DREXEL UNIVERSITY
College of
Arts and Sciences
Mathematics Department

$r = a\theta$

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Annual Report 2019-20

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Faculty

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Leadership Faculty

David Ambrose
*Assosciate
Department
Head*

Shari Moskow
*Department
Head*

J. Douglas Wright
*Assosciate
Department
Head*

Administration

Paige Chmielewski
*Undergraduate
Program Coordinator*

Kenneth Hemphill
Budget Coordinator

C. Gene Phan
Computer Specialist

Sobha Philip
*Graduate
Program Manager*

Tenure - Track Faculty

David
Ambrose

Jonah
Blasiak

Robert
P. Boyer

Patrick
Clarke

Darij
Grinberg

Pavel
Grinfeld

Yixin
Guo

R. Andrew
Hicks

Pawel
Hitczenko

Dmitry
Kaliuzhnyi-V.

Georgi S.
Medvedev

Cecilia
F. Mondaini

Shari
Moskow

Ronald
K. Perline

Marci
A. Perlstadt

Eric
J. Schmutz

Li
Sheng

Gideon
Simpson

Xiaoming
Song

Hugo
J. Woerdeman

J. Douglas
Wright

Thomas
Pok-Yin Yu

Teaching Faculty

Jason S. Aran

Yasmin B.-Pant

Fernando Carreon

Daryl Falco

Raymond J. Favocci

Anatolii Grinshpan

Jeffrey LaComb

Oksana P. Odintsava

Dimitrios Papadopoulos

Joel Pereira

Adam C. Rickert

Jeanne M. Steuber

Kenneth P. Swartz

K.S. Virbhadra

Richard D. White

Dennis G. Yang

Matthew Ziemke

Visiting Faculty

Anuj Abishek

Huseyin Acan

Fazel Hadadifard

Thomas Stojsavljevic

Adjunct Faculty

John Coppola

Harold Gilman

June Gordon
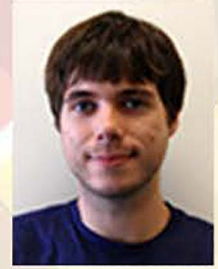
Boris Kheyfets

Susanne Kriete

Leo Lampone

Brianna Pezzato

Patricia H. Russel

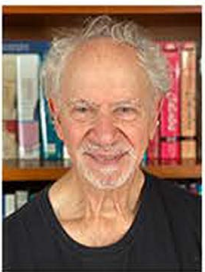Valerie Sarris

Patrick Shields

Olga Trubina

Sergio Zefelippo

Kai Zhao

Emiritus Faculty

Howard Anton

Loren Argabright

Robert Busby

William Goh

Charles Mode

Patricia H. Russel

Chris Rorres

Justin Smith

Jet Wimp

New Faculty

Yasmin B.-Pant
Teaching Instructor

Yasmin Boolakee-Pant received her MS in mathematics from Albert-Ludwigs University in Freiburg, Germany. She has been a faculty member at Delaware County Community College and was previously a public relations specialist in Germany.

Darij Grinberg, PhD
Tenure Track Assistant Professor

Darij Grinberg, PhD, received his Diplom (master's equivalent in Germany) in mathematics from the Ludwig-Maximilians-Universität Munich in 2011 and his PhD from the Massachusetts Institute of Technology in 2016. He joins Drexel following three years as the Dunham Jackson Assistant Professor at the University of Minnesota. His research interests include algebraic combinatorics, noncommutative algebra, symmetric functions, Hopf algebras, enumerative combinatorics and invariant theory.

Fazel Hadadifard, PhD
Visiting Assistant Professor

Fazel Hadadifard, PhD, received his PhD in mathematics in 2019 from the University of Kansas. His research interests include fluid dynamics and nonlinear systems of partial differential equations.

Jeffrey LaComb, PhD
Teaching Assistant Professor

Jeffrey LaComb, PhD, received his BS from Rensselaer Polytechnic Institute in 2013 and his master's and PhD from Duke University in 2019. His research interests include rare event simulation, dynamical systems, numerical analysis and mathematical biology.

Cecilia F. Mondaini, PhD
Tenure Track Assistant Professor

Cecilia Mondaini, PhD, received her PhD in mathematics from the Federal University of Rio de Janeiro. Prior to coming to Drexel, she held postdoctoral positions at Texas A&M University, Brown University's Institute for Computational and Experimental Research in Mathematics, and Tulane University. Her research interests include analysis of partial differential equations, fluid dynamics and stochastic processes.

Thomas Stojsavljevic, PhD
Visiting Assistant Professor

Thomas Stojsavljevic, PhD, received his PhD in mathematics from the University of Wisconsin-Milwaukee in 2019. His research interests include mathematical biology, ordinary and partial differential equations, parameter estimation, global sensitivity analysis, cellular automata models, network models.

Faculty Promotions

Xiaoming Song, *Ph. D,*
was promoted to Associate Professor with tenure starting
September 2020.

Publications

Acan, Huseyin, and B. Pittel,
Giant descendant trees and matching sets in the preferential attachment graph,
Random Structures Algorithms, 56, p. 37-62, 2020

Acan, Huseyin, S. Chakraborty, S. Jo, and S. R. Satti.
Succinct Data Structures for Families of Interval Graphs, Algorithmica, 2020

Akhunov, T., **David Ambrose**, and **J. Douglas Wright**,
Well posedness of fully nonlinear KdV type evolution equations, Nonlinearity, 2019

Ambrose, David M., and **J. Douglas Wright**,
Nonexistence of small, smooth, time-periodic, spatially periodic solutions for nonlinear Schrodinger equation, Quarterly of Applied Mathematics, 77, p. 579-590, 2019

Ambrose, David M., and A.L. Mazzucato,
Global existence and analyticity for the 2D Kuramoto-Sivashinksy equation.
Journal of Dynamic Differential Equations, 31, p. 1525-1547, 2019

Ambrose, David M.,
The radius of analyticity for solutions to a problem in epitaxial growth on the torus.
Bulletin of the London Mathematics Society, 51, p. 877-886, 2019

Ambrose, David M., E. Das Gupta, **Shari Moskow**, V. Ozornina, and **Gideon Simpson**,
Detection of thin high contrast dielectrics from boundary measurements,
Journal of Physics Communications, 3, p. 115016, 2019

Liu, S. and **David M. Ambrose**,
The zero surface tension limit of three-dimensional interfacial Darcy flow.
Journal of Differential Equations, 268, p. 3599-3645, 2020

Blasiak, Jonah, J. Morse, A. Pun, and D. Summers,
k-Schur Expansions of Catalan Functions, Advance Mathematics, 371, 2020

Aas. E, **Darij Grinberg**, T. Scrimshaw.
Multiline Queues with Spectral Parameters.
Communications in Mathematical Physics vol. 374, p. 1743 - 1786, 2020

Grinberg, Darij,
A double Sylvester determinant. Ars Mathematica Contemporanea., 2019

Hadadifard, Fazel, A. Stefanov,
Sharp relaxation rates for plane waves of general reaction-diffusion models,
Journal of Mathematical Physics, 61(4), 2020

Hadadifard, Fazel, A. Stefanov;
Steady states of the weakly forced SQG equation: existence and sharp relaxation rates;
J. Math. Fluid Mechanics.

Hadadifard, Fazel, A. Stefanov;
On the sharp time decay rates for the 2D generalized Quasi-Geostrophic equation and the Boussinesq system; J. of Nonlinear Science.

Hadadifard, Fazel,
Sharp time asymptomatics for the Quasi-Geostrophic Equation, The Boussinesq System and Near Plane Waves fo Reaction-Difusion Models. Thesis (Ph.D.) - Univeristy of Kansas, 155 pp., 2019.

Hadadifard, Fazel, **J. Douglas Wright**;
Mass-in-Mass Lattices with Small Internal Resonators; J. Studies in Applied Mathematics.

Hicks, R. Andrew, **Ronald K. Perline**, and S.G. Rody, S.,
Anti-eikonal equation of an eigenmirror,
Journal of the Optical Society of America A, 37(10), p. 1566-1573, 2020

Ibdah, H.A., **Cecilia F. Mondaini**, and E.S. Titi,
Fully discrete numerical schemes of a data assimilation algorithm: uniform-in-time error estimates,
IMA Journal of Numerical Analysis, 2019

Borcea, L., V. Druskin, A.V. Mamonov, **Shari Moskow,** and M. Zaslavsky.
Reduced order models for spectral domain inversion: embedding into the continuous problem and generation of internal data, Inverse Problems, 36(5), 2020
Cakoni, F., B.B. Guzina, **Shari Moskow,** and T. Pangburn.
Scattering by a bounded highly oscillating periodic medium and the effect of boundary correctors.
SIAM Journal of Applied Mathematics, 79(4), p. 1448–1474, 2019
Cakoni, F., **Shari Moskow,** T. Pangburn,
Limiting boundary correctors for periodic microstructures and inverse homogenization series,
Inverse Problems, 36(6), 2020

Martins, Rodrigo S. V. ; Panario, Daniel; Qureshi, Claudio, and **Schmutz, Eric**,
Periods of iterations of functions with restricted preimage sizes,
ACM Transactions on Algorithms, 16(3), 2020

Aristoff, D., J. Copperman, D. Makarov, **Gideon Simpson**, and Daniel Zuckerman,
Transient probability currents provide upper and lower bounds on non-equilibrium steady-state currents in the Smoluchowski picture. Journal of Chemical Physics, 151(17), 174108, 2019
Janssen, J., M. Luskin, J. Neugebauer, P. Plechac, **Gideon Simpson**, T.D. Swinburne, and M. Todorova,
Anharmonic free energy of lattice vibrations in fcc crystals from a mean-field bond,
Physical Review B, 102, 100101(R), 2020
Mell J.C., M.P. O'Connor, G.L. Rosen, **Gideon Simpson**, S. Woloszynek, Z. Zhao,
Exploring thematic structure and predicted functionality of 16S rRNA amplicon data,
PLoS ONE, 14(12), e0219235

Dongxiu, Xie, **Hugo J. Woerdeman,** and An-Bao Xu,
Parametrized quasi-soft thresholding operator for compressed sensing and matrix completion.
Computational and Applied Mathematics, volume 39, 149.   2020
Grossmann, Benjamin W. and **Hugo J. Woerdeman**,
On the Preservers of Maximally Entangled States,
Linear Algebra and its Applications, 583, p. 171-194, 2019
Kennett L. Dela Rosa & **Hugo J. Woerdeman**,
Location of Ritz values in the numerical range of normal matrices,
Linear and Multilinear Algebra, DOI: 10.1080/03081087.2020.1761280, (2020)

Androulakis, G., A. Wiedemann, and **Matthew Ziemke**,
The Induced Semigroup of Schwarz Maps to the Space of Hilbert-Schmidt Operators.
Mathematical Physics, Analysis, and Geometry, 23(10), 2020

Presentations

Acan, Huseyin, *"Several Threshold Problems in Uniform Attachment Graphs,"*
    University of Michigan, February 2020
Acan, Huseyin, *"Several Threshold Problems in Uniform Attachment Graphs,"*
    Kennesaw University, February 2020
Acan, Huseyin, *"Hamilton Cycles and Perfect Matchings in Uniform Attachment Graphs,"*
    The Ohio State University, November 2019

Ambrose, David, *"Existence Theory for a Mean Field Games Model of Household Wealth,"*
    Differential Equations and Nonlinear Analysis Seminar, Department of Mathematics,
    Norwegian University of Science and Technology (NTNU), September 2019, Invited
Ambrose, David, *"Some existence results for mean field games,"*
    Center for Nonlinear Analysis, Carnegie Mellon University, February 2020, Invited
Ambrose, David, *"Existence theory for nonseparable mean field games in Sobolev spaces,"*
    Workshop on Mean Field Games and Applications, IPAM, UCLA, May 2020, Invited
Ambrose, David, *"Existence Results for a Mean Field Games Model of Household Wealth,"*
    Conference on Mean Field Games, University of Chicago, February 2020, Invited
Ambrose, David, *"Existence Theory for a Mean Field Games Model of Household Wealth,"*
    SIAM Conference on Analysis of PDE, Minisymposium on Mean Field Games, December 2019, Invited
Ambrose, David, *"Traveling Waves with Multi-Valued Height in Interfacial Fluid Flows,"*
    SIAM Conference on Analysis of PDE, Minisymposium on Nonlinear Waves, December 2019, Invited

Grinberg, Darij, *The Petrie symmetrie functions and Murnaghan-Nayakama rules,*
    Institut Mittag-Leffler, Djursholm, Sweden, February 2020
Grinberg, Darij, *Guassian elimination greedoids from ultrametric spaces,*
    Insitut Mittag-Leffler, Djursholm, Sweden, March 2020
Grinberg, Darij, *From generalized factorials to greedoids, or meditations on the Vandermonde determinant,*
    Rutgers Experimental Mathematics Seminar, April 2020, online
Grinberg, Darij, *Littlewood-Richardson coefficients and birational combinatorics,*
    Algebraic and Combinatorial Perspectives in the Mathematical Sciences, August 2020, online

Hadadifard, Fazel, *"Sharp Relaxation Rates for Plane Waves of General Reaction--Diffusion Model,"*
    SIAM Conference on Analysis of Partial Differential Equations, La Quinta, CA, December 2019
Hadadifard, Hazel, *"Sharp time asymptotics for the quasi-geostrophic equation and nearplane waves of
    reaction-diffusion models",* Drexel University, Math department Colloquium, Philadelphia, PA, Nov 2019

Hicks, R. Andrew, Drexel Pedagogical Happy Hour, July 2020

Hitczenko, Pawel, Probability Seminar, Warsaw University of Technology, May 2020
Hitczenko, Pawel, colloquium, Division of Mathematical Sciences at NSF, June 2020

Mondaini, Cecilia, *"Mixing for Hamiltonian Monte Carlo in infinite dimensions,"*
SIAM Conference on Analysis of Partial Differential Equations, Special Session on Analysis and Applications of Deterministic and Stochastic Evolution Equations, California, CA, December 2019, Invited

Mondaini, Cecilia, *"Numerical Approximation of the invariant measure for 2D stochastic Navier-Stokes equations,"* SIAM Conference on Analysis of Partial Differential Equations, California, CA, December 2019, Invited

Mondaini, Cecilia, *"Rates of convergence to statistical equilibrium: a general approach and applications,"* Analysis Seminar, Temple University, Feb 2020, Invited

Mondaini, Cecilia, *"Rates of convergence to statistical equilibrium: a general approach and applications,"* Applied Math Seminar, Hunter College/CUNY, Feb 2020, Invited

Mondaini, Cecilia, *"Mixing for Hamiltonian Monte Carlo in infinite dimensions,"* 13th Berlin-Oxford Young Researchers Meeting on Applied Stochastic Analysis, June 2020, Invited

Mondaini, Cecilia, *"Mixing for Hamiltonian Monte Carlo in infinite dimensions"* SIAM Conference on Mathematics of Data Science, June 2020, Invited

Mondaini, Cecilia, *"Mixing for Hamiltonian Monte Carlo in infinite dimensions,"* Dynamics Days Digital, August 2020, Invited

Moskow, Shari, *"Reduced order models for spectral domain inversion: Galerkin equivalence and generation of internal data,"* workshop on Computational Methods for New Directions in Inverse Problems, Texas A&M University, February 2020, Invited

Moskow, Shari, *"Reduced order models for spectral domain inversion: Galerkin equivalence and generation of internal data,"* International Zoom Inverse Problems Seminar, UC Irvine, May 2020, Invited

Moskow, Shari, *"Reduced order models for spectral domain inversion: Galerkin equivalence and generation of internal data,"* Carnegie Mellon University applied math seminar, September 2019, Invited

Moskow, Shari, *"Reduced order models for spectral domain inversion: Galerkin equivalence and generation of internal data,"* workshop on Computational complex analysis, Isaac Newton Institute, Cambridge, UK, December 2019, Invited

Song, Xiaoming, *"Large deviations for functionals of some self-similar Gaussian processes,"* Seminar at the Department of Mathematics and Statistics, Boston University, November 2019, Invited

Song, Xiaoming, *"Nonlinear Feynman-Kac formulae for SPDEs with space-time noise,"* Seminar at the Department of Mathematics, Lehigh University, November 2019, Invited

Song, Xiaoming, *"Nonlinear Feynman-Kac formulae for SPDEs with space-time noise,"* Seminar at the Department of Mathematics, University of Kansas, September 2019, Invited

Woerdeman, Hugo J., *"Maximum determinant positive definite Toeplitz completions",* Operator Theory with its Applications (OTWIA), August 2020

Woerdeman, Hugo J., *"Error Bounds and Singularity Degree in Semidefinite Programming,"* 2020 Joint Meetings of the American Mathematical Society & the Mathematical Association of America, Denver, January 2020

Woerdeman, Hugo J., *"Spectral density functions of bivariable stable polynomials",* 2019 AMS Sectional Meeting at the University of Florida in Gainesville, November 2019

Wright, J. Douglas, *"Solitary Waves in Mass-in-Mass Lattices,"* minisymposium on Hamiltonian Lattice Dynamics SIAM NWCS, online, July 2020

Wright, J. Douglas, *"Traveling wave solutions of the capillary-gravity Whitham equation,"* Applied PDE Seminar, University of Washington, January 2020

Wright, J. Douglas, *"Traveling waves in diatomic FPUT lattices,"* Applied Interdisciplinary Mathematics Seminar, University of Michigan, November 2019

Grants & Awards

Ambrose, David, PI, National Science Foundation, DMS-1907684,
Partial Differential Equation Methods for Mean Field Games, 2019-2022, $316,981

Blasiak, Jonah, National Science Foundation,
Schubert Calculus and Catalan functions, 2019-2022, $180,000

Medvedev, Georgi, PI, National Science Foundation, DMS 1715161,
Mean Field Analysis of Dynamical Networks, 2017-2020, $199,000

Mondaini, Cecilia F., PI, National Science Foundation, DMS 2009859,
Determining Degrees of Freedom in Nonlinear Complex Systems: Deterministic and Stochastic Applications, $206,895, 2020-2023

Moskow, Shari, co-PI, National Science Foundation DUE,
Preparing Mathematics and Science Teachers for Middle School. 2018-2022, $1,199,374

Moskow, Shari, PI, National Science Foundation, DMS 2008441,
Novel Image Reconstruction Methods in the Frequency Domain, 2020-2023, $324,988.

Moskow, Shari, National Science Foundation,
Heterogeneous Optical Media: Boundary Effects, Spectral Properties and Inversion, 2017-2020, $339,999

Simpson, Gideon, Co-PI, National Science Foundation, Collaborative Research:
Stochastic Methods for Multiscale Distributions, 2018-2021, $98,134

Simpson, Gideon, PI,
Uncertainty Quantification for statistical models in dynamic environments, ARO, 2019-2020

Woerdeman, Hugo J., PI, National Science Foundation, DMS 2000037,
Modern Aspects of Multivariable Operator Theory and Matrix Analysis, 2020-2023, $249,000

Woerdeman, Hugo J., PI, Simons Foundation, Collaborative grant,
The multivariable Schur class and determinantal representations, 2015-2020, $35,000

Wright, J. Douglas, PI, National Science Foundation, DMS 2006172,
Singular and spatially heterogeneous perturbations of solitary waves, 2020 2023, $165,000

Yu, Thomas Pok-Yin, PI, National Science Foundation, DMS 1913038,
Geometric Approximation and Variational Problems, 2019-2022, $299,999

Conference Organizations & Faculty Appointments

Ambrose, David, vice-chair, *SIAM Activity Group on Analysis of Partial Differential Equations*

Ambrose, David, division editor, *Journal of Mathematical Analysis and Applications*

Moskow, Shari, Co-organizer, ICERM workshop,
Computational Statistics and Data-Driven Models, April 2020

Moskow, Shari, Co-organizer, AIP Applied Inverse Problems Minisymposium,
Anisotropic inverse problems and asymptotics, Grenoble, France, July 2019

Moskow, Shari, Co-organizer, ICERM semester program,
Model and dimension reduction in uncertain and dynamic systems, Spring 2020

Simpson, Gideon, session organizer, *Materials Research Society*, December 2019

Woerdeman, Hugo J., board member,
International Research Center for Tensor and Matrix Theory of Shanghai University

Woerdeman, Hugo J., vice president, Steering Committee,
International Workshop on Operator Theory and its Applications

Woerdeman, Hugo J., vice president, *International Linear Algebra Society*

Woerdeman, Hugo J., member, International Program Committee,
International Symposium on Mathematical Theory of Networks and System

Woerdeman, Hugo J., associate editor, *Annals of Functional Analysis*

Woerdeman, Hugo J., associate editor, *Matrices and Operators*

Woerdeman, Hugo J., panel member,
Operator Theory with its Applications (OTWIA) online conference, August 2020

Departmental Committees 2019-20

Tenure and Promotion

Chair: Eric Schmutz
All tenured faculty

Graduate Admissions Committee

Chair: Jonah Blasiak
David M. Ambrose
Xiaoming Song
Thomas Pok-Yin Yu (Spring)
Robert P. Boyer
Gideon Simpson (Fall)

Graduate Program Committee

Chair: J. Douglas Wright
Cecilia Mondaini
Yixin Guo
Robert P. Boyer
Pavel Grinfeld

Undergraduate Program Committee

Chair: Hugo J. Woerdeman
Jason S. Aran
Marcci A. Perlstadt
Joel Pereira
Matthew Ziemke
Ronald K. Perline
Darij Grinberg

Undergraduate Recruitment Committee

Chair: Dimitrios Papadopoulos
Ronald K. Perline
Pavel Grinfeld

Teaching Faculty Promotion

Chair: Dmitry Kaliuzhnyi-V.
All teaching faculty Associate level or higher

Transfer Credits

Li Sheng

Assistant Scheduler

R. Andrew Hicks

Colloquium Coordinator

Georgi Medvedev

Distinguished Speaker Coordinator

Patrick Clarke

Library Liason

K. S. Virbhadra

Math Competition Coordinator

Patrick Clarke

MSO Faculty Advisor

Jason S. Aran

Actuarial Society Faculty Advisor

Marci A. Perlstadt

Pi Day Coordinators

Adam C. Rickert
Daryl Falco
Jason S. Aran

Placement Coordinators

Raymond J. Favocci
Jason S. Aran

Other

Yixin Guo
Li Sheng
Dmitry Kaliuzhnyi-V.

In Memory of
Robert Immordino

Robert (Bob) Immordino was an
Assosciate Teaching Professor of the Math Department
for 15 years. His passion for life, excellence, and care
for others was evident inside and outside of the
classroom, from teaching to skiing, hang gliding, &
sailing. On January 13, family, friends and colleagues
gathered at Korman to honor his life.
He will be missed by us all.

Teaching & Research Assistants

Udoh
Akpan

Nathan
Anderson-Stahl

Luke
Brown

Joshua
Carmichael

Wonsang
Cho

Alexander
Joseph Furia

Anthony
Grabow

Eammon
Hart

Kathryn
Taylor Ioele

Benjamin
Irwin

Joshua
Jackson

Felix
E.G. Jones

Emily
Kay Kelting

Hyeju
Kim

Dominick
Maculoso

Joshua Andrew
McGinnis

Heather
Newman

Taylor
Pangburn

Alexandria
Perry

Samantha
Rodriguez

Kennett L.
Dela Rosa
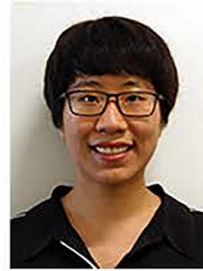
Robert
John Scholle

James
Thomas

Nathan
Anderson-Stahl

Isaac
Woods

Aleksander
Yaroslavskiy

Yaqi
Zhang

Student Information:

Publications:

Cakoni, F., B.B. Guzina, S. Moskow, and **Taylor Pangburn**.
Scattering by a bounded highly oscillating periodic medium and the effect of boundary correctors.
SIAM Journal of Applied Mathematics, 79(4), p. 1448–1474, 2019

Cakoni, F., S. Moskow, **Taylor Pangburn**,
Limiting boundary correctors for periodic microstructures and inverse homogenization series,
Inverse Problems, 36(6), 2020

Kennett L. Dela Rosa & Hugo J. Woerdeman (2020)
Location of Ritz values in the numerical range of normal matrices,
Linear and Multilinear Algebra, DOI: 10.1080/03081087.2020.1761280

Presentations:

Jackson, Joshua, *"A Determinantal Representation for Bivariate Polynomials whose Bezoutians admit a Canonical Factorization.",* AMS Sectional Meeting, University of Florida, Gainesville, Fl, Novembber, 2019.

Conference Organizations:

Yaqi Zhang, Invited Participant,
"Finding Needles in Haystacks: Approaches to Inverse Problems using Combinatorics and Linear Algebra",
AMS Mathematics Research Community, June-August 2020, online

Congratulations New Doctors!

On September 20, 2019, Joseph L. Erikson (left) successfully defended his thesis - *The Zero Attractor of Perturbed Chebyshev Polynomials and Sums of Taylor Polynomials for the Exponential* - under Professor Robert P. Boyer PHD (right)

On May 28, 2020, Joshua Carmichael (left) successfully defended his thesis - *Long wave approximations of the FPUT lattice under planar motion* - under Professor J. Douglas Wright PHD (right)

On May 29, 2020, Tayler Pangburn (left) successfully defended her thesis - *The Effect of Boundary Correctors on Scattering by a Periodic Obstacle* - under Professor Shari Moskow PHD (right)
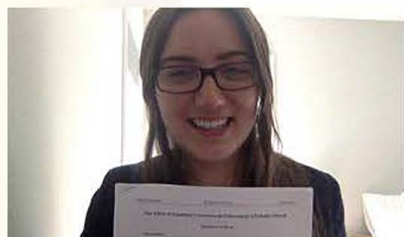
On June 4, 2020, James Thomas (left) successfully defended his thesis -
Three problems in the Asymptotics of group elements
- under Professor Eric Schmutz (right)

On June 8, 2020, Joshua Jackson (left) successfully defended his thesis -
Minimal Realizations and Determinantal Representations in the Indefinite Setting
- under Professor Hugo Woerdeman PHD (right)

On June 16, 2020, Alex Yaroslavskiy (left) successfully defended his thesis -
*Central Limit Theorems for Tableaux Related to the Partially Asymmetric Simple
Execution Process* - under Professor Pawel Hitczenko PHD (right)
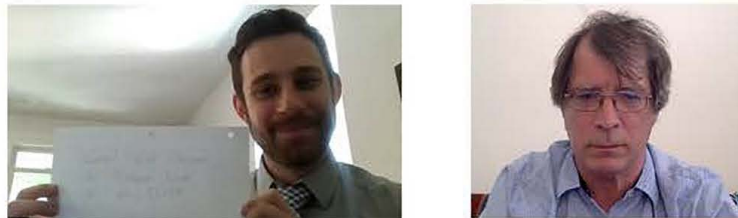
On June 16, 2020, Felix E. G. Jones (left) successfully defended his thesis -
High and Infinite-Dimensional Fitltering Methods
- under Professor Gideon Simpson PHD (right)

Graduate & TA Honors & Awards

University Wide 2019-2020 Teaching Assistance Excellence Award:
There is a real tradition of excellent teaching amoung our graduate students and it is great to see it recognized

Dominick
Macaluso

Departmental 2019-2020 Al Herr "TA Excellence" Award:
There is truly a culture of excellence among our TAs and this year's winners get to carry this banner of achievement

Kennett
Dela Rosa

Benjamin
Irwin

Undergraduate Honors & Awards

Robert J. Bickel Scholarship:
Presented in honor of Dr. Robert J. Bickel, who was a member of the mathematics department from 1946 to 1987

John
Bonnes

Holden
Eriksson

Brian
Proferes

Adam
Smith

Andrea
Umali

Anna
Wilson

Frank H. M. Williams Prize in Mathematics:
Presented annually in regonition of academic achievement in mathematics

Isaiah
Siegl

Dr. Robert C. Busby Mathematics Award:
Funded in honor of Drexel alumnus and Professor Robert C. Busby, who was a member of the mathematics department at Drexel from 1966 to 1968 and from 1970 to 2003. Presented to an outstanding undergraduate mathematics major woh volunteers their time as a mentor or tutor

Kshitij
Kayastha

Graduating Class of 2019-20

Bachelor of Science

Adam Smith - *Magna Cum Laude*
Alex D Kasantsidis
Alyson M. Suchodolski - *Magna Cum Laude*
Ana Ferariu
Dong Whan Jun - *Cum Laude*
James Joseph Friszell
Kayla E. Lees - *Cum Laude*
Narua A. Boerlin - *Cum Laude*
Paul Ciaccia
Ryan H.A. Hassing
Xizhi Tan - *Summa Cum Laude*
Yifan Zhu - *Cum Laude*

Bachelor of Arts

Abdullah M. Spall - *Magna Cum Laude*
Emily K. Collier
Ge Wang
Haorui Wang
Jacob Joseph
Jasper K.H. MacNaughton - *Magna Cum Laude*
Joseph R.Nuyannes - *Summa Cum Laude*
Kamyar Kamyar - *Magna Cum Laude*
Lin Yuan - *Magna Cum Laude*
Palak Bhargava - *Cum Laude*
Rebecca Keeny
Xinyuan Chen - *Magna Cum Laude*
Yuli Chen - *Summa Cum Laude*
Zipei Ma

Master of Science

Heather A. Newman
Katheryn T. Ioele
Samantha M. Rodriguez

SIAM
2019-20

The 2019-2020 academic year of SIAM started off just as any other year, and concluded as anything but normal! The first meeting of the year welcomed the incoming graduate students into the program, where the veteran graduate students offered advice, thoughts on being a first-year student, and strategies for studying for the qualifying exam. In addition, food was offered in the usual first meeting of the quarter tradition! In the Fall quarter, there were several informative talks, and we also welcomed a representative from the Woodrow Wilson Teaching Fellowship to discuss employment at secondary education schools with a need for math and science teachers. In the Winter quarter, we had a graduate student speaker every week of SIAM, and both speakers and attendees benefited greatly from these seminars. Unfortunately, upon going remote in the Spring quarter, a new experience for everyone, SIAM meetings were not able to be held. The fact that our department hosts a diverse group of graduate students returning to different time zones and drastic schedule changes, it was decided that it would be best to postpone meetings, and instead to put a plan in place for the 2020-2021 academic year to continue SIAM meetings regardless of their format. The students involved will always remember the 2019-2020 academic year of SIAM for a multitude of reasons!

10/16/19: AJ Furia:
Eigenvalue Perturbation Results for Linear and Nonlinear Eigenvalue Problems

10/30/19: Difficult Problem Rountable:
Students are invited to talk about hard problems they are working on

11/06/19: Joshua Jackson:
A Determinantal Represenation for Bivariate Polynomials Without Roots on the Bitorus

11/13/19: Neema Ndiba:
Woodrow Wilson Teaching Fellowship presentation

12/04/19: Joshua McGinnis:
Consensus Protocol

01/22/20: Dominick Macaluso:
Stability of Traveling Front Solutions in the neural Field Model

01/29/20: Eammon Hart:
Brownian Motion

02/05/20: Emily Kelting:
Inviscid Burgers Equation

02/12/20: Kennett Dela Rosa:
Location of Ritz Values in the Numerical Range of Normal Matrices

02/19/20: AJ Furia:
Solving for Scatterin Resonances in Perturbation Problems

02/26/20: Samantha Rodriguez:
The Existence of an Infinitely Long, Long, Square Free, Binary Word

03/04/20: James Thomas:
Compositions with 3 Pairwise Coprime Parts

03/11/20: Joshua McGinnis:
Multiscale approach to finding approximate solutions to a certain class of FPU systems

Talks
2019-20

10/02/19: **Benedetto Piccoli (Rutgers University):**
Illustrating a new type of evolution equations for Radon measures based on tools from optimal transport and the Wassertein distances

10/16/19: **Robert M Strain (University of Pennsylvania):**
Proving the existence of small-amplitude global-in-time unique mild solutions to both Landau equation including the Coulomb potential and the Boltzmann equation without angular cut off

10/30/19: **Alexander Teplyaev (University of Connecticut):**
Spectral Analysis and Diffusions on Singular spaces

11/06/19: **Kui Ren (Columbia University):**
Inverse data matching with the Quadratic Wasserstein Distance

11/13/19: **Edward Poon (Embry-Riddle Aeronautical University):**
Complexefications and Isometries

01/15/20: **Alexander Vladiirsky (Cornell University):**
Agreeing to disagree in Anistropic Crowds

01/29/20: **Yoichiro Mori (University of Pennsylvania):**
Planar from instabilities of the Bidomain Allen-Cahn Equations

02/05/20: **Apoorva Khare (Indian Institute of Science):**
Groups with Norms: From Word games to a Polymath Project

02/12/20: **Mahya Ghandehari (University of Delaware):**
Fourier Analysis on NOn Abelian Topological Gropus

10/10/19: **Vera Hur (University of Illinois at Urbana-Champaign):**
Stoke waves in a constant vorticity flow

10/17/19: **James MacLaurin (New Jersey Institute of Technology):**
Organized Biologicla Behavior Resulting from Slowly-Varying Randomness

10/24/19: **Guangqu Zheng (University of Kansas):**
Fourth moment theorem on Poisson chaos

11/03/19: **Fazel Hadadifard (Drexel University):**
Sharp time asymptotics for the quasi-geostrophic equation and near plane waves of reaction-diffusion models

11/21/19: **Cecelia Mondaini (Drexel University):**
Mixing for Hamiltonian Monte Carlo in infinite dimensions

01/30/20: **Thomas Stojsavljevic (Drexel University):**
Mathematical Modeling of Phytoplankton Distributions in Freshwater Ecosystems

10/03/19: **Nicholas Mayers (Lehigh University):**
The index and spectrum of Lie poset algebras

10/17/19: **Darij Grinberg (Drexel University):**
Quotients of symmetric polynomial rings deforming the cohomology of the Grassmannian

10/24/19: **Alejandro Ginory (Rutgers University):**
Positivity Conjectures for Identities involving Jack Polynomials

10/31/19: **Visu Makam (Institute for Advanced Study):**
Singular tuples of matrices is not a null cone

11/14/19: **Lisa Carbone (Rutgers University):**
A Lie group analog for the monster Lie algebra

12/16/19: **Nathan Williams (University of Texas, Dallas):**
Independence Posets

01/21/20: **Apoorva Khare (Indian Institute of Science):**
Schur polynomials, entrywise positivity preservers, and weak majorization

02/06/20: **George Seelinger (University of Virginia):**
K-Theoretic Catlan functions

02/13/20: **Siddharta Sahi (Rutgers University):**
Metaplectic representations, Weyl group actions, and assosciated polynomials

02/20/20: **Mark Skandera (Lehigh University):**
Generating functions for induced characters of the hyperoctahedrol group

10/24/19: **Anatolii Grinshpan (Drexel University):**
A semilinear system with positivity conditions

10/31/19: **Joshua Jackson (Drexel University):**
Determinantal representations of bivariate polynomials

11/14/19: **Edward Poon (Embry-Riddle Aeronautical University):**
Unitary orbit Preservers

11/21/19: **Ross Griebenow (Vertex Labs):**
Continued fractions and the irrationality measure of pi

12/05/19: **Thomas Pok-Yin Yu (Drexel University):**
The gradient descent method is cursed by ill-conditioning only in dimension 3 and higher

02/21/20: **Hugo J. Woerdeman (Drexel University):**
Error Bounds and Singularity Degree in Semidefinite Programming

03/06/20: **Kennett Dela Rosa (Drexel University):**
Star-shapedness in matrix analysis

MSO
2019-20

*The 2019-2020 year of the **Math Student Association** (dubbed 'MSO') showcased the many ways that mathematics is applied in the common world by students - from poker to rubix cubes, as well as discussion on challenging problems.*

*Omesh Dhar Dwivedi (**President**)*
*Alisha Augustin (**Vice President**)*
*Sanskriti Seernani (**Treasurer**)*
*Kayne Gaylie (**Event Coordinator**)*

Fall 2019

Putnam Information Session with Dr. Patrick Clarke:
Discussed Putnam Problems and prepared for the exam

Big Numbers Series I - Graham Numbers:
The kickoff of our Big Number Series where we explore and discuss interesting numbers that grow unexpectedly fast

Big Numbers Series II - Trees and Forests

Big Numbers Series III - Finale:
Discussion of Graham Numbers in the Tree and Forest Problem

Winter 2020

Annual Rubix Cube Night and Group Theory:
Discussion of Group Theory, symmetry, and the role they play in understanding the cube, efficient algorithms, and God's Number

Unsolved Problems in Mathematics: The Erdos Discrepancy Problem:
Discusion of the Erdos Discrepancy problem, a problem viable for a non-mathematical audience and Tao's latest proof of the problem

1st Annual Poker Night:
(Pictured Above) Discused the math behind the game of poker and how to play smart concluding with a tournament

MSO Game Night and Elections:
Our final winter event celebrated with a variety of games such as Uno, Go, and Mahjong

MRC
2019-20

Located in the Korman center, the Math Resource Center was open for 12 weeks in the fall quarter. A total of 3746 student visits recorded in this quarter. The program Assistant, Amy Tiernan left the job on November 14th, 2019 to pursue another career. We wish her the best! The winter quarter started on January 9th, 2020 and 3513 student visits recorded by March 13th, 2020. The activities on campus stopped on March 13th due to Pandemic and the MRC moved to online. The center opened on April 6th in the Spring quarter and the tutoring continued through the zoom platform. The faculty did their office hours at the center and the graduate and undergraduate student tutors helped Drexel students with their math difficulties. The faculty shared the zoom link in their class and students were able to join the MRC without any difficulty.

In the Spring quarter, the department created a position for the Tutor/front Desk Assistant position for coop students, especially math majors who are impacted by the pandemic with coop placements. A math major, Andrea Umali worked as a coop at the center in the Spring /Summer quarter. Around 402 students took advantage of the zoom session in the Spring quarter and 136 students in the summer. In 2019 -20 academic year, a total of 7797 student visits were reported.