817) *Solutions to a three point boundary value problem in nabla fractional calculus*. Preliminary report.
Kevin Ahrendt, Colorado School of Mines (1154-39-1451)
- ▶ 4:15PM (1818) *An Extension of Regressive Functions from Discrete Nabla Calculus into the Complex Domain*. Preliminary report.
Kevin Ahrendt, **Areeba Ikram** and **Larsen Kronstad***, Colorado School of Mines (1154-39-1700)
- ▶ 4:30PM (1819) *Differentiability of a fractional difference operator and modeling applications*. Preliminary report.
Kevin Ahrendt and **Michael O'Leary***, Colorado School of Mines (1154-39-1978)
- ▶ 4:45PM (1820) *Sturm-Liouville Problems in Discrete Nabla Fractional Calculus*. Preliminary report.
Kevin Ahrendt, **Areeba Ikram** and **Rocco Marchitto***, Colorado School of Mines (1154-39-2332)

MAA Contributed Paper Session on Combining Technological Tools and Innovative Practices to Improve Student Learning Outcomes, II

1:00 PM – 3:35 PM 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

- ▶ 1:00PM (1821) *Integrating technology and pedagogical strategies for learning and teaching calculus*.
Katuscia C. B. Teixeira* and **Eduardo V. O. Teixeira**, University of Central Florida (1154-B5-1739)
- ▶ 1:20PM (1822) *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*.
Dan McGee*, **Axel Brandt**, **Steven Wilkinson** and **Bethany Noblitt**, Northern Kentucky University (1154-B5-976)
- ▶ 1:40PM (1823) *Flipping the Classroom: An updated approach*.
Matthew Jonathan Peeples, United States Naval Academy Preparatory School (1154-B5-1664)
- ▶ 2:00PM (1824) *Which One Doesn't Belong? Examining Graphs with Dynamic Representations*.
Nina Bailey*, University of North Carolina - Charlotte, and **Samuel D Reed**, Middle Tennessee State University (1154-B5-1762)

- 2:20PM *A Technology-Enhanced, Flipped Course Design to Foster Students' Understanding of Statistics.*
▶ (1825) **Abeer Hasan**, Humboldt State University (1154-B5-1156)
- 2:40PM *Real Data is Important: Live, Data Collection and Analysis for Statistics Classrooms Using The Free Classroom Stats Platform.*
(1826) **David G Taylor*** and **Adam F Childers**, Roanoke College (1154-B5-2139)
- 3:00PM *The Use of a Flipped Classroom to Strengthen Problem Solving Skills.*
▶ (1827) **Gregory A. Varner**, John Brown University (1154-B5-542)
- 3:20PM *Integrating Technology and Project Based Learning in a Finite Mathematics Class.*
▶ (1828) Preliminary report.
Jing Wang* and **Sandra Davis**, Christian Brothers University (1154-B5-1990)

MAA Contributed Paper Session on Fostering Creativity in Undergraduate Mathematics Courses, II

1:00 PM – 2:35 PM **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
- 1:00PM *Flipping the elementary math education classroom to cultivate creativity within each student through the design and presentation of unique, imaginative Common Core lesson plans.*
▶ (1829) **Margaret Smolinka Adams**, South Georgia State College (1154-E5-579)
- 1:20PM *Employing the Number Talk concept in the Undergraduate Classroom.*
▶ (1830) **Kathy Tomlinson*** and **Keith Nabb**, University of Wisconsin—River Falls (1154-E5-1099)
- 1:40PM *Relaxing Constraints on Creativity.*
▶ (1831) **Rick Cleary**, Babson College (1154-E5-1238)
- 2:00PM *Inquiry and Creative Problem Solving in a General Education Mathematics Course.*
(1832) Preliminary report.
Manmohan Kaur, Benedictine University (1154-E5-1776)

- 2:20PM *Tasks to Foster Mathematical Creativity in Calculus I.*
▶ (1833) **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, I

1:00 PM – 3:55 PM **Room 501, 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
- 1:00PM *An Interdisciplinary Approach to Inclusive Excellence.* Preliminary report.
▶ (1834) **Kerry M. Luse**, Trinity Washington University (1154-F5-1892)
- 1:20PM *Backward Design and Creating a Supportive Culture in Precalculus and First-semester Calculus.* Preliminary report.
▶ (1835) **Jana Gevertz**, **Matthew Mizuhara**, **Susan Schmoyer*** and **Suriza van der Sandt**, The College of New Jersey (1154-F5-1795)
- 1:40PM *Girls Tinker Academy: How a summer program in making tries to close the gap.*
▶ (1836) **Natalie LF Hobson**, Sonoma State University (1154-F5-1636)
- 2:00PM *The Alliance of Indigenous Math Circles Report on the 2019 Summer Camps for Indigenous Students and K-12 Teachers.*
▶ (1837) **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 *The Young Scholars Research Experiences in Mathematics (YSREM) at University of Guam.*
▶ (1838) **Hyunju Oh**, University of Guam (1154-F5-1065)
- 2:40PM *Making the Classroom More Inclusive: Ideas and Strategies.*
(1839) **James E. Hamblin**, Shippensburg University (1154-F5-992)
- 3:00PM *Unpacking LGBTQA: Experiences and supports for queer spectrum students in math.* Preliminary report.
▶ (1840) **Matthew K Voigt**, San Diego State University & UC San Diego (1154-F5-975)

Program of the Sessions – Friday, January 17 (cont'd.)

- ▶ 3:20PM (1841) *Research Program in Mathematics for Young Scientists*. Preliminary report.
Liljana Babinkostova* and **Marion Scheepers**, Boise State University (1154-F5-429)

- ▶ 3:40PM (1842) *Promoting STEM Retention through Self-Efficacy*.
John Symms* and **Kathrine Kramer**, Carroll University (1154-F5-179)

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) *MLB: Decision Making on the Corners*. 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)
- ▶ 1:20PM (1854) *Mathematics and Musical Entropy*.
Federico Favali*, 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
- 1:15PM (1859) *Chordal Hausdorff Convergence and Quasihyperbolic Distance.*
David Herron, **Abigail Richard***, University of Cincinnati, and **Marie Snipes**, Kenyon College (1154-VM-2690)
- ▶ 1:30PM (1860) *Basis functions in time scales.* Preliminary report.
Kirsten R Messer, Colorado State University - Global (1154-VM-1004)
- 1:45PM (1861) *An alternative definition of exponential functions in time scales using basis functions.* Preliminary report.
Beth Schaubroeck, U. S. Air Force Academy (1154-VM-959)
- ▶ 2:00PM (1862) *Two Competitive Lotka-Volterra Systems with Nonlinear Competition.*
Grant C. Wagner, James Madison University (1154-VM-2176)
- ▶ 2:15PM (1863) *Low Regularity Non- $L^2(\mathbb{R}^n)$ Local Solutions to the gMHD- α system.*
Lorenzo Riva, Creighton University (1154-VM-449)
- 2:30PM (1864) *Shape through sound.*
Javad Namazi, FDU (1154-VM-1097)
- ▶ 2:45PM (1865) *Entire Functions, Entirely Discontinuous.* Preliminary report.
Jeremiah A. Hocutt, University of Alabama (1154-VM-625)
- 3:00PM (1866) *Determining Values of Spectral ζ -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)
- ▶ 3:15PM (1867) *Chain Recurrence in Graph Determined Hybrid Systems.*
Kimberly D Ayers, Carroll College (1154-VM-244)
- 3:30PM (1868) *Fractional derivatives in one-sided weighted Sobolev spaces.*
Mary Vaughan* and **Pablo Raúl Stinga**, Iowa State University (1154-VM-193)
- 3:45PM (1869) *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)
- ▶ 4:00PM (1870) *Classifying solutions for an important functional equation in Complex Analysis.*
Danqi Yin* and **Brittney Miller**, Coe College (1154-VM-2387)
- 4:15PM (1871) *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)
- ▶ 4:30PM (1872) *Quantum Bruhat Graphs, Asymptotics, and Undergraduate research.*
Ryan Shifler, Salisbury University (1154-VM-859)

- ▶ 4:45PM (1873) *A sequence of means and generalization.*
Jessica N Gibson* and **Roman Wong**, Washington & Jefferson College (1154-VM-1112)
- ▶ 5:00PM (1874) *A heuristic derivation of the Boole summation formula.*
Thomas J. Osler, Rowan University (1154-VM-2684)
- 5:15PM (1875) *Lower Semicontinuity and Γ -convergence of a Class of Linear Growth Functionals with L^1 Data.*
Thomas Wunderli, The American University of Sharjah (1154-VM-288)
- ▶ 5:30PM (1876) *Developments in the semi-local convergence of Newton's method.*
Yauheniya Shviadok*, **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 Erbes**, Hiram College
Holley Friedlander, Dickinson College
Steven McKay, Brigham Young University

- ▶ 1:00PM (1877) *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-VV-2382)
- ▶ 1:15PM (1878) *The Lake Wobegon Paradox.*
C. Bryan Dawson, Union University (1154-VV-693)
- ▶ 1:30PM (1879) *Bifurcations of a discrete analog of the Bernoulli differential equation.*
Chris Ahrendt, University of Wisconsin-Eau Claire (1154-VV-1110)
- ▶ 1:45PM (1880) *Lyapunov Inequalities for Discrete Fractional Nonlinear Boundary Value Problems.* Preliminary report.
Areeba Ikram, Colorado School of Mines (1154-VV-2489)
- ▶ 2:00PM (1881) *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-VV-1921)
- ▶ 2:15PM (1882) *Peakless Motzkin Paths with Marked Level Steps at Fixed Height.*
Naiomi T Cameron, Spelman College, and **Everett N Sullivan***, Virginia Tech (1154-VV-1131)
- ▶ 2:30PM (1883) *Color Space Mathematical Modeling.*
Mohamed Allali, Chapman University (1154-VV-1863)

Program of the Sessions – Friday, January 17 (cont'd.)

- 2:45PM (1884) ▶ *Positional games and the probabilistic method.* Preliminary report.
Segun Victor Ofe, Sam Houston State University (1154-VV-2651)
- 3:00PM (1885) ▶ *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 (1886) ▶ *Steiner Algebras.* Preliminary report.
Benjamin R Prather, Florida State University (1154-VV-1923)
- 3:45PM (1887) ▶ *How often do two permutations meet in the minimal element?*
Adam J Hammett and **James Ford McElroy***, Cedarville University (1154-VV-2309)
- 4:00PM (1888) ▶ *Maximally sized upward and downward closed P-free families.*
A Sophie Aiken, Colorado College (1154-VV-1674)
- 4:15PM (1889) ▶ *Security of generalized lightweight substitution permutation ciphers.* Preliminary report.
Liljana Babinkostova, Boise State University, **Robert J. Erbes**, Idaho National Lab, **William R. Myers**, New Mexico Institute of Mining and Technology, and **William Unger***, Boise State University (1154-VV-2736)
- 4:30PM (1890) ▶ *"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 (1891) ▶ *Convexity and star-shapedness of joint matricial range.*
Pan Shun Lau, University of Nevada, Reno (1154-VV-299)
- 5:00PM (1892) ▶ *Weak log-majorization of unital trace-preserving completely positive maps.*
Tin-Yau Tam, University of Nevada, Reno (1154-VV-868)
- 5:15PM (1893) ▶ *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 (1894) ▶ *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 (1895) ▶ *Positioning, Navigation, and Timing Trust Inference Engine.*
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 (1896) ▶ *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 (1897) ▶ *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 (1898) ▶ *E-Bayesian Estimation on Cure Model for Right Censored Data.* Preliminary report.
Durga H Kotal* and **Khyam N Paneru**, University of Wisconsin-Whitewater (1154-VT-1755)
- 1:45PM (1899) ▶ *Solving Statistical Estimation Problems with Algebraic Geometric Tools.*
Grant Lee Innerst*, Shippensburg University, and **David J Kahle**, Baylor University (1154-VT-1501)
- 2:00PM (1900) ▶ *Progress on bounding site percolation thresholds of Archimedean lattices.* Preliminary report.
John C. Wierman, Johns Hopkins University (1154-VT-250)
- 2:15PM (1901) ▶ *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 Sazib Hasan*, Dixie State University, and **Kalimuthu Krishnamoorthy**, University of Louisiana at Lafayette (1154-VT-1066)
- 3:00PM (1903) *Lehmann ROC Regression for Longitudinal Data.*
Melissa Innerst*, Juniata College, and **Jack D Tubbs**, Baylor University (1154-VT-1402)
- ▶ 3:15PM (1904) *Bootstrap Control Chart for Pareto Percentiles.* Preliminary report.
Ruth Burkhalter, University of South Dakota (1154-VT-2337)
- 3:30PM (1905) *Inference on the difference of location parameters under Multivariate skew-normal setting.* Preliminary report.
Ziwei Ma* and **Tonghui Wang**, New Mexico State University (1154-VT-2090)
- ▶ 3:45PM (1906) *Multiple Points of Fractional Brownian Motion in \mathbb{R}^d .*
Mark Landry*, Michigan State University, **Paige Percy**, University of Arizona, and **Cheuk-Yin Lee**, Michigan State University (1154-VT-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-VT-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-VT-482)
- 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)
- ▶ 4:30PM (1916) *An Investigation Using Homology and Inverted Distances.* Preliminary report.
Brett A. Jefferson, Pacific Northwest National Laboratory (1154-55-2154)
- 5:00PM Panel Discussion: Mathematics at the National Laboratories.

SIAM Minisymposium on Mathematics at the National Laboratories

1:00 PM – 6:00 PM 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

NAM Haynes-Granville-Browne Session of Presentations by Recent Doctoral Recipients

1:00 PM – 4:00 PM Room 605, Meeting Room Level, Colorado Convention Center

Organizers: **Naiomi Cameron**, Spelman College

Edray Goins, Pomona College

- ▶ 1:00PM (1917) *Enumerations of Restricted Dumont Permutations.*
Opel Jones, Towson University (1154-05-2157)

Program of the Sessions – Friday, January 17 (cont'd.)

- 1:45PM (1918) *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 (1919) *Positive Definite Kernels, Harmonic
 Analysis, and Boundary Spaces:
 Drury-Arveson Theory, and Related.*
Aqeeb A Sabree, Xavier University
 (1154-46-2678)
- ▶ 3:15PM (1920) *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**

1:20 PM – 5:35 PM **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 (1921) *Calculus Students' Understandings of
 Graphical Representations of Functions
 and Differences of Outputs.* Preliminary
 report.

Benjamin David Sencindiver, Colorado
 State University (1154-N5-2691)

▶ 1:40PM (1922) *Students' meanings for the Derivative
 at a Point in the context of Linear
 Approximation.*

Franklin H Yu, Arizona State University
 (1154-N5-2389)

▶ 2:00PM (1923) *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, **Debendra
 Banjade**, Coastal Carolina University,
 and **Manoj Lamichhane**, Florida
 Polytechnic University (1154-N5-1492)

▶ 2:20PM (1924) *Distinctions in Undergraduate Students'
 Interpretations of Differences from
 Calculus Statements in the Graphical
 Register.*

Erika David Parr, Rhodes College
 (1154-N5-2475)

▶ 2:40PM (1925) *Students' Gaze Patterns and
 In-the-Moment Shape Thinking.*
Wesley K. Martsching, University of
 Northern Colorado (1154-N5-2625)

▶ 3:00PM (1926) *Towards a Hypothetical Learning
 Trajectory for business and marginal
 functions.*

Ralph E. Chikhany, Washington State
 University, Pullman, WA (1154-N5-912)

▶ 3:20PM (1927) *A conceptual analysis of students'
 abstracted structural reasoning.*
Yufeng Ying* and **Kevin C Moore**,
 University of Georgia (1154-N5-1484)

▶ 3:40PM (1928) *Examining area of a rectangular region
 with area-unit comparison.* Preliminary
 report.

Sayonita Ghosh Hajra* and **Yajenny
 Pacheco Enamorado**, California State
 University, Sacramento (1154-N5-599)

▶ 4:00PM (1929) *Investigating Prospective Secondary
 Mathematics Teachers' Evolving Function
 Concept Images.*

Janessa M Beach, The University of
 Texas at Arlington (1154-N5-981)

- 4:20PM (1930) *Variation, Covariation, and Conceptual or Experiential Time.*
 ► **Kevin C. Moore**, University of Georgia (1154-N5-152)
- 4:40PM (1931) *Understanding students' uses of dynamic geometry environments in screencast presentation.*
 ► **Younggon Bae**, University of Texas Rio Grande Valley (1154-N5-1822)
- 5:00PM (1932) *State of the undergraduate Geometry courses for secondary Teachers: Curriculum, Instructional Practices, and Student achievement.*
Patricio G Herbst, **Irma E. Stevens***, **Amanda M. Milewski**, **Michael G Ion** and **Inah Ko**, University of Michigan (1154-N5-2080)
- 5:20PM (1933) *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

- 1:30PM (1934) *Bands and symmetry.*
Francis J Pastijn, Marquette University, Milwaukee, Wisconsin (1154-20-1675)
- 2:00PM (1935) *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)
- 2:30PM (1936) *Maximal Commutative Subsemigroups of a Finite Semigroup.*
Janusz Konieczny, University of Mary Washington, Fredericksburg, Virginia (1154-20-572)
- 3:00PM (1937) *Topological Transformation Monoids.*
Zachary Mesyan*, University of Colorado, Colorado Springs, **James D. Mitchell**, University of St Andrews, and **Yann H. Péresse**, University of Hertfordshire (1154-20-92)
- 3:30PM (1938) *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)

- 4:00PM (1939) *A generalization of Wilf's Conjecture.*
 ► **Michael DiPasquale**, Colorado State University (1154-13-840)
- 4:30PM (1940) *Counting the number of numerical semigroups using polytopes.*
 ► **Hayan Nam***, Iowa State University, and **Nathan Kaplan**, University of California, Irvine (1154-05-1881)
- 5:00PM (1941) *Report on homological finiteness conditions for one-relator monoids.* Preliminary report.
Robert D Gray, University of East Anglia, and **Benjamin Steinberg***, The City College of New York (1154-20-1169)
- 5:30PM (1942) *Conjugacy and the center of inverse monoids.*
 ► **Michael Kinyon**, University of Denver (1154-20-841)

ASL Invited Address

2:00 PM – 2:50 PM Room 302, Meeting Room Level, Colorado Convention Center

- (1943) *Representation theorems for exchangeable structures: a computability-theoretic perspective.*
Cameron E. Freer, Massachusetts Institute of Technology (1154-03-1223)

Rocky Mountain Mathematics Consortium Board of Directors Meeting

2:15 PM – 4:00 PM Granite C, 3rd Floor, Hyatt Regency Denver

AMS Committee on Science Policy

2:30 PM – 4:00 PM Room 203, Meeting Room Level, Colorado Convention Center

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

▶ 3:00PM (1947) *Videos Lectures to Enhance Student Learning and Performance in an Online Elementary Statistics Course*. Preliminary report.

Cathy M. Frey, Norwich University (1154-P1-1802)

▶ 3:20PM (1948) *SOTL- driven evolution of a university probability course*.

J. Todd Lee, Elon University (1154-P1-2311)

▶ 3:40PM (1949) *Improving Student Ownership in Introductory Statistics Class through a Project-Based Approach*.

Vinodh Kumar Chellamuthu, Dixie State University, Saint George, Utah (1154-P1-1273)

▶ 4:00PM (1950) *Modeling and Statistical Research with R*.

Leon Kaganovskiy, Touro College (1154-P1-277)

▶ 4:20PM (1951) *Using GeoGebra for Statistics*.

Heather Pierce, Emmanuel College (1154-P1-2587)

▶ 4:40PM (1952) *Study of Student Performance and Perceptions in Inverted Introductory Statistics*.

Reza O. Abbasian*, 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**

3:00PM (1953) *Local Hanf Numbers, Kurepa Trees, and Limit Characterizable Cardinals*.
Ioannis Souldatos, University of Detroit Mercy (1154-03-897)

3:30PM (1954) *An introduction to HT-fields*.
Elliot Kaplan, University of Illinois at Urbana-Campaign (1154-03-1435)

4:00PM (1955) *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)

▶ 4:30PM (1956) *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, Pomona College

Victor Piercey, Ferris State University

Samuel L. Tunstall, Trinity University

▶ 3:20PM (1957) *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)

- 3:40PM *Quantitative Literacy for Pre-service Elementary Teachers in a Remedial Pilot Program*. Preliminary report.
 ► (1958) **Maria G Fung**, Worcester State University (1154-M1-888)
- 4:00PM *Mathematics, Quantitative Literacy, and Social Justice: Continuing the Conversation*. Preliminary report.
 ► (1959) **Samuel Luke Tunstall***, Trinity University, **Victor Piercey**, Ferris State University, **Gizem Karaali**, Ponoma College, **Catherine Crockett**, Point Loma University, **Mark A Branson**, Stevenson University, and **Jason Douma**, University of Sioux Falls (1154-M1-2809)

Radmila Sazdanovic, North Carolina State University
Yusu Wang, Ohio State University
Liz Vivas, Ohio State University

- 5:00PM *Theoretical justification and error analysis for slender body theory*.
 (1960) **Laurel A Ohm**, University of Minnesota
- 5:00PM *Area and Partial Length Spectrum Data*. Preliminary report.
 (1961) **Noelle Sawyer**, Wesleyan University
- 5:00PM *Extending fibrations of knot complements to ribbon disk complements*.
 (1962) **Maggie Miller**, Princeton University
- 5:00PM *Exponential Domination on $C_n \square P_k$ and infinite grids*.
 ► (1963) **Faisal Min Mahfoodh**, University of Minnesota, **Bo Peng**, Carleton College, **Elizabeth Sprangel*** and **Michael Young**, Iowa State University

- 5:00PM *Lattice Polytopes arising from Schur Polynomials and Symmetric Grothendieck Polynomials*.
 (1964) **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 **Julianne Vega***, University of Kentucky

- 5:00PM *Strictly n -regular Hermitian lattices*. Preliminary report.
 (1965) **Freda Li**, Wesleyan University

- 5:00PM *Self-organized division of labor leads to behavioral contagion in mixed social groups*.
 ► (1966) **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

- 5:00PM *Sketching and Clustering Metric Measure Spaces*.
 ► (1967) **Facundo Memoli**, The Ohio State University, **Anastasios Sidiropoulos**, University of Illinois at Chicago, and **Kritika Singhal***, The Ohio State University

- 5:00PM *Classification on Planar Polygonal Complexes*. Preliminary report.
 ► (1968) **Thanittha Kowan**, Florida State University

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

Program of the Sessions – Friday, January 17 (cont'd.)

5:00PM (1969) *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

5:00PM (1970) *Projective cases for the restriction of the oscillator representation to dual pairs.*

Sabine Jessica Lang, University of Utah

5:00PM (1971) *Fractional derivatives and Laplacians in one and two-sided weighted Sobolev spaces.*

Mary Vaughan* and **Pablo Raúl Stinga**, Iowa State University

5:00PM (1972) *Unified Topological and Geometric Characterization of Genomic Networks Underlying Complex Traits in Genome-wide Association Studies.*

Emily T Winn* and **Lorin Crawford**, Brown University

5:00PM (1973) *Semi-Ample Asymptotic Syzygies.*

Juliette Bruce, University of Wisconsin - Madison

5:00PM (1974) *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

5:00PM (1975) *Smallness properties and locally complete intersections.*

Janina C. Letz, University of Utah

5:00PM (1976) *Counterexamples for Cohen-Macaulayness of Lattice Ideals.*

Aleksandra Sobieska* and **Laura Felicia Matusevich**, Texas A&M University

▶ 5:00PM (1977) *Stability deterioration of diffuse optical tomography in the Bayesian framework.*

Kit Newton* and **Qin Li**, University of Wisconsin-Madison

5:00PM (1978) *Quantitative Properties of Ideals arising from Hierarchical Models.*

Aida Maraj, University of Kentucky

MAA Panel

5:00 PM – 7:00 PM **Room 601, Meeting Room Level, Colorado Convention Center**

2020 Vision for Actuarial Science Education

Organizers: **Kevin Charlwood**, Washburn University

Michelle Guan, Indiana University Northwest

Steve Paris, Florida State University

Barry Smith, Lebanon Valley College

Sue Staples, Texas Christian University

Panelists: **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

Hélène 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 504, 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

- 6:00PM *The future of textbooks.*
▶ (1979) **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 Lecture

6:15 PM – 7:05 PM Room 504, Meeting Room Level, Colorado Convention Center

Organizer: **Bonnie Gold**, Monmouth University

- 6:15PM *Possible and impossible infinities.*
▶ (1980) Preliminary report.
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

- 7:20PM *The importance of statisticians in a development-driven world.*
(1981) **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

Project 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

- ▶ 8:00AM *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)
- ▶ 8:30AM *On the Knotting Probability of Random Equilateral Hexagons.* **Clara Buck***, Iowa State University, **Sean Gallagher**, Oakland, California, and **Aniruddha Nadiga**, University of Glasgow (1154-54-2465)
- ▶ 9:00AM *An Invariant of p -colorable Knots.* Preliminary report. **Olivia Del Guercio***, **Elise Catania**, **Jack Kendrick**, **Hana Sambora** and **Sarangoo Chimgee**, Smith College (1154-57-2226)
- ▶ 9:30AM *Invariants of \mathbb{Z} -linear quasigroups.* Preliminary report. **Ariane Alexandrescu**, **Christine Cho**, **Dalyn Gillentine**, **Allison Quintana*** and **Marium Tapal**, Smith College (1154-20-2649)
- ▶ 10:00AM *Statistical analysis of jackal skull length.* Preliminary report. **Marisa Blackman**, Smith College (1154-62-2790)
- ▶ 10:30AM *Chorded Pancyclic Properties in Claw-Free Graphs.* **Kathryn Beck***, Dickinson College, **Lisa Cenek**, Amherst College, and **Brittany Gelb**, Muhlenberg College (1154-05-200)
- ▶ 11:00AM *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)
- ▶ 11:30AM *Shortest Paths in Generalizations of the Sierpinski Carpet.* Preliminary report. **Maxwell Auerbach**, University of Redlands, **Adam Hodapp**, University of Minnesota, and **Rebecca Whitman***, Wellesley College (1154-51-1940)

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

- ▶ 8:00AM *Who Invented the Decimal Point?* Preliminary report. **Glen R Van Brummelen**, Quest University (1154-01-371)
- ▶ 8:30AM *Quadrature, Rectification and the Cycloid.* Preliminary report. **Maria R Zack**, Point Loma Nazarene University (1154-01-1482)
- ▶ 9:00AM *Arithmetic in Sum.* **Duncan J Melville**, St. Lawrence University (1154-01-1294)
- ▶ 9:30AM *Indian mathematics and convergence of sequences and series.* Preliminary report. **Kim Plofker**, Union College, NY (1154-01-1943)
- ▶ 10:00AM *Divergent Series and Numeric Computation.* Preliminary report. **Brenda Davison**, Simon Fraser University (1154-01-1489)
- 10:30AM Discussion
- ▶ 11:00AM *Mr Mary Somerville, Husband and Secretary.* **Brigitte Stenhouse**, Open University, UK (1154-01-437)
- ▶ 11:30AM *"A Senior Wrangler among Senior Wranglers": the mathematical education of Robert Leslie Ellis.* Preliminary report. **June Barrow-Green**, School of Mathematics & Statistics, The Open University, Milton Keynes, UK (1154-01-356)

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

- ▶ 8:00AM *The point processes at turning points of large lozenge tilings.* **Sevak Mkrtchyan**, University of Rochester (1154-60-775)

- 9:00AM *A deformation of the Tracy-Widom GOE distribution.* Preliminary report.
Karl Liechty, DePaul University (1154-60-2433)
- 10:00AM *Ellipsoidal Billiards and Chebyshev-type polynomials.*
Vladimir Dragovic, The University of Texas at Dallas (1154-37-470)
- 10:30AM *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)
- 11:00AM *Universality for Lozenge Tiling Local Statistics.*
Amol Aggarwal, Harvard University (1154-60-672)
- 11:30AM *A Riemann-Hilbert approach to asymptotic analysis of Toeplitz+Hankel determinants.*
Roozbeh Gharakhloo*, 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

8:00 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

- 8:00AM *Highly Likely Clusterable Data With No Cluster.*
Mireille Boutin, Purdue University (1154-68-398)
- 9:00AM *Topology and Hypergraphs for Biological Data.*
Sinan Aksoy, Pacific Northwest National Laboratory, **Emily Heath**, University of Illinois, **Brett Jefferson**, **Cliff Joslyn**, **Jason McDermott**, **Hugh Mitchell**, **Brenda Praggastis** and **Emilie Purvine***, Pacific Northwest National Laboratory (1154-05-720)
- 9:30AM *Non-parametric Mixture Model for Unsupervised Image Segmentation.* Preliminary report.
Marilyn Vazquez*, Mathematical Biosciences Institute (MBI), **Jeova Farias**, Brown University, and **Pedro Felzenszwalb**, Brown University (1154-00-1182)

- 10:00AM *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)
- 10:30AM *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)
- 11:00AM *Longevity of User Anonymity.*
Allison Beemer*, New Jersey Institute of Technology, **Sanghamitra Dutta**, **Haewon Jeong**, Carnegie Mellon University, **Esther Lamken**, California Institute of Technology, **Emina Soljanin**, Rutgers University, and **Mansi Sood**, Carnegie Mellon University (1154-94-848)
- 11:30AM *Analysis of Simulated Crowd Flow Exit Data: Visualization, Panic Detection, and Exit Time Convergence, Attribution and Estimation.*
Anna Grim, Brown University, **Alona Kryshchenko***, California State University of Channel Islands, **Linda Ness**, DIMACS, 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

- 8:00AM *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)
- 8:30AM *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)

Program of the Sessions – Saturday, January 18 (cont'd.)

- 9:00AM *Modularity of generating series of cycles on orthogonal Shimura varieties.* (2013)
Preliminary report.
Keerthi S Madapusi Pera, Boston College (1154-11-1956)
- 9:30AM *Specialization of cycles at conifold points.* (2014)
Matt Kerr, Washington University in St. Louis (1154-14-1703)
- 10:00AM *Cycle class maps and birational invariants.* (2015)
Brendan Hassett*, ICERM/Brown University, and **Yuri Tschinkel**, Courant Institute, NYU and Simons Foundation (1154-14-764)
- 10:30AM *Zero-cycles over arithmetic fields.* (2016)
Preliminary report.
Evangelia Gazaki, University of Virginia (1154-14-1250)
- 11:00AM *Rational points and derived equivalence.* (2017)
Katrina Honigs, University of Oregon (1154-14-1050)
- 11:30AM *Moduli spaces of sheaves on surfaces.* (2018)
Sarah Frei, Rice University (1154-14-1487)

AMS Special Session on Applications and Computations in Knot Theory, II

8:00 AM – 11:50 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 *Knots with Keen Weakly Reducible Bridge Spheres.* (2019)
Puttipong Pongtanapaisan*, University of Iowa, and **Daniel Rodman**, Taylor University (1154-57-1409)
- 8:30AM *Virtual Parity Alexander Polynomial.* (2020)
Heather A Dye*, McKendree University, and **Aaron Kaestner**, North Park University (1154-57-199)
- 9:00AM *Knot Graphs and Gromov Hyperbolicity.* (2021)
Preliminary report.
Stanislav Jabuka, University of Nevada, Reno, **Beibei Liu**, Max Planck Institute for Mathematics, and **Allison H Moore***, Virginia Commonwealth University (1154-57-2302)
- 9:30AM *Learning from Filtrations on the Space of Knots.* (2022)
Mustafa Hajij, Ann Arbor, MI, **Jesse S F Levitt***, University of Southern California, and **Radmila Sazdanovic**, North Carolina State University (1154-54-2488)
- 10:00AM *Reinforcement learning for constructive proofs in knot theory.* Preliminary report. (2023)
Mark Clifford Hughes*, **Thomas Liddle**, **Jamison Moody** and **Spencer Reschke**, Brigham Young University (1154-57-1518)

- 10:30AM *On the complexity of cusped non-hyperbolicity.* (2024)
Robert C Haraway, III* and **Neil R Hoffman**, Oklahoma State University (1154-57-1139)
- 11:00AM *Categorification of the Kauffman Bracket Skein Module of the Projective Space and Lens Spaces.* (2025)
Rhea Palak Bakshi* and **Józef H. Przytycki**, The George Washington University (1154-57-1750)
- 11:30AM *Computing torsion of Khovanov homology.* (2026)
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
- 8:00AM *The inverse problem for arboreal Galois representations of index two.* (2027)
Andrea Ferraguti*, Instituto de Ciencias Matemáticas, **Carlo Pagano**, Max Planck Institute for Mathematics, and **Daniele Casazza**, Instituto de Ciencias Matemáticas (1154-11-395)
- 8:30AM *Higher arithmetic degrees of rational maps.* Preliminary report. (2028)
Nguyen-Bac Dang, Stony Brook University, **Dragos Ghioca**, University of British Columbia, **Fei Hu**, University of Waterloo, **John Lesieutre***, Pennsylvania State University, and **Matthew Satriano**, University of Waterloo (1154-14-831)
- 9:00AM *New types of heights with connections to the Batyrev-Manin and Malle Conjectures.* (2029)
Jordan Ellenberg, University of Wisconsin-Madison, **Matthew Satriano***, University of Waterloo, and **David Zureick-Brown**, Emory University (1154-11-123)
- 9:30AM *On Kawaguchi-Silverman conjecture for endomorphisms of rationally connected varieties.* (2030)
Yohsuke Matsuzawa, Brown University (1154-14-1622)
- 10:00AM *Automorphism loci for endomorphisms of \mathbb{P}^1 .* Preliminary report. (2031)
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 J 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)

11:30AM *Moduli spaces for dynamical systems with level structure.*
John R. Doyle*, Louisiana Tech University, and **Joseph H. Silverman**, Brown University (1154-37-668)

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, German 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), **Pornpimol Charoentong**, National Center for Tumor Diseases (NCT), Heidelberg, Germany, **Nek Valous** and **Rodrigo Rojas Moraleda**, German Cancer Research Center (DKFZ), Heidelberg, Germany (1154-92-1592)

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 (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 Skrzeczkowski**, 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)
- 11:30AM (2050) *Optimal control of a size-structured model for metastatic cancer treatment.*
Jun Liu, Southern Illinois University Edwardsville, and **Xiang-Sheng Wang***, University of Louisiana at Lafayette (1154-92-77)
- 8:00AM (2051) *Quasispecies and error catastrophe.*
Chris McCarthy* and **Johannes Familton**, 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 χ^2 Goodness-of-Fit test? Revisiting a controversy from the birth of modern statistics and genetics.*
Daniel Fairbanks* and **Bob Palais**, Utah 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)

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

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.*
Robert G. Niemeyer*, Metropolitan State University of Denver, and **Charles C. Johnson**, Bucknell University (1154-37-2003)
- 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)
- 9:30AM (2060) *Fibonacci Word Fractals: Three Constructions and Introductory Analysis.* Preliminary report.
Benjamin Steinhurst, McDaniel College (1154-34-1603)

AMS Special Session on Evolution

8:00 AM – 11:40 AM Room 109, Meeting Room Level, Colorado Convention Center

Organizers: **Chris McCarthy**, Borough of Manhattan Community College CUNY
Johannes Familton, Borough of Manhattan Community College CUNY

- 10:00AM (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)
- 10:30AM (2062) *Partial marked length spectrum rigidity for negatively curved surfaces.* Preliminary report.
Noelle Sawyer, Wesleyan University (1154-53-1260)
- 11:00AM (2063) *Optimal Quantization.*
Mrinal K Roychowdhury, University of Texas Rio Grande Valley (1154-37-1355)
- 11:30AM (2064) *Towards the Development of a Diffraction Measure for the Sets of Complex Dimensions of Nonlattice Self-Similar Fractal Strings via Lattice Approximation.* Preliminary report.
Michel L. Lapidus, University of California, Riverside, **Machiel van Frankenhuijsen**, Utah Valley University, and **Edward K. Voskanyan***, 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

- 8:00AM (2065) *A local vs nonlocal segregation model.*
Stefania Patrizi* and **Luis Caffarelli**, UT Austin (1154-35-2432)
- 9:00AM (2066) *Relative isoperimetric inequality outside a convex set.*
Brian Krummel, Purdue University (1154-49-2535)
- 9:30AM (2067) *A problem in shape optimization.* Preliminary report.
Cornelia Mihaila, University of Chicago (1154-49-2437)
- 10:00AM (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)
- 10:30AM (2069) *Minimizers of strictly convex functionals.*
Connor Mooney, UC Irvine (1154-35-782)
- 11:00AM (2070) *Minimizers for the thin one-phase problem.* Preliminary report.
Yannick Sire, Johns Hopkins University (1154-35-314)

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

- 8:00AM (2071) *Conformal subnets and compact hypergroups.* Preliminary report.
Marcel Bischoff*, Ohio University, **Simone Del Vecchio**, Leipzig University, and **Luca Giorgetti**, Vanderbilt University (1154-46-1641)
- 8:30AM (2072) *Vanishing categorical obstructions for permutation orbifolds.*
Terry Gannon, University of Alberta, and **Corey Jones***, The Ohio State University (1154-81-1553)
- 9:00AM (2073) *Fusion rules for permutation defects in multilayer topological order.*
Colleen Delaney, Indiana University (1154-18-1262)
- 9:30AM (2074) *Tensor categories associated to the Virasoro algebra.*
Florencia Orosz Hunziker*, Harvard University, **Jinwei Yang**, **Thomas Creutzig**, **Cuibo Jiang** and **David Ridout** (1154-17-405)
- 10:00AM (2075) *Braided Tensor Categories related to B_p Vertex Algebras.*
Jean Auger, **Thomas Creutzig**, University of Alberta, **Shashank Kanade**, University of Denver, and **Matthew Rupert***, University of Alberta (1154-16-1226)
- 10:30AM (2076) *New Duality in W -algebras.*
Thomas Creutzig, **Naoki Genra***, University of Alberta, and **Shigenori Nakatsuka**, University of Tokyo (1154-81-565)
- 11:00AM (2077) *Chern classes of vector bundles on the moduli space of curves from vertex algebras.* Preliminary report.
C. Damiolini, Princeton, **A. Gibney***, Rutgers University, New Brunswick, and **N. Tarasca**, Virginia Commonwealth University (1154-14-1396)
- 11:30AM (2078) *"Holomorphic fibrations, factorization algebras, and toroidal vertex algebras".*
Matt Szczesny*, **Jackson Walters**, Boston University, and **Brian Williams**, Northeastern University (1154-17-355)

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**, IMKT & University of Michigan

Program of the Sessions – Saturday, January 18 (cont'd.)

- Olaf Teschke**, zbMath
Stephen Watt, University of Waterloo
- 8:00AM (2079) *Automated Reasoning: retrospective and current progress.*
John Harrison, Amazon Web Services (1154-03-1280)
- ▶ 9:00AM (2080) *The Formalization of Mathematics and Controlled Natural Language.*
Thomas Hales, University of Pittsburgh (1154-03-1029)
- 9:30AM (2081) *Logipedia: towards a Wikipedia of formal proofs.*
Gilles Dowek, Inria and ENS de Paris-Saclay (1154-03-825)
- ▶ 10:00AM (2082) *Math-Aware Search: A Progress Report from the MathSeer Project.*
Richard Zanibbi*, Department of Computer Science, Rochester Institute of Technology, and **Anurag Agarwal**, School of Mathematical Sciences, Rochester Institute of Technology (1154-00-1116)
- ▶ 10:30AM (2083) *Progress in Mathematical Information and Knowledge Bases.*
Stephen M Watt, University of Waterloo (1154-68-1086)
- 11:00AM Discussion

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
Marie Jameson, University of Tennessee, Knoxville
James Sellers, Pennsylvania State University
- 8:00AM (2084) *Ranks for n-marked Durfee symbols and quantum modular forms.*
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)
- ▶ 8:30AM (2085) *An analogue of k-marked Durfee symbols for strongly unimodal sequences.* 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)
- ▶ 9:00AM (2086) *A Novel Generalization of Partitions with Parts Separated by Parity.* Preliminary report.
Hannah E Burson*, University of Illinois at Urbana-Champaign, and **Dennis Eichhorn**, University of California, Irvine (1154-05-1254)

- 9:30AM (2087) *Andrews-Bressoud Series and Wronskians.* Preliminary report.
Maggie Wieczorek, University of Tennessee (1154-11-696)
- ▶ 10:00AM (2088) *Partitions and characters of symmetric groups.* Preliminary report.
Amita Malik, Rutgers University, New Brunswick (1154-11-1208)
- 10:30AM (2089) *Partitions and a conjecture of John Thompson.*
Madeline Locus Dawsey, University of Texas at Tyler, **Ken Ono**, University of Virginia, and **Ian Wagner***, Vanderbilt University (1154-11-830)
- 11:00AM (2090) *Index of seaweed algebras and integer partitions.*
Ae Ja Yee, Penn State University (1154-05-1117)
- ▶ 11:30AM (2091) *Analysis and combinatorics of partition zeta functions.*
Robert Schneider*, University of Georgia, and **Andrew V. Sills**, Georgia Southern University (1154-11-2606)

AMS Special Session on Quantum Theory of Matter Meets Noncommutative Geometry and Topology, II

8:00 AM – 11:40 AM **Room 110, Meeting Room Level, Colorado Convention Center**

- Organizers: **Masoud Khalkhali**, University of Western Ontario
Markus Pflaum, University of Colorado, Boulder
- 8:00AM Discussion
- 9:00AM (2092) *On the non-commutative geometry of topological insulators and superconductors.*
Emil Prodan, Yeshiva University (1154-81-600)
- 10:00AM (2093) *Topological invariants and insulators.*
Ralph M Kaufmann*, **Dan Li** and **Erika Birgit Wehefritz-Kaufmann**, Purdue University (1154-81-1891)
- 11:00AM (2094) *A dynamical Toric Code model and stability of the superselection sectors of two-dimensional quantum lattice models.*
Matthew Cha, Michigan State University, East Lansing, **Pieter Naaijken**, Universidad Complutense de Madrid, **Bruno Nachtergaele***, University of California, Davis, and **Nicholas Sherman**, University of California, Berkeley (1154-82-577)

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
- 8:00AM (2095) *Efficient algorithm for simulating ensembles of parameterized flow problems.*
Zhu Wang, University of South Carolina (1154-65-478)
- 8:30AM (2096) *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-Phuong 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)
- 9:00AM (2097) *Conservative Explicit Local Time-Stepping Schemes for the Shallow Water Equations.*
Thi-Thao-Phuong 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)
- ▶ 9:30AM (2098) *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)
- 10:00AM (2099) *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)
- 10:30AM (2100) *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)
- 11:00AM (2101) *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)

- 11:30AM (2102) *New Developments in Exponential Integration for Large Scale Stiff Systems.*
Tommaso Buvoli*, University of California, Merced, **Stéphane Gaudreault**, Recherche en prévision numérique atmosphérique, Environnement et Changement climatique Canada, and **Mayya 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

- 8:00AM (2103) *The Benson - Symonds invariant for Permutation modules.*
Aparna Upadhyay, University at Buffalo, SUNY (1154-20-801)
- 8:30AM (2104) *On the diameter of blocks of solvable groups.*
J.P. Cossey, University of Akron (1154-20-617)
- ▶ 9:00AM (2105) *Finite groups with the CUT property.*
Stephen Trefethen, College of William & Mary (1154-20-2049)
- 9:30AM (2106) *GVZ-groups.*
Shawn T. Burkett* and **Mark L. Lewis**, Kent State University (1154-20-1569)
- 10:00AM (2107) *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)
- 10:30AM (2108) *Finding finite representations of finitely presented groups.* Preliminary report.
Heiko Dietrich, Monash University, and **Alexander Hulpke***, Colorado State University (1154-20-755)
- 11:00AM (2109) *p-permutation equivalences and auto-equivalences.*
Robert Boltje*, University of California Santa Cruz, and **Philipp Perepelitsky**, 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 401, Meeting Room Level, Colorado Convention Center

Organizers: **Steve Butler**, Iowa State University
Michael Ferrara, University of Colorado Denver
Jeremy Martin, University of Kansas

- Tyrrell McAllister**,
University of Wyoming
- Jamie Radcliffe**, University
of Nebraska-Lincoln
- 8:00AM (2110) *A positivity phenomenon in Elser's Gaussian-cluster percolation model.*
Galen Dorpalen-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 Whitlatch**, Gonzaga University (1154-05-641)
- 8:30AM (2111) *Antimagic orientations of graphs with large maximum degree.*
Donglei Yang, Shangdong 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, **Fangfang Zhang**, Nanjing University, and **Xiaohong Zhang**, University of Manitoba (1154-05-423)
- 9:00AM (2112) *Intersections, circuits, and colorability of line segments.*
Boris Brimkov, Rice University, **Jesse Geneson**, Iowa State University, **Alathea Jensen***, Susquehanna University, **Jordan Miller**, Washington State University, and **Pouria Salehi Nowbandegani**, Vanderbilt University (1154-05-413)
- 9:30AM (2113) *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)
- 10:00AM (2114) *Universal partial words.*
Bennet Goeckner, 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)
- 10:30AM (2115) *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)
- 11:00AM (2116) *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)
- 11:30AM (2117) *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)
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- AMS Special Session on Riemannian Foliations and Applications**
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- 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
- 8:00AM (2118) *New cohomological invariants of foliations.*
Georges Habib, Lebanese University, and **Ken Richardson***, Texas Christian University (1154-58-1121)
- 8:30AM (2119) *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)
- 9:00AM (2120) *Classification of weak solenoids.*
Steven Hurder, University of Illinois at Chicago (1154-58-629)
- 9:30AM (2121) *Leaves with non-trivial holonomy in laminations.*
Olga Lukina, University of Vienna (1154-37-216)
- 10:00AM (2122) *Laplacian algebras and singular Riemannian foliations in spheres.*
Marco Radeschi, University of Notre Dame (1154-53-229)
- 10:30AM (2123) *On Mean curvature flow of Singular Riemannian foliations: Non compact cases.*
Marcos M. Alexandrino, Universidade de Sao Paulo (1154-53-1796)
- 11:00AM (2124) *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)

- 11:30AM (2125) *A trace formula for foliated flows.*
Jesús A. Álvarez López*, University of Santiago de Compostela, **Yuri A. Kordyukov**, Ufa Federal Research Centre, Russian Academy of Science, and **Eric Leichtnam**, Institut de Mathématiques de Jussieu-PRG, CNRS (1154-57-324)

AMS Special Session on Set-Valued and Fuzzy-Valued Analysis with Applications

8:00 AM – 11:50 AM Room 712, Meeting Room Level, Colorado Convention Center

Organizer: **Vira Babenko**, Drake University

- 8:00AM (2126) *Korneichuk-Stechkin lemma and Ostrovskii type inequalities for functions with values in L-spaces.*
Vladyslav Babenko*, Oles Honchar Dnipro National University, Ukraine, **Vira Babenko**, Drake University, and **Oleg Kovalenko**, Oles Honchar Dnipro National University (1154-41-2457)
- 8:30AM (2127) *Set Optimization Problems on Ordered Sets and Applications.* Preliminary report.
Jinlu Li, Shawnee State University (1154-49-240)
- 9:00AM (2128) *Relative Interiors for Graphs of Convex Set-Valued Mappings and Applications to Generalized Differential Calculus.*
Mau Nam Nguyen, Portland State University (1154-49-1861)
- 9:30AM (2129) *Interval Valued Probability Measures as a Unifying Theory for Optimization Under Generalized Uncertainty.*
Weldon A. Lodwick, University of Colorado Denver (1154-49-2668)
- 10:00AM (2130) *Stability properties of Lagrange multipliers in constrained optimization problems.*
Ebrahim Sarabi, Miami University (1154-49-960)
- 10:30AM (2131) *An Interactive Guide to Data-Consistent Solutions for Stochastic Inverse Problems, Part I: The Role of Set-Valued Inverses.*
Troy Butler* and **Wenjuan Zhang**, University of Colorado Denver (1154-28-1955)
- 11:00AM (2132) *An Interactive Guide to Data-Consistent Solutions for Stochastic Inverse Problems, Part II: From (Potential) Chaos to Order.*
Troy Daniel Butler and **Wenjuan Zhang***, Department of Mathematical and Statistical Sciences, University of Colorado Denver (1154-28-1927)
- 11:30AM (2133) *Best Approximation, Optimal Recovery, and Landau Inequalities for Derivatives of Hukuhara-type in function L-spaces.*
Vira Babenko*, Drake University, and **Vladyslav Babenko**, Oles Honchar Dnipro National University, Ukraine (1154-28-2449)

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

- 8:00AM (2134) *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)
- 8:30AM (2135) *Mathematics is Not Neutral.*
Brian P Katz, Smith College (1154-97-388)
- 9:00AM (2136) *Analysis of partisan gerrymandering tools in advance of the US 2020 census.* Preliminary report.
Marion Campisi*, San Jose State University, **Thomas C Ratliff**, Wheaton College, and **Ellen Veomett**, Saint Mary's College of California (1154-91-98)
- 9:30AM (2137) *Diversity through a data science lens.*
Chad M. Topaz, Williams College (1154-00-908)
- 10:00AM (2138) *Improving Equity and Access in Mathematics Curricula.*
Roberto Carlos Pelayo, University of California, Irvine (1154-00-1638)
- 10:30AM (2139) *Partisan Gerrymandering and the Efficiency Gap.* Preliminary report.
Emille Lawrence, University of San Francisco (1154-00-1996)
- 11:00AM 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
Therese Shelton, Southwestern University
Brian Winkel, SIMIODE

- 8:00AM (2140) *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)
- 8:30AM (2141) *Thanos Population Dynamics.*
Sarah Patterson* and **Blain Patterson**, Virginia Military Institute (1154-97-453)

Program of the Sessions – Saturday, January 18 (cont'd.)

- 9:00AM *Lost at Sea: Introduction to Numerical Methods through Navigation.*
 ► (2142) **Corban Harwood**, George Fox University (1154-34-1748)
- 9:30AM *Sometimes Predicting the Future is Easier than Deciphering the Past and Other Aspects of Modeling the Draining of a Bottle.* Preliminary report.
 ► (2143) **John F McClain**, University of New Hampshire (1154-97-2627)
- 10:00AM *SCUDEM Update: Students' Expected and Measured Gains.*
 ► (2144) **Jennifer A Czocher*** and **Elizabeth Roan**, Texas State University (1154-97-1476)
- 10:30AM *Tiling an n by 3 Hallway with 1 by 2 Tiles: An Interactive Presentation.*
 ► (2145) **Robert Krueger***, Concordia University, St. Paul, and **Eric Stachura**, Kennesaw State University (1154-39-1872)
- 11:00AM *Modeling Bubbles of Beer.*
 ► (2146) **Michael A. Karls**, Ball State University (1154-34-232)
- 11:30AM *Theoretical game modelling in the insurance sector.*
 (2147) **Leonard Mushunje**, Midlands state university (1154-34-26)

MAA Invited Paper Session on Modernizing the Introductory Statistics Course

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

- Organizers: **Lisa Carnell**, High Point University
Alana Unfried, California State University, Monterey Bay
- 8:00AM *GAISE 2016 in action.*
 (2148) **Beverly Wood**, Embry-Riddle Aeronautical University (1154-AE-2849)
- 8:30AM *How technology facilitates modernizing intro stats.*
 (2149) **Patti Frazer Lock**, St. Lawrence University (1154-AE-2850)
- 9:00AM *Statistical inference via data science: A "tidy" approach.*
 (2150) **Albert Y. Kim**, Smith College (1154-AE-2851)
- 9:30AM *Stats for data science.*
 (2151) **Daniel Kaplan**, Macalester College (1154-AE-2852)
- 10:00AM *The p -value: Replacing 0.05 with understanding.*
 (2152) **Kari Lock Morgan**, Pennsylvania State University (1154-AE-2853)
- 10:30AM *Conceptual approaches to teaching multivariable statistical thinking: Using simulation methods and visualization.*
 (2153) **Beth Chance**, Cal Poly – San Luis Obispo (1154-AE-2854)

AMS Contributed Paper Session on Algebra and Algebraic Geometry, II

8:00 AM – 11:10 AM Room 206, Meeting Room Level, Colorado Convention Center

- 8:00AM *Equal characteristic deformations of Artin-Schreier-Witt covers.*
 (2154) **Huy Dang**, University of Virginia (1154-14-475)
- 8:15AM *Scrollar Invariants of Tropical Curves.*
 ► (2155) **Kalila Joelle Sawyer*** and **David Jensen**, University of Kentucky (1154-14-1163)
- 8:30AM *Projective Duality, Unexpected Hypersurfaces and Hyperplane Arrangements.*
 (2156) **Bill F. Trok**, University of Kentucky (1154-14-2648)
- 8:45AM *Differential graded algebra over quotients of skew polynomial rings by normal elements.*
 (2157) **Luigi Ferraro*** and **W. Frank Moore**, Wake Forest University (1154-16-64)
- 9:00AM Break
- 9:15AM *A Generalization of Exchange Rings.*
 ► (2158) **Feroz Siddique***, University of Wisconsin Eau Claire, and **Daniel Bossaler**, John Carrol University (1154-16-615)
- 9:30AM *On Copure-injectively Poor Modules.*
 (2159) **Sultan Eylem Toksoy**, Hacettepe University (1154-16-675)
- 9:45AM *An ideal analogue to the property $lcm(a, b) * gc.f(a, b) = ab$ for Leavitt path algebras.*
 (2160) **K. Radler***, Saint Louis University, **S. Esin**, Kadiköy, Istanbul, Turkey, **M. Kanuni**, Düzce University, **A. Koç**, Istanbul Kültür University, and **K. M. Rangaswamy**, University of Colorado. Colorado Springs (1154-16-680)
- 10:00AM *Heap cohomology and ternary self-distributive cohomology.*
 (2161) **M Elhamdadi**, **M Saito** and **Emanuele Zappala***, University of South Florida (1154-17-391)
- 10:15AM *Truncated Quantum Drinfeld Hecke Algebras and Hochschild Cohomology.*
 (2162) **Lauren Grimley**, Spring Hill College, and **Christine Uhl***, St. Bonaventure University (1154-16-1808)
- 10:30AM *Lie Orbifold Algebras for Doubled Reflection Representations of the Symmetric Group.*
 (2163) **Briana Foster-Greenwood***, Cal Poly Pomona, and **Cathy Krilloff**, Idaho State University (1154-16-1365)
- 10:45AM *On Two-Value Graph Algebras.*
 (2164) **Rebin A. Muhammad***, Ohio Univeristy, **Pinar Aydogdu**, Department of Mathematics, Hacettepe University, 06800 Beytepe Ankara, Turkey, and **Sergio Lopez-Permouth**, Ohio University (1154-16-1932)

- 11:00AM *Classification of Low Dimensional Complex Nilpotent Leibniz Algebras.*
(2165) **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.*
▶ (2166) **Sawyer Jack Robertson*** and **Javier Alejandro Chávez-Domínguez**, University of Oklahoma (1154-05-1827)
- 8:15AM *Two dependent probabilistic chip-collecting games.*
▶ (2167) **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 (1154-05-1866)
- 8:30AM *Some convergence of random characteristic polynomials to random permutations and its applications.*
(2168) **Hayan Nam***, Iowa State University, **Gilyoung Cheong**, University of Michigan, and **Myungjun Yu**, Korea Institute for Advanced Study (1154-05-1928)
- 8:45AM *Some Codes and Designs Related to Mathieu Group M₂₄.*
(2169) **Vincent N. Marani***, **Lucy Chikamai W** and **Shem O. Aywa**, Kibabii University (1154-05-2208)
- 9:00AM *Group actions on Stanley-Reisner rings and Stanley rings.*
▶ (2170) **Ashleigh Adams**, University of Minnesota, Twin Cities (1154-05-1948)
- 9:15AM *Counting Signed Vexillary Permutations.*
▶ (2171) **Yibo Gao** and **Kaarel Hänni***, Massachusetts Institute of Technology (1154-05-2023)
- 9:30AM *Cosine distance on lifted polynomials.*
(2172) **Fatmanur Gursoy**, Dogus University, and **Elif Segah Oztas***, Karamanoglu Mehmetbey University (1154-05-2031)
- 9:45AM *Minimally Non-Asymmetric Graphs.*
▶ (2173) **Darren A. Narayan*** and **Brendan Rooney**, Rochester Institute of Technology (1154-05-2035)
- 10:00AM *Dyadic matroids with spanning cliques.*
(2174) **Ben Clark**, Louisiana State University, **Kevin Grace***, University of Bristol, **James Oxley** and **Stefan H.M. van Zwam**, Louisiana State University (1154-05-2071)
- 10:15AM *Modified Erdős-Ginzburg-Ziv Constants for $(\mathbb{Z}/n\mathbb{Z}, x\mathbb{Z}/m\mathbb{Z})$.*
▶ (2175) **Trajan Hammonds**, Carnegie Mellon University (1154-05-2136)

- 10:30AM *Minimum coprime graph labelings.*
▶ (2176) **Catherine Lee**, Yale University (1154-05-2078)
- 10:45AM *Pattern Avoidance in Rooted Forests.*
▶ (2177) **Swapnil Garg** and **Alan Peng***, MIT (1154-05-2167)
- 11:00AM *Orbigraphs: a directed graph analog of a Riemannian orbifold.*
▶ (2178) **K. Daly**, Booz Allen Hamilton, OH, **C. Gavin**, 908 Devices, CA, **G. Montes de Oca**, University of Oregon, **D. Ochoa**, **E. Stanhope***, Lewis & Clark College, and **S. Stewart**, University of Minnesota (1154-05-2177)
- 11:15AM *Enumerating a Certain Class of Valid Hook Configurations.*
▶ (2179) **Maya R Sankar**, MIT (1154-05-2203)

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.
(2180) **Vani Cheruvu*** and **Sujeewa Hapuarachchi**, The University of Toledo (1154-65-2730)
- 8:15AM *Optimizing Flappy Bird Flight Paths.* Preliminary report.
(2181) **Thomas J. Clark***, Dordt University, and **Anil B. Venkatesh**, Adelphi University (1154-49-1902)
- 8:30AM *An Algorithm to Segment Noisy Medical Images.*
(2182) **Youssef Qranfal**, Wentworth Institute of Technology (1154-49-1952)
- 8:45AM *Optimal allocation in annual plants with non-linear utility functions.*
▶ (2183) **Sergiy Koshkin**, University of Houston-Downtown, **Cameron Spiess**, Keene State, and **Zachary Zalles***, Rice University (1154-49-1467)
- 9:00AM *Discrete Approximation of a Controlled Sweeping Process over polyhedral sets with perturbations.*
(2184) **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 (1154-49-339)
- 9:15AM *A Hybrid Multivariate Root-finding Method For Smooth Functions.*
▶ (2185) **Lukas C. Erikson***, **Suzanna Stephenson**, **Daniel Christensen**, **Natalie Larsen** and **Tyler Jarvis**, Brigham Young University (1154-65-2617)

Program of the Sessions – Saturday, January 18 (cont'd.)

- 9:30AM ▶ (2186) *Discontinuous Galerkin Finite Element Schemes for Diffuse Interface Models.*
Andreas C Aristotelous, West Chester University of Pennsylvania (1154-65-2454)
- 9:45AM (2187) *Krylov Subspace Spectral Methods for Problems in Acoustics.* Preliminary report.
James V Lambers, The University of Southern Mississippi (1154-65-2408)
- 10:00AM (2188) *Reconstructing the Diffusion Coefficient for Diffuse Optical Tomography Problems Using A Variationally Constrained Nonlinear Optimization Framework.* Preliminary report.
Thowhida Akther*, Colorado State University, **Shyla Kupis** and **Taufiqar Khan**, Clemson University (1154-65-2372)
- 10:15AM (2189) *The AAA algorithm for parametric dynamical systems.*
Andrea Carracedo Rodriguez* and **Serkan Gugercin**, Virginia Tech (1154-65-2077)
- 10:30AM (2190) *A hybrid approach combining analytical and iterative regularization methods for Electrical Impedance Tomography.* Preliminary report.
Sanwar Ahmad*, Colorado State University, and **Taufiqar Khan**, Clemson University (1154-65-2361)
- 10:45AM ▶ (2191) *Image reconstruction via edge-masked regularization.*
Victor Churchill, Dartmouth College (1154-65-2254)
- 11:00AM (2192) *Development of a Wavelet-Based Parameter Representation to Improve Solutions to the Electrical Impedance Tomography Inverse Problem.* Preliminary report.
Shyla Rae Kupis* and **Taufiqar R Khan**, Clemson University (1154-65-1749)
- 8:45AM (2196) *Analysis of the Seasonal Threshold Number Calculation for Malaria.* Preliminary report.
Katharine Gurski, Howard University (1154-92-2093)
- 9:00AM ▶ (2197) *Ebola: Impact of hospital's admission policy in an overwhelmed scenario.*
Zahid Mondal Hasan, University of Texas at Arlington (1154-92-1982)
- 9:15AM ▶ (2198) *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)
- 9:30AM (2199) *Ecology and Infectious Disease on Large Metapopulation Graphs.*
Daniel B Cooney, Princeton University (1154-92-2133)
- 9:45AM (2200) *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)
- 10:00AM ▶ (2201) *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)
- 10:15AM ▶ (2202) *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)
- 10:30AM ▶ (2203) *Analyzing the Effects of Observation functions in Nonlinear filtering for the SIR model.*
Leah Mitchell* and **Andrea Arnold**, Worcester Polytechnic Institute (1154-92-2142)

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

- 8:00AM ▶ (2193) *The Role of Utility in the Optimal Allocation Strategy of Annual Plants.*
Marianne C DeBrito, University of Michigan - Ann Arbor, and **Nicolas Toumbacaris***, Marist College (1154-92-1933)
- 8:15AM (2194) *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 Kirby**, Colorado State University (1154-92-1963)
- 8:30AM (2195) *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)
- 10:45AM (2204) *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)
- 11:00AM ▶ (2205) *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)
- 11:15AM ▶ (2206) *Optimal water flow through plants and the segmentation hypothesis.*
Jeffae Schroff*, **Sergiy Koshkin** and **Michael Tobin**, University of Houston-Downtown (1154-92-2450)

AMS Contributed Paper Session on Number Theory, I

8:00 AM – 11:40 AM Room 602, Meeting Room Level, Colorado Convention Center

- ▶ 8:00AM (2207) *On Convergent of Some Infinite Series Involving Fibonacci Numbers and Identities.* Preliminary report. **Mohammad K. Azarian**, University of Evansville (1154-11-246)
- ▶ 8:15AM (2208) *Primes in Lucas sequences.* Preliminary report. **John Greene*** and **Mark Broderius**, University of Minnesota Duluth (1154-11-406)
- ▶ 8:30AM (2209) *Linnik's large sieve and the L^1 norm of exponential sums.* **Emily Eckels**, Emory University, **Steven Jin***, University of Maryland, College Park, **Andrew Ledoan**, University of Tennessee at Chattanooga, and **Brian Tobin**, Harvard University (1154-11-458)
- ▶ 8:45AM (2210) *Lagrange spectra and intrinsic Diophantine approximation of spheres.* Preliminary report. **Byungchul Cha***, Muhlenberg College, and **Dong Han Kim**, Dongguk University (1154-11-729)
- 9:00AM (2211) *Creating Several Infinite Classes of Mock and Quantum Modular Forms.* **Allison Arnold-Roksandich**, Boise State University (1154-11-578)
- ▶ 9:15AM (2212) *Gleason-type polynomials for rational maps.* Preliminary report. **Minsik Han**, Brown University (1154-11-1127)
- 9:30AM (2213) *Non-vanishing of the Derivative of L-Functions at the Central Point.* **Matthew Dolan Jobrack**, Washington State University (1154-11-1158)
- ▶ 9:45AM (2214) *A gold version of Dirichlet's bronze approximation theorem.* **Andrew Simoson**, King University (1154-11-1168)
- ▶ 10:00AM (2215) *Universal sums of generalized m-gonal numbers.* **Ben Kane**, University of Hong Kong, and **Jingbo Liu***, Texas A&M University-San Antonio (1154-11-1205)
- ▶ 10:15AM (2216) *Rational points on hyperelliptic curves.* Preliminary report. **Levent Alpoge**, Princeton University (1154-11-1214)
- ▶ 10:30AM (2217) *Summing $\mu(n)$: a faster elementary algorithm.* **Lola Thompson***, Oberlin College and Max Planck Institute for Mathematics, and **Harald Andres Helfgott**, University of Goettingen and CNRS (1154-11-2358)
- ▶ 10:45AM (2218) *On partitions into squares of distinct integers whose reciprocals sum to 1.* **Max A Alekseyev**, George Washington University (1154-11-1242)

- ▶ 11:00AM (2219) *Differential equations of infinite order and the zeta function.* **Bernardo Bianco Prado***, University of Minnesota, and **Kim Klinger-Logan**, Kansas State University (1154-11-1440)
- 11:15AM (2220) *Computing Roots in Finite Fields.* Preliminary report. **Kubra Nari***, **Enver Ozdemir**, Istanbul Technical University, **Neslihan Aysen Ozkirisci**, Yildiz Technical University, and **Elif Segah Oztas**, Karamanoglu Mehmetbey University (1154-11-1552)
- 11:30AM (2221) *Quantum Unique Equidistribution conjecture for Eisenstein series in the level aspect.* **Jiakun Pan*** and **Matthew P. Young**, Texas A&M University (1154-11-1600)

MAA Contributed Paper Session on Active Learning in Introductory Courses: Insights from Math Departments in the Process of Change, II

8:00 AM – 11:55 AM 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
- 8:00AM (2222) *Shifting the Culture: Actively Engaging Students in Introductory Service Courses.* **Lisa Driskell*** and **Tracie Friedman**, Colorado Mesa University (1154-A5-2773)
 - ▶ 8:20AM (2223) *Activating Calculus to Command the Seas: Reflecting on ten years of active and inquiry-based learning at the US Naval Academy.* **Megan E Selbach-Allen***, Stanford University, and **Amy Ksir**, US Naval Academy (1154-A5-2803)
 - 8:40AM (2224) *Calculus II Course Redesign: Supporting Faculty in Pedagogical Change.* Preliminary report. **Rebecca Swanson***, **Debra Carney**, **Megan Sanders**, **Samuel Spiegel** and **Ariana Vasquez**, Colorado School of Mines (1154-A5-2791)
 - ▶ 9:00AM (2225) *Teaching TRIOs: A Peer Observation Model for Sharing Teaching Practice and Initiating Department Change.* Preliminary report. **Sarah K. Bleiler-Baxter***, **Jeremy F. Strayer** and **Jordan E. Kirby**, Middle Tennessee State University (1154-A5-1651)
 - ▶ 9:20AM (2226) *Coordinating First-Year Courses.* Preliminary report. **Jacqueline Jensen-Vallin**, Lamar University (1154-A5-490)

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)
- 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)
- 10:20AM (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)
- 10:40AM (2230) *Designing, Coordinating, and Supporting Active Learning for Multi-Section College Algebra Courses.*
Topaz H Wiscons, California State University, Sacramento (1154-A5-2749)
- 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 **RaKissa Manzanares**, University of Colorado Denver (1154-A5-2534)
- 11:20AM (2232) *Transforming tradition in calculus instruction at Ferris State University.*
David M McClendon, Ferris State University (1154-A5-1405)
- 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 **Viktoriya Savatorova**, Central Connecticut State University (1154-A5-36)
- 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 (2236) *Dixie Tensor Scholar Program.* Preliminary report.
Bhuvanewari Sambandham, **Clare Banks**, **Jie Liu*** and **Vinodh Chellamuthu**, Dixie State University (1154-F5-2780)
- 10:20AM (2237) *Math Circle continues: activities, assessment, and campus visit.*
Vita Borovyk* and **Christina Therkelsen**, University of Cincinnati (1154-F5-2750)
- 10:40AM (2238) *GirlsDoMath in Western Colorado.* Preliminary report.
Tracii Friedman* and **Cathy Bonan-Hamada**, Colorado Mesa University (1154-F5-2594)
- 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 (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 (2241) *Using New Invasive Species to Engage 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

- 9:20AM (2234) *Building Community and Improving Equity through Small-Group Collaborative Learning.* Preliminary report.
Michaela Kubacki, Middlebury College (1154-F5-118)

MAA Contributed Paper Session on Mathematical Knowledge for Teaching as an Integrated Application in Core Mathematics Courses

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

- April Strom,**
Chandler/Gilbert
Community College
- 8:00AM (2242) *Meaningful content for high school teachers.*
Tamas Szabo, UW Whitewater (1154-J5-1562)
- ▶ 8:20AM (2243) *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 (2244) *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 (2245) *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 (2246) *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)
- ▶ 9:40AM (2247) *Explicit Teaching Connections in Elementary Number Theory.* Preliminary report.
Scott Zinzer, Aurora University (1154-J5-1765)
- ▶ 10:00AM (2248) *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 (2249) *Explanatory Proofs.*
James R Henderson, Penn State Behrend (1154-O1-487)

- ▶ 8:35AM (2250) *Mathematical Explanation as an Aesthetic.* Preliminary report.
Jeremy Case*, Taylor University, and **Sam Stueckle,** Trevecca Nazarene University (1154-O1-2227)
- ▶ 9:10AM (2251) *Proofs that explain, proofs that don't, and proofs of the obvious.*
Paul Zorn, Saint Olaf College (1154-O1-2672)
- ▶ 9:45AM (2252) *What makes proofs explanatory? Let's look at some examples.* Preliminary report.
Bonnie Gold, Monmouth University (Emerita) (1154-O1-716)
- ▶ 10:20AM (2253) *How logic is presented may obscure or enlighten.*
Susan Ruff, Massachusetts Institute of Technology (1154-O1-2716)
- ▶ 11:00AM (2254) *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 (2255) *Using Interactive Visualizations to Stimulate Conceptual Understanding in Differential Equations.*
Douglas B Meade, University of South Carolina - Columbia (1154-Q1-2821)
- ▶ 8:20AM (2256) *Using Complex Visualization to Enhance Understanding of DE Solution Techniques.*
Itai Seggev, Wolfram Research (1154-Q1-2713)
- ▶ 8:40AM (2257) *Engaging STEM Students with Ordinary Differential Equations through Modern Models.* Preliminary report.
Scott A. Strong*, Department of Applied Mathematics and Statistics, Colorado School of Mines, **Allison R. Palmer,** Colorado School of Mines, and **G. Gustave Greivel,** Department of Applied Mathematics and Statistics, Colorado School of Mines (1154-Q1-2637)
- ▶ 9:00AM (2258) *Active Differential Equations, Whiteboard Pedagogy and Slope Fields.*
Mel Henriksen* and **Mami Wentworth,** Wentworth Institute of Technology (1154-Q1-2322)
- ▶ 9:20AM (2259) *Mobile Apps for Exploring Ordinary and Partial Differential Equations.*
Timothy A Lucas, Pepperdine University (1154-Q1-747)

Program of the Sessions – Saturday, January 18 (cont'd.)

- 9:40AM *Modeling the Historical Effects of Overhunting and the Current Effects of Conservation on Whale Populations.*
 ► (2260) **Glenn Ledder**, Department of Mathematics, University of Nebraska-Lincoln (1154-Q1-618)
- 10:00AM *Students' Comprehension of Qualitative Techniques in an Inquiry-Oriented Differential Equations Course.*
 ► (2261) **Samer Habre**, Lebanese American University (1154-Q1-214)
- 10:20AM *SIR Models: Differential Equations that Support the Common Good.*
 ► (2262) **Lorelei Koss**, Dickinson College (1154-Q1-127)
- 10:40AM *Discussion: The global role of the CODEE Journal.*
 ► (2263) **Beverly Henderson West**, Cornell University (1154-Q1-2596)
- 11:00AM Discussion

MAA General Contributed Paper Session on Modeling and Applications, II

8:00 AM – 9:40 AM Room 707, Meeting Room Level, Colorado Convention Center

Organizers: **Cathy Erbes**, Hiram College

Holley Friedlander, Dickinson College

Steven McKay, Brigham Young University

- 8:00AM *Modelling and Analysis of Effect of Delay Induced by Toxic Metal on Plant Dry Weight.*
 ► (2264) **Raminder Pal Singh**, Lovely Professional University, Phagwara, India (1154-VF-120)
- 8:15AM *Inertial Laws in Population Biology: The Role of Entropy.*
 ► (2265) **Remi Draï**, Pepperdine University (1154-VF-1406)
- 8:30AM *Mathematical model of annual growth in trees: a response to perturbation by fire.*
 ► (2266) Preliminary report.
Sean M Laverly* and **Brittany E Bannish**, Department of Mathematics and Statistics, University of Central Oklahoma (1154-VF-2652)
- 8:45AM *Adaptability Conditions in Biological Networks.*
 ► (2267) **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)

- 9:00AM *A Data-driven Mathematical Study of the Role of Energy in Sepsis.* Preliminary report.
 (2268) **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)
- 9:15AM *Age-Structured Models for HPV Vaccination: A Student Research Experience.*
 (2269) **Timothy D. Comar***, Benedictine University, and **Stefano Chiaradonna**, Arizona State University (1154-VF-1971)
- 9:30AM *A Stochastic Predictive Model to Determine the Network Vulnerability Risk.*
 (2270) **Nawa Raj Pokhrel***, Xavier University of Louisiana, **Chris P. Tsokos**, University of South Florida, and **Keshav Pokhrel**, University of Michigan Dearborn (1154-VF-2060)

MAA General Contributed Paper Session on Number Theory, II

8:00 AM – 11:40 AM Room 709, Meeting Room Level, Colorado Convention Center

Organizers: **Cathy Erbes**, Hiram College

Holley Friedlander, Dickinson College

Steven McKay, Brigham Young University

- 10:00AM *Explicit Burgess Bounds for Composite Moduli.*
 ► (2271) **Niraek Jain-Sharma***, UC Berkeley, **Tanmay Khale**, Lafayette College, and **August Liu**, Cambridge University (1154-VS-2017)
- 10:15AM *Minimal Discriminants of Rational Elliptic Curves with Specified Isogeny.*
 ► (2272) **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-2659)
- 10:30AM *A Tannakian framework for displays and Rapoport-Zink spaces.*
 (2273) **Patrick Daniels**, University of Maryland (1154-VS-2106)
- 10:45AM *A Conjectural Inequality for Visible Points in Lattice Parallelograms.*
 ► (2274) **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)

- 11:00AM *Improvements of the Chevalley-Waring Theorems*. Preliminary report.
Rachel Louise Petrik, University of Kentucky (1154-VS-1947)
- ▶ 11:15AM *Characteristic 0 Automorphism loci of the moduli spaces of dynamical systems \mathcal{M}_3 and \mathcal{M}_4 and Applications*.
Benjamin Hutz, Saint Louis University, **Grayson Jorgensen**, Florida State University, **Brandon Gontmacher**, Stony Brook University, **Srinjoy Srimani***, Brown University, and **Shuofeng Xu**, Colby College (1154-VS-1886)
- ▶ 11:30AM *A Novel Generating Function for a Parametrized Family of Möbius-like Arithmetic Functions Related to the Riemann ζ Function*.
Sky Pelletier Waterpeace, Rowan University (1154-VS-2814)
- 9:30AM *Problems from Math Teachers' Circle Outreach Program*. Preliminary report.
Sarah L Sparks*, **Alees Lee**, **Gulden Karakok** and **Katie Morrison**, University of Northern Colorado (1154-VG-1119)
- 9:45AM *Math Circles Program to Facilitate Challenging Tasks*.
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)
- ▶ 10:00AM *Maps, Bridges, Networks, and Art Galleries: Introducing Secondary Students to Graph Theory through Classic Problems*.
Jessica Oehrlein, Columbia University (1154-VG-1311)

MAA General Contributed Paper Session on Outreach, Teaching and Learning Advanced Mathematics

8:00 AM – 10:55 AM Room 710, Meeting Room Level, Colorado Convention Center

- Organizers: **Cathy Erbes**, Hiram College
Holley Friedlander, Dickinson College
Steven McKay, Brigham Young University
- ▶ 8:00AM *Human Cellular Automaton Activities for Fun and Mathematical Insight*.
Andrew Penland, Western Carolina University (1154-VG-1134)
- ▶ 8:15AM *Worcester State Math Academy Circle Project 2019-2020*. Preliminary report.
Hansun To* and **Maria Fung**, Worcester State University (1154-VG-876)
- ▶ 8:30AM *Program on Math Outreach in Panama*.
Jeanette Shakalli, Republic of Panama (1154-VG-212)
- ▶ 8:45AM *OMPR Summer Camp*.
Luis Caceres*, University of Puerto Rico, Mayaguez campus, and **Omar Colon**, University of Puerto Rico, Mayaguez Campus (1154-VG-354)
- ▶ 9:00AM *Mathematical kangaroo: The world's largest international math competition*.
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)
- ▶ 9:15AM *A tale of two circles: math with urban middle school teachers and rural secondary school teachers*. Preliminary report.
Patrick X. Rault* and **Janice Rech**, University of Nebraska at Omaha (1154-VG-2282)

- 10:15AM *Incorporating Python in a Linear Programming Course*.
Brian Drake, Grand Valley State University (1154-VG-946)
- 10:30AM *Exploring the Use of Presentations and Oral Examinations in Abstract Algebra Courses*. Preliminary report.
Lisa Schneider, Salisbury University (1154-VG-2161)
- ▶ 10:45AM *A Student Exploration of Spherical Geometry*.
Shannon R Lockard, Bridgewater State University (1154-VG-2266)

SIAM Minisymposium on Random Matrices and Integrable Systems, I (a joint session with the AMS-SIAM Special Session 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

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

Program of the Sessions – Saturday, January 18 (cont'd.)

MAA Townhall

8:00 AM – 9:20 AM Room 605, Meeting Room Level, Colorado Convention Center

Swap Session for Teaching Aligned with the Instructional Practices Guide

Organizers: **Chris Oehrlein**, Oklahoma City Community College
Carolyn Yackel, Mercer University

Project NExT

8:30 AM – 9:45 AM Mile High Ballroom 4d-4f, Ballroom Level, Colorado Convention Center

Group Work: Demonstrations of Best Practices.

Organizers: **Carly Briggs**, Bennington College
Nicole Fider, University of Arizona)
Eric Stachura, Kennesaw State University
David Walmsley, St. Olaf College

AMS Invited Address

9:00 AM – 9:50 AM Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center

(2290) *Smooth invariants of four-dimensional manifolds and quantum field theory.*
Gregory W. Moore, Rutgers University (1154-58-1618)

ASL Invited Address

9:00 AM – 9:50 AM Room 302, Meeting Room Level, Colorado Convention Center

(2291) *Borel sets in reverse mathematics.*
Linda Brown Westrick, Penn State University (1154-03-1517)

MAA Minicourse #7: Part B

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 B

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 B

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 Effective Assessment Practices in Large-enrollment Classes or Non-traditional Classrooms

9:00 AM – 10:15 AM Room 507, Meeting Room Level, Colorado Convention Center

Organizers: **Beste Gucler**, University of Massachusetts Dartmouth
Gulden Karakok, University of Northern Colorado
Jessica OShaughnessy, Shenandoah University
Jana Talley, Jackson State University
Michael Tallman, Oklahoma State University

9:00AM (2292) *Re-Humanizing Assessments in Large-enrollment Calculus 2 Courses.* Preliminary report.
Kelly MacArthur, University of Utah (1154-E1-2096)

9:20AM (2293) *Mastery-based assessment in a large-enrollment online College Algebra course.* Preliminary report.
Darryl J Chamberlain Jr., University of Florida (1154-E1-1966)

9:40AM (2294) *Implementation and Effects of University College Algebra Growth Mindset Structured Assessments in Large Lectures.*
Hannah Mae Lewis* and **Kady Schneider**, Utah State University (1154-E1-1975)

10:00AM (2295) *Alternate Scoring Practices in Collegiate Mathematics Courses.* Preliminary report.
Jeffrey J. King* and **Michelle Morgan**, Western Colorado University (1154-E1-2697)

AWM Workshop: Women in Several Complex Variables (WinSCV), I

9:00 AM – 12:30 PM Room 207, Meeting Room Level, Colorado Convention Center

Organizers: **Loredana Lanzani**, Syracuse University

- Liz Vivas**, Ohio State University
- 9:00AM (2296) *Holomorphic approximation via Dolbeault cohomology.*
Mei-Chi Shaw*, University of Notre Dame, and **Christine Laurent-Thiebaut**, Université Grenoble-Alpes, Institut Fourier (1154-32-943)
- 10:00AM (2297) *On the stability of the hull(s) of an n -sphere in \mathbb{C}^n via a nonlinear Riemann-Hilbert problem.*
Purvi Gupta* and **Chloe U. Wawrzyniak**, Rutgers University, New Brunswick (1154-32-2478)
- 10:30AM (2298) *Critical locus for complex Henon maps.* Preliminary report.
Tanya Firsova, Kansas State University (1154-32-2601)
- 11:00AM (2299) *Uniform estimates for the Monge-Ampère foliation on a compact Kähler manifold.*
Katherine Brubaker, Emory & Henry College (1154-32-2493)
- 11:30AM (2300) *Polynomial foliations of \mathbb{C}^2 : cheap complex limit cycles and leaves of high genus.*
Nataliia Goncharuk* and **Yuri Kudryashov**, University of Toronto, Canada (1154-32-363)
- NOON (2301) *Neumann boundary condition for $\bar{\partial}$.* Preliminary report.
► **William Gryc**, Muhlenberg College, **Loredana Lanzani**, Syracuse University, **Jue Xiong***, University of Colorado Boulder, and **Yuan Zhang**, Purdue University Fort Wayne (1154-30-2001)

MAA Mathematical Competition in Modeling (MCM) Winners

- 9:00 AM – 10:15 AM **Room 702, Meeting Room Level, Colorado Convention Center**
- Organizers: **Ben Fusaro**, Florida State University
Ben Galluzzo, Shippensburg University
Jason Douma, University of Sioux Falls

MAA Panel

- 9:00 AM – 10:20 AM **Room 601, Meeting Room Level, Colorado Convention Center**
- Supporting Transgender and Non-binary Students*
- Organizers: **Juliette Bruce**, University of Wisconsin
Christopher Goff, University of the Pacific
Greg McCarthy, Hampshire College
- Panelists: **Juliette Bruce**, University of Wisconsin

- Randy Dominick**, University of Massachusetts, Amherst
Maxie Lahn, University of Michigan
Terry Mullen, University of Massachusetts, Amherst

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**
- (2302) *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 – 10:55 AM **Four Seasons Ballroom 2, 3, 4, Ballroom Level, Colorado Convention Center**
- (2303) *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

Program of the Sessions – Saturday, January 18 (cont'd.)

Chair: **Michael Dorff**, Brigham Young University

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

▶ 1:00PM *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)

1:30PM *Olinde Rodrigues' contribution to Catalan numbers.*
Johannes Familton, Borough of Manhattan Community College The City University of New York (1154-01-196)

▶ 2:00PM *Canonical Transformations and Hamilton-Jacobi Theory 1866–1920.* Preliminary report.
Craig Fraser*, University of Toronto, and **Michiyo Nakane**, Seijo University, Tokyo (1154-01-147)

▶ 2:30PM *Victorian London's Mathematical Culture — Non-Euclidean Geometry as a Case Study.* Preliminary report.
Rosie Lev-Halutz, Tel-Aviv University (1154-01-938)

▶ 3:00PM *Polish Women Mathematicians in Secret Classes During World War II.* Preliminary report.
Emelie A Kenney, Siena College (1154-01-298)

3:30PM Discussion

▶ 4:00PM *"Peculiarly accessible": Roles of postulate theory for different mathematical publics in E.V. Huntington's work.* Preliminary report.
Laura E. Turner, Monmouth University (1154-01-1648)

4:30PM *From Mathematical Programming to Convex Analysis: Duality as a driving force in history of mathematics.*
Tinne Hoff Kjeldsen, Department of Mathematical Sciences, University of Copenhagen (1154-01-307)

5:00PM *How differential geometry became (temporarily) obsolete in the life of Václav Hlavatý.*
Helena Durnova, Masaryk University, Brno, Czechia (1154-01-2171)

▶ 5:30PM *Soviet Mathematics Curriculum Reforms (1958-1985): Redefining the Purpose of Mathematics Education.* Preliminary report.
Mariya Boyko, University of Toronto (1154-01-400)

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

▶ 1:00PM *Universality and Delocalization of random band matrices.*
Fan Yang, U. Penn, **Horng-Tzer Yau**, Harvard University, and **Jun Yin***, UCLA (1154-60-1227)

2:00PM *Universality for random band matrices.*
Tatyana Shcherbina, Princeton University (1154-60-496)

3:00PM *Invertibility of inhomogeneous random matrices.*
Galyna V. Livshyts, **Konstantin Tikhomirov***, Georgia Institute of Technology, and **Roman Vershynin**, University of California, Irvine (1154-60-2102)

▶ 4:00PM *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) *Virtual Niebrzydowski Algebras and Trivalent Spatial Graphs.* Preliminary report.
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 **Anastasiia 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

Jiangguo (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)

Program of the Sessions – Saturday, January 18 (cont'd.)

- 3:00PM (2336) *Generalized Moving Least-Squares approximation of variational problems for advection-diffusion problems.*
Paul A Kuberry*, **Pavel B Bochev**, **Nathaniel A Trask** and **Mauro Perego**, Sandia National Laboratories (1154-65-1076)
- 3:30PM (2337) *A second order in time energy stable variable step method for the Cahn-Hilliard equation.*
Xiaoming Wang, Southern University of Science and Technology (China) (1154-65-836)
- 4:00PM (2338) *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)
- 4:30PM (2339) *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)
- ▶ 5:00PM (2340) *A comparison of discretizations for the Biharmonic equation.* Preliminary report.
Timo Heister*, Clemson University, **Luca Heltai**, International School for Advanced Studies, Trieste, Italy, and **Natasha Sharma**, University of Texas of El Paso (1154-65-1460)
- 5:30PM (2341) *Lax-Wendroff Schemes for Quasi-Exponential Moment-Closure Approximations.*
James A Rossmanith* and **Christine Wiersma**, Iowa State University (1154-65-272)
- 2:30PM (2345) *PDE's and Big Data.*
Nathan Pennington, Creighton University (1154-35-182)
- 3:00PM (2346) *Log-Sobolev inequalities, doubling condition, and degenerate elliptic PDE's.*
Luda Korobenko, Reed College (1154-35-752)
- 3:30PM (2347) *On the Dirichlet problem with boundary datum belonging to Hardy spaces in the upper-half space.*
Ryan Alvarado, Amherst College (1154-35-972)
- 4:00PM (2348) *Vibrating Plates and Eigenvalues of the Bi-Laplacian.*
L. M. Chasman, University of Minnesota Morris (1154-35-1366)
- 4:30PM (2349) *Large coupling asymptotics for the Lyapunov exponent of quasi-periodic Schrödinger operators.*
Chris A Marx, Oberlin College (1154-81-811)
- 5:00PM (2350) *Sparse bounds for Walsh multipliers.*
Amalia Culiuc*, Amherst College, **Wei Chen**, National Sun Yat-sen University, **Francesco Di Plinio**, Washington University in Saint Louis, **Michael Lacey**, Georgia Institute of Technology, and **Yumeng Ou**, Baruch College CUNY (1154-26-1241)
- 5:30PM (2351) *Singular Integrals and Singular Perturbations.*
Ikemefuna C Agbanusi, Colorado College (1154-35-1646)

AMS Special Session on Analysis of Nonlocal Models

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 (2342) *Computing Change with Partial Differential Equations: Running a MAA NREUP at a Liberal Arts College.*
Jennifer Beichman, Smith College (1154-35-419)
- ▶ 1:30PM (2343) *Beyond the first semester on differential equations.*
Alfonso Castro, Harvey Mudd College (1154-34-420)
- 2:00PM (2344) *The effect of an environmental toxin on a competitive species model.*
Jennifer M. Miller, Bellarmine University (1154-34-1629)

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 (2352) *Regularity theory for nonlocal space-time master equations.*
Pablo Raúl Stinga, Iowa State University (1154-35-235)
- ▶ 1:30PM (2353) *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 (1154-45-1656)
- ▶ 2:30PM (2355) *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 (2356) *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 (2357) *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 (2358) *Variable-order fractional PDEs: modeling, computation and analysis.* Preliminary report.
Hong Wang, Department of Mathematics, University of South Carolina (1154-35-1591)
- ▶ 4:30PM (2359) *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 (2360) *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 (2361) *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, Université 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 Spinale**, Carleton College (1154-11-1653)

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

Program of the Sessions – Saturday, January 18 (cont'd.)

Ali Kemal Uncu, Research
Institute for Symbolic
Computation, Johannes
Kepler University Linz

- ▶ 1:00PM (2372) *Numberscope*. Preliminary report.
Katherine E Stange, University of Colorado, Boulder (1154-11-1790)
- ▶ 1:30PM (2373) *Using Machine Learning in Algebra and Geometry*.
Zafeirakis Zafeirakopoulos, Institute of Information Technologies, Gebze Technical University (1154-68-1345)
- ▶ 2:00PM (2374) *Neural-Inspired Computation for Efficient Scientific Computing via Random Walks and Surrogate Models*.
William Mark Severa, Sandia National Laboratories (1154-68-1850)
- ▶ 2:30PM (2375) *A large scale automated deduction project in nonassociative algebra*. Preliminary report.
Petr Vojtěchovský, University of Denver (1154-20-1609)
- 3:00PM (2376) *Proving Infinite Pochhammer Sum Identities*.
Jakob Ablinger, JKU Linz, Research Institute for Symbolic Computation (1154-05-173)
- ▶ 3:30PM (2377) *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 (2378) *Statistics on hypercube orientations*. Preliminary report.
Nathan Chenette, Rose-Hulman Institute of Technology, **Lara Pudwell***, Valparaiso University, and **Manda Riehl**, Rose-Hulman Institute of Technology (1154-05-553)
- 4:30PM (2379) *Finite Rogers-Ramanujan type identities*. Preliminary report.
Andrew V Sills, Georgia Southern University (1154-11-362)
- 5:00PM (2380) *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 (2381) *Congruence mod 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 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 (2382) *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 (2383) *Constructing finitely generated projective modules for noncommutative solenoids*.
Shen Lu, University of Colorado Boulder (1154-46-569)
- 2:00PM (2384) *Fractal Complex Dimensions and Zeta Functions, With Applications to Fractal Geometry*.
Michel L Lapidus, University of California, Riverside (1154-51-596)
- 2:30PM (2385) *Geometric Understanding of a Zero Free Region*.
Machiel van Frankenhuysen, Utah Valley University (1154-11-500)
- 3:00PM (2386) *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 (2387) *Measures of maximal entropy on subsystems of topological suspension semi-flows*.
Tamara Kucherenko*, The City College of New York, and **Daniel Thompson**, Ohio State University (1154-37-1639)
- 4:00PM (2388) *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 (2389) *Dimensions and measures of shrinking target sets*.
Marco Antonio López, Wake Forest University (1154-37-2563)
- 5:00PM (2390) *Fourier Bases for Certain Fractal L^2 Spaces*.
Calvin F Hotchkiss, University of Delaware (1154-42-2107)

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. **Charles Chen***, Morrill Learning Center, and **Mason Chen**, Stanford OHS (1154-62-1640)
- ▶ (2391)
- 1:30PM STEAMS Methodology. Preliminary report. **Charles Chen***, Morrill Learning Center, and **Mason Chen**, Stanford OHS (1154-62-1647)
- ▶ (2392)
- 2:00PM Prediction Intervals for Hypergeometric Distribution. **Shanshan Lv***, Truman State University, and **K. Krishnamoorthy**, University of Louisiana at Lafayette (1154-60-401)
- (2393)
- 2:30PM Small Sample Inference for The Product Limit survival function Estimator. Preliminary report. **Emad M. Abdurasul**, James Madison University (1154-62-1078)
- (2394)
- 3:00PM Manifold Learning Using Persistent Homology on the Laplacian Eigenfunctions. Preliminary report. **Mustafa Hajji**, KLA (1154-68-2798)
- ▶ (2395)
- 3:30PM On Orthogonal Components of a Solution to a Cauchy BVP. Preliminary report. **Dejenie Alemayehu Lakew**, Hampton University (1154-46-621)
- ▶ (2396)

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
Nsoki 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)
- (2397)
- 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)
- (2398)

- 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)
 - (2399)
 - 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)
 - (2400)
 - 3:00PM Fractional Laplacian problems involving logistic reaction terms. **Elliott Z Hollifield***, **Maya Chhetri**, UNC Greensboro, and **Petr Girg**, University of West Bohemia (1154-35-2191)
 - (2401)
 - 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)
 - (2402)
 - 4:00PM Existence of positive solutions for a class of superlinear fractional Laplacian problems. **Maya Chhetri***, UNC Greensboro, **Petr Girg**, University of West Bohemia, and **Elliott Hollifield**, UNC Greensboro (1154-35-2306)
 - (2403)
 - 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)
 - ▶ (2404)
 - 5:00PM Infinitely many solutions of semilinear equations on the exterior domains. **Janak R Joshi**, Cameron University, Lawton. OK (1154-35-685)
 - (2405)
 - 5:30PM Multiple Solutions of Elliptic PDEs in Exterior Domains of \mathbb{R}^2 . **David G Costa**, University of Nevada Las Vegas (1154-35-1525)
 - (2406)
- 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.)

- 1:00PM (2407) *International Research Experiences for Students in Uzbekistan.*
Zair Ibragimov, California State University, Fullerton (1154-00-1557)
- 1:30PM (2408) *Dynamics of Prion Proliferation Under Combined Treatment of Pharmacological Chaperones and Interferons.*
Yair Castillo, University of Colima, **Nora Culik**, Vassar College, **Leah Darwin**, Arizona State University, **Doménica Garzón**, Yachay Tech University, **Abigail Hardin***, University of Oklahoma, **Anji Yang**, University of Shanghai for Science and Technology, **Gabriela Navas**, Arizona State University, **Carlos Castillo-Garsow**, Eastern Washington University, and **Karen Rios-Soto**, University of Puerto Rico-Mayagüez (1154-92-2410)
- 2:00PM (2409) *Finite-dimensional nilpotent Leibniz algebras and their derivations.*
Bakhrom Omirov, National University of Uzbekistan (1154-17-986)
- 2:45PM Break
- 3:30PM (2410) *On a boundary value problem for a time-fractional wave equation with the Riemann-Liouville and Atangana-Baleanu derivatives.* Preliminary report.
Sohaib Nasir, Vassar, **Devraj Duggal**, Georgia Institute of Technology, and **Isabel Allen***, University of Wisconsin - Madison (1154-35-2365)
- 4:00PM (2411) *Transitivity on the Calogero-Moser Variety C_2 .*
Farkhod Eshmatov, Uzbekistan Academy of Sciences Institute of Mathematics, **Rustam Hamdam**, Inha University in Tashkent, **Jacob Kesten***, Rice University, **Samuel Mathers**, Princeton University, and **Zafar Normatov**, National University of Uzbekistan (1154-14-1488)
- 4:30PM (2412) *Classification of Leibniz Algebras Corresponding to Three Dimensional Solvable Lie Algebras.*
Emily Frances Leiter Olson*, St. Olaf College, and **Abror Khudoyberdiyev**, National University of Uzbekistan (1154-08-1304)
- 5:00PM (2413) *On nilpotent and solvable Leibniz superalgebras.*
Abror Khakimovich Khudoyberdiyev, National University of Uzbekistan (1154-17-1001)

AMS Special Session on Mathematical Aspects of Conformal Field Theory, II

1:00 PM – 6:00 PM Room 106, Meeting Room Level, Colorado Convention Center

Organizers: **Shashank Kanade**, University of Denver
Andrew Linshaw, University of Denver

Robert McRae, Vanderbilt University

- 1:00PM (2414) *Relative representation theory.* Preliminary report.
Jonas T Hartwig, Iowa State University (1154-17-2669)
- 1:30PM (2415) *Meromorphic open-string vertex algebra on the two-dimensional sphere and its modules.* Preliminary report.
Fei Qi, University of Manitoba (1154-17-2556)
- 2:00PM (2416) *On Generalizations of Geometric Vertex Operator Algebras and Related Structures.*
Lyda Pamela Urresta, University of Notre Dame (1154-81-2277)
- 2:30PM (2417) *Higher level Zhu algebras for the Heisenberg vertex operator algebra and applications.*
Darlayne Addabbo* and **Katrina Barron**, University of Notre Dame (1154-17-1693)
- 3:00PM (2418) *On generators and relations for higher level Zhu algebras for certain vertex operator algebras.*
Katrina Barron* and **Darlayne Addabbo**, University of Notre Dame (1154-17-1688)
- 3:30PM (2419) *Strong Finite Generation of the Z_n Orbifolds of the Rank 2 Heisenberg System.*
Dan D. Graybill, University of Denver (1154-17-1243)
- 4:00PM (2420) *Structure of VOAs of type $W(2,N)$.* Preliminary report.
Vladimir V Kovalchuk, Denver University (1154-17-1399)
- 4:30PM (2421) *Permutation Orbifolds of Vertex Operator Algebras.*
Michael Penn, Randolph College (1154-17-1449)
- 5:00PM (2422) *Quantum toroidal superalgebras associated with $gl_{m|n}$.*
Luan Bezerra* and **Evgeny Mukhin**, IUPUI (1154-81-2711)
- 5:30PM (2423) *Deformed W -algebras.*
Evgeny Mukhin, Indiana University Purdue University Indianapolis (1154-81-2251)

AMS Special Session on Mathematical Physics Some Open Problems for the 21st Century, III

1:00 PM – 6:00 PM Room 402, Meeting Room Level, Colorado Convention Center

Organizer: **Michael Maroun**

- 1:00PM (2424) *A Generalized Nonlinear Schrodinger Equation.*
Michael A Maroun, Boston, MA (1154-81-2067)
- 1:50PM (2425) *p -Adic Brownian Motion as a Limit of Discrete Time Random Walks.*
David Eric Weisbart, University of California, Riverside (1154-60-2373)

2:40PM *Bulk Viscous Cosmological model in General Relativity*. Preliminary report. **Reena Tandon**, Lovely Professional University (1154-85-2156)

3:30PM Discussion

3:40PM *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)

4:10PM *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)

4:40PM *The Characteristic Polynomial of a Quantum Binary Graph*. Preliminary report. **Tori Hudgins*** and **Jon Harrison**, Baylor University (1154-81-863)

5:10PM *Generalized Span Categories in Classical Mechanics*. **David Weisbart** and **Adam Yassine***, University of California, Riverside (1154-18-2182)

5:40PM *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

1:00PM Discussion

▶ 1:30PM *The Upside of Down Syndrome: Math is My Superpower!* **Heidi Berger**, Simpson College (1154-00-2661)

2:00PM *The elastohydrodynamics of a simplified model of human birth*. **Roseanna Gossmann**, Art of Problem Solving Academy (1154-76-2331)

▶ 2:30PM *The Mathematics Behind Twin Motherhood*. **Tiffany N Kolba**, Valparaiso University (1154-92-87)

▶ 3:00PM *Using parenting to understand and manage inquiry-based learning and teaching*. **Aliza Steurer**, Dominican University (1154-00-2043)

▶ 3:30PM *Finding Luz*. **Carrie Diaz Eaton**, Bates College (1154-01-1140)

▶ 4:00PM *Then and Now: Calculating Intersections of Math and Motherhood*. **Della Dumbaugh**, University of Richmond, and **Hannah Fenster***, Goucher College (1154-00-1255)

4:30PM 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

1:00PM *Coarse geometry and family invariants of gapped phases of quantum matter*. **Anton Kapustin**, California Institute of Technology (1154-82-590)

2:00PM *Homotopy theoretic methods in phases of matter*. **Agnes Beaudry**, University of Colorado Boulder (1154-55-619)

3:00PM *Some Homotopical Computations in Physics*. **Jonathan A Campbell**, Duke University (1154-55-304)

4:00PM *Gapped phases of quantum matter and topological quantum field theories*. **Michael Hermele**, University of Colorado Boulder (1154-81-1839)

5:00PM *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***, Department of Mathematics and Statistics, Washington University in St. Louis, and **Yijun Yao**, School of Mathematical Sciences, Fudan University (1154-19-302)

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

Program of the Sessions – Saturday, January 18 (cont'd.)

- 1:00PM (2443) *An alternative formulation for a delayed logistic equation.*
Gail Wolkowicz*, **Chiu-Ju Lin**, McMaster University, and **Lin Wang**, University of New Brunswick (1154-92-463)
- ▶ 1:30PM (2444) *Mathematical Modeling of HIV/SIV Infection in Brain.* Preliminary report.
Weston Roda, **Michael Li*** and **Christopher Power**, University of Alberta, Edmonton, Alberta, Canada (1154-34-1007)
- 2:00PM (2445) *Time series analytics: Networks reconstruction and dynamics prediction.*
Wei Lin, Fudan University (1154-92-772)
- 2:30PM (2446) *Larval versus adult dispersal: implications of two modes of dispersal on the spread rate of an invasion.*
James Watmough*, **Lin Wang**, **Myriam Barbeau** and **Ali Gharouni**, University of New Brunswick (1154-92-447)
- 3:00PM (2447) *Continuous Natural Language Vowel Change.*
Patrick Shipman, Colorado State University (1154-92-460)
- ▶ 3:30PM (2448) *Population Dynamics of Honeybees: Interplay Effects of Parasites and Nutrition.* Preliminary report.
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)
- 4:00PM (2449) *The potential impact of climate change on the transmission risk of tick-borne encephalitis: insights from dynamical modeling.*
Kyeongah Nah, York University (1154-92-446)
- ▶ 4:30PM (2450) *A Data-Driven Approach to Modeling the Heroin and Fentanyl Epidemic.* Preliminary report.
Tricia Phillips*, **Suzanne Lenhart** and **Christopher Strickland**, University of Tennessee, Knoxville (1154-92-485)
- ▶ 5:00PM (2451) *Role of Regulatory T Cells on a Tumor-Immune System with Immunotherapy.* Preliminary report.
Peng Feng* and **Menaka Navaratna**, Florida Gulf Coast University (1154-34-1080)
- ▶ 5:30PM (2452) *Rigorous Analysis of Edge-Based Network Disease Models.* Preliminary report.
Zhisheng Shuai, University of Central Florida (1154-92-2546)

AMS Special Session on Representations of Finite Groups and Related Structures, II

1:00 PM – 5:50 PM Room 103, Meeting Room Level, Colorado Convention Center
 Organizers: **Mandi Schaeffer Fry**, Metropolitan State University of Denver

- Nat Thiem**, University of Colorado Boulder
- 1:00PM Discussion
- 2:00PM (2453) *Tensor Product Markov Chains.*
Persi Diaconis, Stanford University (1154-20-2101)
- 3:00PM (2454) *Kohnert polynomials as characters of flagged Schur modules.* Preliminary report.
Sami Assaf*, University of Southern California, and **Dominic Searles**, University of Otago (1154-05-1322)
- 3:30PM (2455) *Representation theory and combinatorial Hopf structures.* Preliminary report.
Farid Aliniaiefard, University of British Columbia (1154-20-1031)
- 4:00PM (2456) *Towards a tropical geometry of Coxeter matroids.* Preliminary report.
Christopher Eur, UC Berkeley (1154-05-1983)
- 4:30PM (2457) *Invariants of modular reflection groups and (q, t) -binomial coefficients.*
Chelsea Drescher* and **Anne V. Shepler**, University of North Texas (1154-13-591)
- 5:00PM (2458) *Cartan subalgebras in the C^* -algebras of non-principal groupoids.*
Elizabeth Gillaspay*, 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)
- 5:30PM (2459) *The rectangular representation of the double affine Hecke algebra via elliptic Schur-Weyl duality.*
David Jordan, University of Edinburgh, and **Monica Vazirani***, UC Davis (1154-05-2008)

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

1:00 PM – 5:20 PM Room 401, Meeting Room Level, Colorado Convention Center

Organizers: **Steve Butler**, Iowa State University
Michael Ferrara, University of Colorado Denver
Jeremy Martin, University of Kansas
Tyrrell McAllister, University of Wyoming
Jamie Radcliffe, University of Nebraska-Lincoln

- 1:00PM (2460) *Counterexamples to a conjecture of Harris on Hall ratio.*
Adam Blumenthal*, **Bernard Lidicky**, **Ryan Martin**, Iowa State University, **Sergey Norin**, McGill University, **Florian Pfender**, Colorado University, Denver, and **Jan Volec**, Masaryk University (1154-05-1085)

- 1:30PM (2461) *On the Genus of a quotient of a numerical semigroup.*
Ayomikun Adeniran*, Texas A&M University, College Station, TX, **S. Butler**, Iowa State University, Ames, IA, **C. Defant**, Princeton University, Princeton, NJ, **Y. Gao**, Massachusetts Institute of Technology, Cambridge, MA, **P. E. Harris**, Williams College, Williamstown, MA, **C. Hettle**, Georgia Institute of Technology, Atlanta, GA, **Q. Liang**, Duke University, Durham, NC, **H. Nam**, Iowa State University, Ames, IA, and **A. Volk**, University of Nebraska-Lincoln, Lincoln, NE (1154-05-464)
- ▶ 2:00PM (2462) *Manifold Matching Complexes.*
Margaret Bayer, University of Kansas, **Bennet Goeckner***, University of Washington, and **Marija Jelić Milutinović**, University of Belgrade (1154-05-780)
- ▶ 2:30PM (2463) *Lattice polytopes from Schur polynomials.*
Margaret Bayer, University of Kansas, Lawrence, **Bennet Goeckner**, University of Washington, **Su Ji Hong**, University of Nebraska, Lincoln, **Tyrrell McAllister**, University of Wyoming, **McCabe Olsen**, The Ohio State University, **Casey Pinckney***, Colorado State University, **Julianne Vega**, **Martha Yip**, University of Kentucky, and **Semin Yoo**, University of Rochester (1154-05-1461)
- ▶ 3:00PM (2464) *Plane Graphs with Maximum Degree 7 and no Adjacent Triangles are Entirely 10-Colorable.*
Axel Brandt, Northern Kentucky University, **Michael Ferrara**, **Nathan Graber***, **Stephen Hartke**, University of Colorado Denver, and **Sarah Loeb**, Hampden-Sydney College (1154-05-2183)
- 3:30PM (2465) *Flexibility of Planar Graphs—Sharpening the Tools to Get Lists of Size Four.* Preliminary report.
Ilkyoo Choi, Hankuk University of Foreign Studies, **Felix Christian Clemen**, University of Illinois at Urbana-Champaign, **Michael Ferrara**, University of Colorado Denver, **Paul Horn**, University of Denver, **Fuhong Ma**, Shandong University, and **Tomáš Masařík***, Charles University & University of Warsaw & Simon Fraser University (1154-05-657)
- 4:00PM (2466) *Constructions of distance Laplacian cospectral graphs.*
Kate Lorenzen*, Iowa State University, **Boris Brimkov**, Slippery Rock University, **Ken Duna**, University of Kansas, **Leslie Hogben**, **Carolyn Rienhart**, **Sung-Yell Song**, Iowa State University, and **Mark Yarrow**, University of Sheffield (1154-05-441)
- 4:30PM (2467) *Odd Cycle Saturation Games.*
Erin Meger*, Ryerson University, **Sam Spiro**, University of California San Diego, **Sean English**, University of Illinois Urbana-Champaign, **Tomas Masarik**, Charles University Prague, **Mike Ross**, Iowa State University, **Grace McCourt**, University of Illinois Urbana-Champaign, and **Cedar Wiseman**, University of Wyoming (1154-05-2744)
- 5:00PM (2468) *Saturation of Berge Hypergraphs.*
Sean English, Ryerson University, Toronto, ON, Canada, **Pamela Gordom**, The Ellis School, Pittsburgh, PA, United States, **Nathan Graber**, University of Colorado, Denver, CO, United States, **Abhishek Methuku**, École polytechnique fédérale de Lausanne, Switzerland, and **Eric C Sullivan***, University of Colorado, Denver, CO, United States (1154-05-1138)

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 Stanovsky, Charles University in Prague

- 1:00PM (2469) *The Structure of Hom Quandles.*
Alissa S Crans*, Loyola Marymount University, **Marco Bonatto**, Universidad de Buenos Aires, and **Glen Whitney**, Studio Infinity (1154-57-1332)
- ▶ 1:30PM (2470) *Quandles and Biquandles in Virtual Knot Theory.* Preliminary report.
Louis H Kauffman, University of Illinois at Chicago (1154-57-994)
- 2:00PM (2471) *Constructing almost classical virtual links from virtual links.*
Naoko Kamada, Nagoya City University (1154-57-386)
- 2:30PM (2472) *A geometric field theory for three-manifolds.*
Charles Frohman*, The University of Iowa, and **Joanna Kania-Bartoszyńska**, National Science Foundation (1154-57-188)
- 3:00PM (2473) *Motions and their actions on the fundamental groups and quandles of H-trivial links.*
Seiichi Kamada, Osaka University (1154-57-435)
- 3:30PM (2474) *Diagrammatic categorification of the polynomial ring $\mathbb{Z}[x]$.*
Radmila Sazdanovic*, NC State University, and **Mikhail Khovanov**, Columbia University (1154-18-2453)
- 3:55PM Break

Program of the Sessions – Saturday, January 18 (cont'd.)

- 4:10PM (2475) *Arbitrarily large torsion in Khovanov homology.* Preliminary report.
Sujoy Mukherjee*, The Ohio State University, and **Dirk Schuetz**, Durham University (1154-57-1456)
- 4:40PM (2476) *Two-(co)cycle invariants of links from column unital Yang-Baxter operators.*
Jozef H. Przytycki, George Washington University (1154-57-2005)
- 5:10PM (2477) *Skein for Yang-Baxter homology.* Preliminary report.
Mohamed Elhamdadi, **Masahico Saito*** and **Emanuele Zappala**, University of South Florida (1154-57-1431)
- 5:40PM (2478) *The classification of connected quandles of size p to the cube.*
Marco Bonatto, Universidad de Buenos Aires (1154-06-634)
- 3:00PM (2483) *Modelling Initial Biofilm Formation with Stochastic Differential Equations.* Preliminary report.
Robert G Smits, New Mexico State University (1154-60-575)
- 3:30PM (2484) *Stochastic Functional Kolmogorov Equations.*
Dang H Nguyen, University of Alabama (1154-60-845)
- 4:00PM (2485) *Analysis of Active Transport in Human Lung Cells using Stochastic Modeling.* Preliminary report.
Keisha Cook, Tulane University (1154-92-1623)
- 4:30PM (2486) *Stochastic approximations of Fredholm Volterra Integro-differential equation arising in mathematical neuroscience.* Preliminary report.
Mahbubur Rahman, University of North Florida (1154-34-2081)

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 (2479) *A Gaussian particle distribution for branching Brownian motion with an inhomogeneous branching rate.* Preliminary report.
Matt Roberts, University of Bath, and **Jason Schweinsberg***, University of California San Diego (1154-60-787)
- 1:30PM (2480) *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 (2481) *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 (2482) *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)

- 5:00PM (2487) *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 (2488) *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 Younsi, University of Hawaii

- 1:00PM (2489) *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 (2490) *Rouché's Theorem and the Geometry of Rational Functions.*
Trevor J. Richards, Monmouth College (1154-30-2285)
- ▶ 2:00PM (2491) *A Nonlocal Transport Equation Describing Roots of Polynomials Under Differentiation.*
Stefan Steinerberger, Yale (1154-31-124)
- ▶ 2:30PM (2492) *Polynomial and rational approximation in several complex variables.*
Javier Falco, Universidad de Valencia, **Paul M. Gauthier**, University of Montreal, **Myrto Manolaki***, University College Dublin, and **Vassili Nestoridis**, University of Athens (1154-32-2319)

- 3:00PM *The Asymptotic Growth of the Expected Number of Zeros of Random Harmonic Polynomials.*
(2493) **Andrew P. Thomack**, Greenville University (1154-30-1959)
- ▶ 3:30PM *An upper bound on the number of solutions in a particular gravitational lensing ensemble.*
(2494) **Sean W Perry**, Florida Atlantic University (1154-14-667)
- 4:00PM *The Lemniscate Tree of a Random Polynomial.*
(2495) **Michael Epstein***, Colorado State University, **Boris Hanin**, Texas A&M University, and **Erik Lundberg**, Florida Atlantic University (1154-30-1195)
- ▶ 4:30PM *The geometry of random polynomials: a probabilistic counterpart to the Erdos lemniscate problem.*
(2496) **Erik Lundberg***, Florida Atlantic University, and **Koushik Ramachandran**, Tata Institute of Fundamental Research (1154-30-1329)
- 5:00PM *Fekete polynomials and shapes of Julia sets.*
(2497) **Malik Younsi**, University of Hawaii (1154-30-1885)

AMS Special Session on Vietoris-Borsuk-Rips Homotopy

1:00 PM – 5:50 PM Room 104, Meeting Room Level, Colorado Convention Center

- Organizers: **Danuta Kolodziejczyk**, Warsaw University of Technology
Krystyna Kuperberg, Auburn University
- 1:00PM *Parametrized homotopy theory and motion planning problems.*
(2498) **Gunnar Erik Carlsson**, Stanford University (1154-55-1277)
- 2:00PM *An application of nerve complexes in imputation.*
(2499) **Ryan Moag** and **Boris Goldfarb***, University at Albany, SUNY (1154-57-1347)
- 2:30PM *Quasi Z-Structures.* Preliminary report.
(2500) **Craig R Guilbault**, University of Wisconsin-Milwaukee, and **Molly A Moran***, Colorado College (1154-54-838)
- 3:00PM *Vietoris-Rips complexes of spheres.*
(2501) **Michał Adamaszek**, MOSEK ApS, **Henry Adams***, Colorado State University, and **Florian Frick**, Carnegie Mellon University (1154-55-352)
- 3:30PM *Inverse systems with simplicial bonding maps and cell structures.*
(2502) **Edward Tymchatyn***, University of Saskatchewan, **Wojciech Debski**, Parksville, British Columbia, **Kazuhiro Kawamura**, University of Tsukuba, and **Murat Tuncali**, Nipissing University (1154-55-754)

- 4:00PM *Maps of rank $\leq m$ revisited.*
(2503) **Pawel Krupski**, Wroclaw University of Science and Technology, and **Murat Tuncali***, Nipissing University (1154-54-440)
- 4:30PM *On coarse properties of persistence diagrams.*
(2504) **Greg Bell*** and **C. Neil Pritchard**, UNC Greensboro (1154-54-778)
- 5:00PM *Linear algebra and unification of geometries in all scales: Evolution of concepts.* Preliminary report.
(2505) **Jerzy Dydak**, University of Tennessee (1154-51-316)
- 5:30PM *Polyhedra with Finite Depth II.*
(2506) **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

- ▶ 1:00PM *The index of Lie poset algebras.*
(2507) **Nicholas W. Mayers**, Lehigh University (1154-17-810)
- 1:15PM *Crystal structure on Gelfand-Tsetlin-Zhelobenko patterns.*
(2508) **O'Neill Kingston*** and **Jonas Hartwig**, Iowa State University (1154-17-1563)
- 1:30PM *Unimodality for certain families of Frobenius seaweed algebras.*
(2509) **Nicholas V. Russoniello***, **Nick W. Mayers** and **Vincent E. Coll**, Lehigh University (1154-17-1635)
- 1:45PM *A 3-parameter vertex algebra interpolating between the diagonal cosets of \mathfrak{sl}_n .* Preliminary report.
(2510) **Andrew R. Linshaw**, University of Denver (1154-17-2239)
- 2:00PM Break
- 2:15PM *Gluing vertex algebras.*
(2511) **Thomas Creutzig**, University of Alberta, **Shashank Kanade**, University of Denver, and **Robert McRae***, Tsinghua University (1154-17-2751)
- 2:30PM *Network models from Petri nets with catalysts.*
(2512) **John C. Baez**, University of California, Riverside, **John D. Foley***, Metron, Inc., and **Joe Moeller**, University of California, Riverside (1154-18-2063)
- 2:45PM *A Categorification of Group Cohomology.*
(2513) Preliminary report.
Michael Horst, The Ohio State University (1154-18-2470)

Program of the Sessions – Saturday, January 18 (cont'd.)

- 3:00PM (2514) *An Explicit Formula for the Loday Assembly*. Preliminary report.
Virgil Chan, Indiana University–Purdue University Indianapolis (1154-19-676)
- ▶ 3:15PM (2515) *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 (2516) *On the Graph Laplacian and the Rankability of Data*.
Thomas R Cameron, Davidson College (1154-15-1284)
- ▶ 4:00PM (2517) *The almost semimonotone matrices*.
Megan G Wendler, Washington State University (1154-15-698)
- ▶ 4:15PM (2518) *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 (2519) *Understanding Behavioral Synchrony: Differences in Behavioral Synchrony in Adolescents with Autism Spectrum Disorder using Functional EEG Networks*.
Emily P. Devine*, College of the Holy Cross, Worcester MA, **David B. Damiano**, Department of Mathematics and Computer Science, College of the Holy Cross, Worcester MA, and **Richard C. Schmidt**, Department of Psychology, College of the Holy Cross, Worcester MA (1154-15-1709)
- ▶ 4:45PM (2520) *Diagonalizing the Undiagonalizable*.
Sarah Friday*, **Jordan Smith**, **Aaron Waclawczyk** and **Fumiko Futamura**, Southwestern University (1154-15-2370)
- 5:00PM (2521) *α -adjacency- A generalization of Skew Adjacency*.
Enzo Wendler, Washington State University (1154-15-2428)
- 5:15PM (2522) *Solution of Linear Ill-Posed Problems Using Random Dictionaries*.
Pawan K. Gupta* and **Marianna Pensky**, University of Central Florida (1154-15-2604)
- 5:30PM (2523) *Tensor Train Random Projection*.
Beheshteh Tolouei Rakhshan, Purdue University (1154-15-2841)
- 1:15PM (2525) ▶ *Lattice Paths and Pattern-Avoiding Uniquely Sorted Permutations*.
Hanna Mularczyk, Harvard University (1154-05-2344)
- ▶ 1:30PM (2526) *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 (2527) *Generating functions of the b-nomial numbers*. Preliminary report.
Ji Young Choi, Shippensburg University of PA (1154-05-2360)
- ▶ 2:00PM (2528) *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 (2529) *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 (2530) *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 (2531) *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 (2532) *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 (2533) *Ordered set partitions, Garsia-Procesi modules, and rank varieties*. Preliminary report.
Sean T. Griffin, University of Washington (1154-05-2482)

AMS Contributed Paper Session on Combinatorics and Graph Theory, IV

1:00 PM – 5:10 PM Room 202, Meeting Room Level, Colorado Convention Center

- ▶ 1:00PM (2524) *Discrete Balls and New Bounds on (t, r) Broadcast Domination of n -Dimensional Grids*.
Tom Shlomi, Florida Gulf Coast University (1154-05-2310)

- 3:30PM (2534) *Enumeration of Fuss-Catalan paths.*
 ► **Suhyung An**, Department of Mathematics, Yonsei University, **JiYoon Jung***, Department of Mathematics, Marshall University, and **Sangwook Kim**, Department of Mathematics, Chonnam National University (1154-05-2554)
- 3:45PM (2535) *Automated tree strategy selection for graph pebbling numbers.*
Jonad Pulaj, Davidson College (1154-05-2628)
- 4:00PM (2536) *Implementing an efficient algorithm to 4-color planar graphs.*
 ► **Pedro H Sacramento de Oliveira**, University of Pennsylvania (1154-05-2494)
- 4:15PM (2537) *Triangles in K_S -saturated graphs with minimum degree t .*
Craig Timmons*, **Benjamin Cole**, **Albert Curry**, California State University Sacramento, and **David Davini**, University of California, Los Angeles (1154-05-2733)
- 4:30PM (2538) *Lower Bounds on Rectangular Ramsey Numbers.* Preliminary report.
 ► **Julian A Marquez**, Sam Houston State University (1154-05-2760)
- 4:45PM (2539) *On the Number of Restricted Strip Arrangements on Square Chessboards.*
Arthur L Gershon, Case Western Reserve University (1154-05-2797)
- 5:00PM (2540) *λ -unimodal involutions.*
 ► **Kassie Archer***, University of Texas at Tyler, **Virginia Germany**, Kilgore College, **Catherine Marin King**, University of Missouri, and **Lindsey-Kay Lauderdale**, Towson University (1154-05-2776)
- 1:30PM (2543) *Optimizing ℓ_1 Loss Regularizer for Sylvester Type LASSO Problem and Its Application to EEG Inverse Problem.*
Kiran K Mainali, The University of Texas at Arlington (1154-65-1683)
- 1:45PM (2544) *Convergent semi-discrete finite difference approximations for the boundary control of partial differential equations.*
 ► **Ahmet Ozkan Ozer**, Department of Mathematics, Western Kentucky University (1154-65-1465)
- 2:00PM (2545) *A Parallel-in-Time Multigrid Approach to Constrained Optimization.*
 ► **Joseph Munar***, Rice University, **Isaiah Meyers**, The University of Texas at Austin, **Tom Overman**, The University of Texas at Arlington, and **Eric Neville**, University College Dublin (1154-65-1382)
- 2:15PM (2546) *Monte Carlo Estimators for the Schatten- p Norm.*
 ► **Ethan Dudley***, **Arvind Saibaba** and **Alen Alexanderian**, North Carolina State University (1154-65-1303)
- 2:30PM Break
- 2:45PM (2547) *The Discrete Green's Function: Positivity in Two Dimensions Versus Three Dimensions using Piecewise Linear Finite Elements.* Preliminary report.
Andrew P Miller* and **Dmitriy Leykekhman**, University of Connecticut (1154-65-983)
- 3:00PM (2548) *Preconditioners for nonsymmetric indefinite linear systems.*
Zhen Chao*, **Dexuan Xie**, University of Wisconsin-Milwaukee, and **Ahmed H. Sameh**, Purdue University (1154-65-914)
- 3:15PM (2549) *Surface Grid Generation Using R.*
 ► **Bashar Zogheib**, American University of Kuwait (1154-65-533)
- 3:30PM (2550) *High order well-balanced discontinuous Galerkin methods for blood flow simulation through arteries with living man equilibrium.*
Jolene Britton*, UC Riverside, and **Yulong Xing**, Ohio State University (1154-65-301)
- 3:45PM (2551) *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 (1154-00-2483)
- 4:00PM (2552) *A variant of relaxed triangular splitting preconditioners for generalized saddle point problems from Navier-Stokes Equations.* Preliminary report.
Xinyun Zhu, Department of Mathematics, UTPB, Odessa, TX 79762 (1154-65-126)
- 4:15PM (2553) *A Penalized Neural Network Process for Viable Selection and Application in Economics.*
 ► **Sheng Gao*** and **Mingwei Sun**, Samford University (1154-62-1821)

AMS Contributed Paper Session on Experimental Mathematics and Numerical Analysis, II

1:00 PM – 5:10 PM Room 208, Meeting Room Level, Colorado Convention Center

- 1:00PM (2541) *Machine learning approach for image reconstruction in electrical impedance tomography inverse problem.* Preliminary report.
Taufiqar R Khan*, **Shyla Rae Kupis**, Clemson University, and **Vincent Barra**, LIMOS, University of Clermont Auvergne, France (1154-65-1746)
- 1:15PM (2542) *A level-set method combining 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)

Program of the Sessions – Saturday, January 18 (cont'd.)

- 4:30PM ▶ (2554) *Data Science: Challenges in the Quintessential Interdisciplinary Field.* Preliminary report.
Michelle R. DeDeo, Univ. of North Florida & Mayo Clinic-JAX (1154-62-2580)
- 4:45PM (2555) *Arbitrary Rectangle-range Generalized Elastic Net Penalty Model and Variable Selection Consistency.*
Yujia Ding*, **Qidi Peng**, Institute of Mathematical Sciences, Claremont Graduate University, **Hansen Chen**, Department of Physics, Yale University, and **Zhengming Song**, Institute of Mathematical Sciences, Claremont Graduate University (1154-62-1021)
- 5:00PM ▶ (2556) *A New Approach to Substrate Flux Approximation for Monod Boundary Value Problem Arises in the Study of Biofilms.*
Fazal Abbas*, Stetson University, DeLand Florida USA, and **Hermann J. Eberl**, University of Guelph, Guelph ON Canada (1154-41-1416)

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

- 1:00PM ▶ (2557) *Modeling Zika Virus Transmission Dynamics: Parameter Estimates, Disease Characteristics, and Prevention.*
Naveen K. Vaidya, San Diego State University (1154-92-2451)
- 1:15PM ▶ (2558) *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)
- 1:30PM ▶ (2559) *Proteins with random effects become evolutionary capacitors.*
Swati Patel* and **Scott McKinley**, Tulane University (1154-92-2486)
- 1:45PM ▶ (2560) *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)
- 2:00PM ▶ (2561) *Estimating Time-Varying Applied Current in the Hodgkin-Huxley Model.*
Kayleigh Campbell, **Laura Staugler*** and **Andrea Arnold**, Worcester Polytechnic Institute (1154-92-2498)

- 2:15PM (2562) *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 Leiderman**, 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)
- 2:30PM ▶ (2563) *Analyzing Uncertainty in Time-Varying Parameter Estimates for Biological Systems.*
Andrea Arnold, Worcester Polytechnic Institute (1154-92-2525)
- 2:45PM Break
- 3:00PM ▶ (2564) *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)
- 3:15PM ▶ (2565) *A simple ODE model relating BDNF content and circadian rhythms.* Preliminary report.
Jordan Michael Culp, Washington State University (1154-92-2664)
- 3:30PM ▶ (2566) *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)
- 3:45PM ▶ (2567) *Continuous Mathematical Model of Blood Vessel Formation.*
Cynthia Melissa Ramirez, California State University - Los Angeles (1154-92-2636)
- 4:00PM ▶ (2568) *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)
- 4:15PM (2569) *Selectivity of the KcsA potassium channel: Analysis and computation.*
Zilong Song*, UC Riverside, **Xiulei Cao**, York University, **Tzzy-Leng Horng**, Feng Chia University, and **Huaxiong Huang**, York University (1154-35-1266)

- 4:30PM (2570) *Evolutionary Dynamics in a Group Population Structure with Barriers to Group Entry*. Preliminary report.
Olivia J. Chu*, **Vitor V. Vasconcelos** and **Corina E. Tarnita**, Princeton University (1154-91-2378)
- ▶ 4:45PM (2571) *Evolutionary Kuramoto Dynamics*. Preliminary report.
Elizabeth Tripp*, **Feng Fu** and **Scott Pauls**, Dartmouth College (1154-91-2429)
- 5:00PM (2572) *A Kinetic Theory Approach to Pedestrian Motion and Onset of Disease Spreading*. Preliminary report.
Daewa Kim*, Department of Mathematics, West Virginia University, and **Annalisa Quaini**, Department of Mathematics, University of Houston (1154-91-2452)

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 Ekblad**, 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*. Preliminary report.
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 **Aitzin Cornejo-Reynoso**, Harvey Mudd College (1154-11-1941)
- 2:30PM (2579) *Metacommutation in quaternion orders and actions on the Bruhat-Tits tree*. Preliminary report.
Angelica Babei*, Vanderbilt University, and **Sara Chari**, Bates College (1154-11-2764)

- ▶ 2:45PM (2580) *The Diophantine equation $mA^2 + nB^4 = C^3$* .
Susil Kumar Jena, Plot No-170, Sector-5, Niladri Vihar, Chandrasekharpur, Bhubaneswar-751021, Odisha, India (1154-11-2231)
- 3:00PM (2581) *Augmented Generalized Happy Functions: Deserts and Oases*.
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 $\{1, 2, \dots, n\}$* .
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 Programs at Branch Campuses*.
Gina Monks, Penn State - Hazleton (1154-A5-332)

Program of the Sessions – Saturday, January 18 (cont'd.)

- 1:20PM *A Holistic Approach to Supporting Student-centered Pedagogy: Navigating Co-requisite Calculus I.*
 ▶ (2589) **Emilie Hancock***, Central Washington University, **Spencer Bagley**, Westminster College, **Lorraine Franco** and **Gulden Karakok**, University of Northern Colorado (1154-A5-849)
- 1:40PM *Role of Active Collaborative Learning Workshops in Changing the Introductory Mathematics Course.*
 ▶ (2590) **Vesna Kilibarda***, **Yuanying Guan** and **Xiaofang Wang**, Indiana University Northwest (1154-A5-1682)
- 2:00PM *Establishing Consistent Active Learning in Calculus I Courses.*
 (2591) **Steve Bennoun*** and **Tara Holm**, Cornell University (1154-A5-974)
- 2:20PM *Our Experiences in a Graduate Teaching Assistant Training Pilot.* Preliminary report.
 ▶ (2592) **Daniel James*** and **Christopher Raymond**, University of Delaware (1154-A5-2816)
- 2:40PM *Active Calculus at the University of Florida.* Preliminary report.
 ▶ (2593) **Darryl J Chamberlain Jr.**, **Kevin Knudson**, **Melissa Shabazz**, **Willard Keeran**, **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: **Naiomi Cameron**, Lewis & Clark College
Rachelle DeCoste, Wheaton College
Chris Goff, University of the Pacific
Semra Kilic-Bahi, Colby-Sawyer College

- 1:00PM *How Oxford College's Mathematics Center Encourages Inclusivity.*
 ▶ (2594) **Christina Lee**, Oxford College of Emory University (1154-F5-2349)
- 1:20PM *Girls Talk Math: Providing a Path to Math-related Careers through Early Support and Media.*
 (2595) **Sarah Cassie Burnett**, University of Maryland at College Park (1154-F5-2348)
- 1:40PM *Programmatic Inclusive Environment Building in the Context of a Large Department.*
 ▶ (2596) **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 *Stress-strength Inference for the Multicomponent System Based on Progressively type-II censored samples from Pareto Distributions.* Preliminary report.
 ▶ (2597) **Lauren J Sauer**, University of South Dakota (1154-VN-2131)
- 1:15PM *Differential Equation Model for Carbon Dioxide Emission and the Impact of Major Contributors.* Preliminary report.
 ▶ (2598) **Netra P Khanal**, The University of Tampa (1154-VN-1045)
- 1:30PM *Measuring Gerrymandering in Colorado.* Preliminary report.
 ▶ (2599) **Haley Colgate**, Colorado College (1154-VN-1144)
- 1:45PM *Risk Assessments and Measurements of Privacy Leaks within Google's Ads Data Hub.*
 ▶ (2600) **Miguel Fuentes***, University of Delaware, **Shreya Gupta**, Delhi Technological University, **Sarika Aggarwal**, University of Pittsburgh, and **Aviva Prins**, University of Maryland, College Park (1154-VN-407)
- 2:00PM *Symmetries of the Canonical Geodesic Equations of Five-Dimensional Nilpotent Lie Algebras.*
 (2601) **Hassan Almusawa***, Virginia Commonwealth University, **Ryad Ghanam** and **Gerard Thompson**, University of Toledo (1154-VV-2789)
- 2:15PM *Rayleigh-Bénard Problem (2D): A Determining Form and Algebraic Bounds on the Global Attractor.*
 (2602) **Yu Cao**, Indiana University (1154-VN-2160)
- 2:30PM *Numerical Results for Linear Sequential Caputo Fractional Boundary Value Problems with Mixed Nonhomogeneous Boundary Conditions.* Preliminary report.
 ▶ (2603) **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 *High Order Local Discontinuous Galerkin Method for Solving Nonlinear Thin Film Equations.*
 (2604) **Caleb Logemann*** and **James Rossmanith**, Iowa State University (1154-VN-1614)

- 3:00PM (2605) *Quasi-Newton Methods for Infinite-Dimensional Inverse Problems Governed by PDEs.*
Radoslav G Vuchkov*, University of California, Merced, **Cosmin Gheorghita Petra**, Lawrence Livermore National Laboratory, and **Noemi Petra**, University of California, Merced (1154-VN-2500)
- ▶ 3:15PM (2606) *Reaction-Advection-Dispersion Equation.*
Malcolm Alexander Gehlbach* and **Janak R Joshi**, Cameron University, Lawton, OK (1154-VN-1717)

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 (2607) *Finding the missing values: An activity for introducing limits in a Calculus course.*
Bernadette Boyle, Sacred Heart University (1154-VI-2223)
- ▶ 1:45PM (2608) *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 (2609) *Using an Ellipse to Compute the Elapse of an Eclipse in Multivariate Calculus.*
Melanie Pivarski, Roosevelt University (1154-VI-2618)
- ▶ 2:15PM (2610) *Using Peer Facilitators in Calculus Labs.* Preliminary report.
Jordan Nikkel* and **Cathy Grilli**, Christian Brothers University (1154-VI-1724)
- ▶ 2:30PM (2611) *Designing a Calculus Course for Middle School Teachers.* Preliminary report.
Reva Kasman, Salem State University (1154-VI-1410)
- 2:45PM (2612) *Active Learning in College Calculus: Supporting Instructors and Targeting Cultural Change.*
Brian E. Moore*, **Erin Saitta**, **Michele Gill**, **Jacquelyn J. Chini**, **Melissa Dagley** and **Xin Li**, University of Central Florida (1154-VI-2190)
- ▶ 3:00PM (2613) *Mastery-Based Grading in a Large Calculus Course.*
Silva Chang* and **Anne Dougherty**, University of Colorado Boulder (1154-VI-2810)

- 3:15PM (2614) *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 (2615) *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 (2616) *Massachusetts Department of Higher Education Mathematics Pathways Project & Bridgewater State University.* Preliminary report.
Rebecca Metcalf, Bridgewater State University (1154-VI-1588)
- 4:00PM (2617) *Coordinating Calculus with Limited Resources.*
Jila Niknejad* and **Joseph Phillip Brennan**, University of Kansas (1154-VI-1997)
- ▶ 4:15PM (2618) *Co-requisite courses and the STEM pathway: a report from Humboldt State University.*
Bori Mazzag, Humboldt State University (1154-VI-1986)
- ▶ 4:30PM (2619) *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 (2620) *Pointwise convergence of the Schrödinger flow.*
Erin Compaan, MIT, **Renato Luca'**, Univerisitat Basel, and **Gigliolo Staffilani***, MIT (1154-35-1937)
- 1:30PM (2621) *Uniform large deviations principles.*
Michael Salins, Boston University (1154-60-439)
- 2:00PM (2622) *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 (2623) *An A Posteriori Error Estimation for Numerical Solution of Richards Equation.* Preliminary report.
Victor Ginting, University of Wyoming (1154-65-2252)

Program of the Sessions – Saturday, January 18 (cont'd.)

- 3:00PM (2624) *A numerical method for Kolmogorov equations in Hilbert spaces.*
Francisco Delgado-Vences*, Instituto de Matemáticas, Universidad Nacional Autónoma de México, and **Franco Flandoli**, Scuola Normale Superiore di Pisa (1154-35-979)
- 3:30PM (2625) *Fractional White-Noise Limit and Paraxial Approximation for Waves in Random Media.*
Olivier Pinaud, Colorado State University (1154-35-756)
- 4:00PM (2626) *Moment estimates for some renormalized parabolic Anderson models.* Preliminary report.
Cheng Ouyang, University of Illinois at Chicago (1154-60-402)
- ▶ 4:30PM (2627) *Strong Feller property of the magnetohydrodynamics system forced by space-time white noise via regularity structures.* Preliminary report.
Kazuo Yamazaki, Department of Mathematics and Statistics, Texas Tech University (1154-35-389)
- 5:00PM (2628) *Unique ergodicity for the damped-driven stochastically forced Korteweg-de Vries equation.* Preliminary report.
Vincent R Martinez, City University of New York-Hunter College (1154-37-380)

Julia Robinson Mathematics Festival

1:00 PM – 3:00 PM **Mile High Ballroom 4a-4c, Ballroom Level, Colorado Convention Center**

Organizers: **Thomas J. Clark**, Dordt University
Mark Saul, Julia Robinson Mathematics Festival
Hector Rosario, Julia Robinson Mathematics Festival
Phil Yasskin, Texas A&M University

Project NExT

1:00 PM – 2:15 PM **Mile High Ballroom 4d-4f, Ballroom Level, Colorado Convention Center**

Overcoming Anxiety in the Active-Learning Classroom.
Organizers: **Emelie Curl**, Christopher Newport University
Stephen Deterding, West Liberty University
Jordan Kostiuk, Brown University
Jillian Morrison, The College of Wooster

Mathemati-Con Presents

1:00 PM – 2:00 PM **Four Seasons Ballroom 1, Ballroom Level, Colorado Convention Center**

Showtime! What have mathematicians done for us? presented by Chris Budd, 2020 JPBM Communications Award Winner

AWM Workshop: Women in Several Complex Variables (WinSCV), II

2:00 PM – 5:00 PM **Room 207, Meeting Room Level, Colorado Convention Center**

Organizers: **Loredana Lanzani**, Syracuse University
Liz Vivas, Ohio State University

2:00PM (2629) *On geometric and computational aspects of Bergman kernel estimates.*
Alexander Nagel, University of Wisconsin, Madison, and **Malabika Pramanik***, University of British Columbia, Vancouver (1154-32-1528)

3:00PM (2630) *Existence of attracting domains in \mathbb{C}^3 for some holomorphic maps tangent to the identity.*
Sara Lapan*, University of California, Riverside, and **Feng Rong**, Shanghai Jiao Tong University (1154-32-428)

▶ 3:30PM (2631) *Hölder solutions to $\bar{\partial}$ problem on product domains in \mathbb{C}^n .*
Yifei Pan and **Yuan Zhang***, Purdue University Fort Wayne (1154-32-808)

4:00PM (2632) *Entropy of real rational surface automorphisms.*
Jeffrey Diller, University of Notre Dame, and **Kyounghee Kim***, Florida State University (1154-37-506)

4:30PM (2633) *The Poincaré-Dirichlet inequality for planar domains.*
Anne-Katrin Gallagher*, Bellevue, WA, **Jiri Lebl**, Oklahoma State University, Stillwater, USA, and **Koushik Ramachandran**, TIFR Centre For Applicable Mathematics, Bangalore (1154-32-900)

Mathemati-Con Presents

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

Showtime! A Dozen Proofs That 1=2: A Misguided Review of Mathematics presented by James Tanton, 2020 JPBM Communications Award Winner

**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 AMS Associate Secretary Riverside, California	Hortensia Soto MAA Associate Secretary Greeley, Colorado
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