institute for pure & applied mathematics

Fall 2024

MATHMatters

WITH PRIMES AWARD, ANASTASIA CHAVEZ BUILDS HER RESEARCH PROGRAM IN WAYS THAT WILL HELP HER STUDENTS

When she isn't teaching and mentoring students in her role as an assistant professor of mathematics at St. Mary's College of California, Anastasia Chavez is pursuing her academic interest in algebraic combinatorics — in particular, the objects known as matroids, which generalize the properties of independence in vector spaces. Chavez has most recently looked at matroids from a geometric perspective — as polytopes. It is the generalized nature of the notion of matroids that allows them to be understood in more than one area of math; thus, "they act as a nice bridge between fields of mathematics," Chavez says.

As someone with an interest in metaphorical bridges — whether it's bridges that allow her to connect with colleagues in other disciplines, or bridges that inspire young people to pursue degrees and careers in mathematics — Chavez feels especially comfortable at the Institute of Pure and Applied Mathematics (IPAM), which fosters wide-ranging interdisciplinary interactions as well as offering a myriad of programs designed to engage and support students.

Chavez recently received a two-year NSF Partnership for Research Innovation in the Mathematical Sciences (PRIMES) program grant to continue her studies in matroid

Anastasia Chavez
St. Mary's College of California

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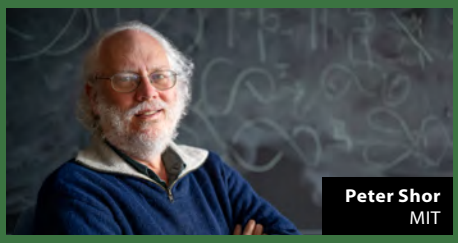
GREEN FAMILY LECTURES



Peter Shor
MIT

Peter Shor, a Professor of Applied Mathematics and the Chair of the Applied Mathematics Committee at the Massachusetts Institute of Technology, gave a Green Family Lecture Series (GFL) in November 2023. He is widely regarded for his pioneering work in quantum computing. In the first lecture, Professor Shor discussed quantum algorithims, culminating in a description of the famous Shor Algorithm for prime factorization. The second lecture focused on the importance of quantum error correction in quantum computing and discussed several approaches.

(continued on page 4)

PUMA PROGRAM FOR STUDENTS

PUMA, The Practicum for Undergraduate MAthematicians, is a series of workshops for rising sophomores, including community college students transitioning to upper-division mathematics. It is designed to support and encourage participation in specific mathematical sciences research areas, particularly among diverse cohorts of students from the Los Angeles area. PUMA seeks to motivate and empower students by exposing them to various directions of modern-day mathematics so they can more confidently navigate their mathematical journey.

Modeled after the PUNDiT program by Dr. Edray Goins focused on number theory, each PUMA includes tutorials, problem sessions, expository lectures, and professional development sessions. Foundational concepts are introduced, and hour-long problem sessions are facilitated by graduate TAs. Expository lectures delivered by experts in the research area introduce students to current exciting

(continued on page 4)

IPAM IN CONGRESS

With mathematics increasingly becoming central to our daily lives – from optimizing business decisions, to ensuring secure communications through encryption, to faster MRI scans made possible by compressive sensing, to searches for new materials and new medical drugs enabled by mathematical algorithms – government support for mathematics research is as critical as ever.

On December 6, 2023, IPAM and the American Mathematical Society jointly hosted a Congressional briefing entitled

Left to Right: Dima Shlyakhtenko, Alan Lee, Selenne Bañuelos, and Christian Ratsch

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FEATURES

HIGHLIGHTS

INFORMATION

NOTE FROM DIRECTOR DIMA SHLYAKHTENKO


Dima Shyakhtenko
IPAM Director

Last year, IPAM has explored deep connections between mathematics and physics through programs on Mathematical and Computational Challenges in Quantum Computing (Fall 2024) and Statistical Mechanics, Integrable Systems, and Geometry (Spring 2025). Both programs were highly successful in establishing new collaborations and pushing the boundaries of scientific knowledge.

Thanks to support from our Diversity, Equity, and Inclusion endowment, IPAM was able to expand its focus on DEI in mathematics. Our new Practicum in Undergraduate Mathematics (PUMA) program, following an idea of IPAM Trustee Edray Goins, showcases advanced mathematics to diverse groups of college students. With additional NSF funding, IPAM will be co-organizing the Modern Math Workshop at SACNAS this Fall, and the 4th LatMath conference in March 2025.

Several people deserve a special recognition for their commitment to IPAM. Nancy Potok is stepping down as the chair of our Board of Trustees after 4 successful years. Long time IPAM advocate and supporter Alan Lee is the chair-elect. We welcome Terry Tao in his new role as a special projects director.

I am very grateful to our new CAO Ann Fain as well as to our amazing staff, Rich Bartlebaugh, Sabrina Del Sid, Lilly Hurtado, Takamasa Imai, Jim Kimmick, Abby Navin, Aida Velasco, Karen Villasano, Jun Wan, Ginger Williams, Ivan Zhao, for their hard work and for making IPAM such a special place to do mathematics.

Looking at the year ahead it just remains to say: Math Changes Everything! ■

IPAM PROVIDES IDEAL VENUE AS JOSEPH M. LANDSBERG MOVES OUTSIDE REALM OF PURE MATHEMATICS

After starting his career as a pure mathematician doing algebraic and differential geometry, Joseph M. Landsberg began to pivot into new areas — exploring important questions in theoretical computer science, as well as working with physicists on tensor networks and quantum information. As he became more active in pursuits that relied on collaborations with individuals outside his disciplinary scope, Landsberg found the Institute for Pure and Applied Mathematics (IPAM) to be an ideal venue for engaging in the extended, informal exchanges that could advance this work.

Landsberg, the Owens professor of mathematics at Texas A&M University, focused early in his career on the area of differential geometry — the study of geometric objects using calculus — and in that work utilized representation theory, the systematic use of symmetry in linear algebra. He then moved on to algebraic geometry — the study of objects defined by polynomial equations. A little more than a decade after completing his PhD, he became interested in questions from outside of theoretical mathematics — in particular, a problem related to the complexity of multiplying matrices. In 1969, the mathematician Volker Strassen proved that the matrix multiplication algorithm that had been used for centuries was not optimal — a discovery that paved the way for a new frontier in computer science known as the complexity of matrix multiplication. Computer scientists began to produce ever more efficient algorithms for multiplying matrices, but there has been almost no progress since 1988. Landsberg's main contribution to the area has been to prove lower complexity bounds — that is, showing there is a limit to how much algorithms can be improved. For example, he showed that Strassen's original algorithm for 2x2 matrices cannot be improved upon.


Jospeh M. Landsberg
Texas A&M University

Landsberg began working with physicists on tensor networks and quantum information, and there, too, he used mathematics to disprove a long-held assumption. "Physicists were assuming that if you have a sequence of tensor networks and you take a limit, at the end you still have a tensor network — but that's false," Landsberg says.

Although intriguing findings had emerged from a number of disciplines on tensor methods, there had been little exchange or collaboration between theoreticians and developers of practical algorithms when Landsberg was ask to join the organizing committee of the 2021 IPAM long program Tensor Methods and Emerging Applications to the Physical and Data Sciences, which was held virtually because of COVID-19. "It was painful not to be able to meet in person, but we still learned quite a bit," Landsberg says. He was instrumental in developing a basic lecture series that aimed to establish a common language among the disparate participants.

As productive as the online program was, "we had two follow-up reunion workshops, and it was great to finally meet these people in person," Landsberg notes. So Landsberg embraced the opportunity to co-organize an

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IPAM Provides Ideal Venue

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in-person Tensor Networks workshop early this year. Held February 5-9, Tensor Networks was organized on the heels of one group's announcement that a task performed with a tensor network on a classical computer was more effective than the same task performed on Google's quantum computer. The workshop brought in members of that group as well as others — including a mix of applied and pure mathematicians, computer scientists, theoretical physicists, computational physicists, and industry representatives — to compare the computational advantages of quantum computing vs. tensor networks.

"This is an area where there's a lot of opportunity for great exchanges because of the tension between the theory and the practice," Landsberg says. "In many cases, the theory hasn't caught up to the practice, and so we have interesting questions that we can work on to try to understand why these methods that seem to make no sense from a geometric point of view are producing such good results."

For Landsberg, the workshop produced benefits that were both tangible and intangible. "The main takeaway from these meetings is to get an idea of what the central problems are that people in other areas are working on and what we might be able to contribute to help," he says. "That was a vague concept beforehand, but after the workshop, there are quite a few things I've learned that are opportunities for mathematicians to work on. And in some cases, while we're together, once we understand what the people in other fields are dealing with we might be able to say, 'This is known mathematics — here's the answer to your question.' "

Landsberg recently published a textbook, Quantum Computation and Quantum Information Theory: A Mathematical Perspective, aimed at explaining quantum computing and quantum information theory to graduate students in mathematics. He says his interactions with practitioners through his IPAM experiences served as a guide as he set out to describe the state of the art in the fields.

"IPAM provides a great opportunity for interactions among people who wouldn't otherwise communicate," Landsberg says. "It can be very hard for me to read a physics paper and really understand what's going on. But if I have the person who wrote the paper in the room with me, we can talk until I have a grasp of the issue." ■

MARIA GABRIELA BOADA MODELS QUANTUM NOISE AT IPAM

Quantum computing has generated considerable buzz in recent years, with speculation that increasing computing power by exploiting quantum superposition could revolutionize our ability to solve previously intractable problems. But Maria Gabriela Boada, a PhD candidate in physics at the University of Texas, San Antonio (UTSA), notes that before that potential can be unleashed, significant hurdles must be cleared. "We don't have a fully realized quantum computer yet, and the reason is that they're 'noisy,'" she explains.

Boada works on noise models for quantum systems, and specifically their applications to quantum information and computation. It is increasingly apparent that modeling noise in quantum computers requires sophisticated mathematics to study the interaction between the environment and the quantum system that comprises the computer itself. One approach involves treating the quantum computer as an open quantum system, viewing it as a subsystem that has been "intrinsically interlocked or entangled with its environment," she says.

Boada's current focus stems from her time spent at IPAM. Along with her PhD advisor Jose Morales, Boada came to IPAM for the fall 2023 program Mathematical and Computational Challenges in Quantum Computing. In addition to playing an active role as a long-term core participant, she led the working group Open Quantum Systems (OQS). One of several self-organized working groups during the long program, it included a core of 10-15 people who met weekly, and featured talks and discussions with experts who brought different perspectives to the table.

One focus for the group was on "a big disconnect related to why quantum machines aren't moving to the next era of computation," Boada says. "The big question — asked by Soo-Jong Rey on the first day of OQS — is, what sort of control is feasible? And what we found was that the leading experts in open quantum systems don't share language with the people designing the devices." That led to a subgroup that Boada also led, Autonomous Quantum Error Correction. "The idea is to work directly with hardware folks utilizing a recent breakthrough, the design of a device capable of correcting itself in its sleep," she explains.

"We were very productive and raised a lot of awareness about these disconnects," Boada says. "It was a great experience, and I left with friends I now have on speed dial — people I can call whenever I have a question on something that they have more knowledge about."

Boada continued to meet weekly with her subgroup colleagues after returning to UTSA, and they began discussing new collaborations, papers, and proposals. She returned to IPAM earlier this year for the Winter School on Quantum Information Science for Chemistry, which was aimed at early-career scientists in quantum information science and related disciplines.

"What's great about IPAM is that they don't restrict you," Boada says. "IPAM provides the resources, the support, and the freedom to organically interact with the other participants. You can attend a talk and then sit down over coffee and discuss it. You get to know a lot of people, and that makes for great outcomes." ■

Maria Boada
UT San Antonio

NEWS STORIES

GREEN FAMILY LECTURES

(continued from page 1) Another GFL was given by Hugo Duminil-Copin in May 2024. Hugo Duminil-Copin received his Ph.D. from the University of Geneva in 2011, where he was also appointed professor of mathematics in 2013. He has also been a permanent professor at the Institut des Hautes Etudes Scientifiques in Bures-Sur-Yvette since 2016. In 2022 he was awarded the Fields Medal. His two lectures focused on the mathematical area of statistical mechanics, and he described applications from ferromagnetism to percolation theory to the game of HEX.

Hugo Duminil-Copin
The University of Geneva

PUMA PROGRAM

(continued from page 1) area introduce students to current exciting mathematical questions. The professional development sessions cover essential topics for STEM professionals such as constructing a curriculum vitae (CV), preparing materials for summer research opportunities, and guidance on seeking letters of recommendation. In addition, mentors provide valuable advice and students gain access to supportive networks.

IPAM IN CONGRESS

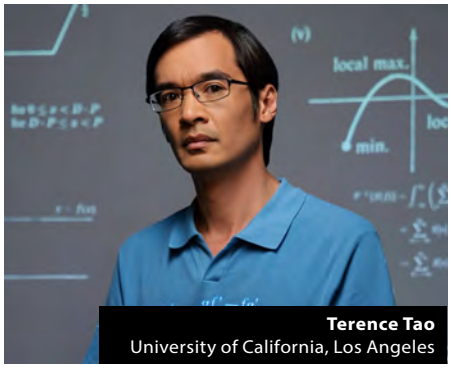
(continued from page 1) "Math Changes Everything – Importance of Mathematics to the U.S.: An Industry Perspective" in Washington, DC. Alan Lee, IPAM's Board of Trustees Chair-elect and Chief Technology Officer at Analog Devices, Inc., spoke of the critical need for more strategic investment in mathematics and the substantial societal benefits of such investment. He emphasized that mathematics – and mathematicians – are key to fueling innovation in areas as diverse as personalized medicine, supply chain management, health of the planet, and national defense. Following his presentation, Lee fielded questions on a variety of U.S. government policies.

RESEARCH IN INDUSTRIAL PROJECTS FOR STUDENTS (RIPS) CELEBRATION 2023

In August 2023, we celebrated the success of IPAM's summer undergraduate Research in Industrial Projects for Students (RIPS) program. IPAM provides a unique and valuable real-world industry exposure to undergraduate students from all over the world. More than 700 students have participated in the program since the inaugural RIPS in 2001. The Los Angeles program has now been complemented by a satellite program in Singapore, and 2 related graduate student versions (G-RIPS) in Sendai, Japan, and Berlin, Germany. The celebration of 23 years of RIPS reunited alumni and friends of the program, and included keynote talks, panel sessions, and a banquet.

DIRECTOR OF SPECIAL PROJECTS

UCLA Mathematics Professor Terence Tao will be joining IPAM as a Director of Special Projects. Tao will help formulate and realize IPAM's scientific vision and its mission. In this role, he will also help IPAM reach a wide mathematics and scientific community, solicit proposals, and recruit organizers for future IPAM programs. As one of the most prominent mathematicians in the world, Tao brings to IPAM his wide vision of mathematics and science as evidenced by multiple honors, including the Fields Medal, Breakthrough Prize, membership in several Academies, including the National Academy of Science, and his ongoing service on President Biden's Council of Advisors on Science and Technology.



Terence Tao
University of California, Los Angeles

LATMATH

IPAM will host the triennial Latinx in the Mathematical Sciences Conference (LatMath) on the UCLA campus on March 6-8, 2025. LatMath showcases the achievements of Latinx researchers in the mathematical sciences. The goal of the conference is to encourage Latinx to pursue careers in the mathematical sciences, promote the advancement of Latinx currently in the discipline, showcase research being conducted by Latinx at the forefront of their fields, and build a community around shared academic interests. The conference will include research talks, a poster session, professional development and mentoring activities, panel discussions, interactive storytelling, and opportunities for networking. This conference is sponsored by the Mathematical Sciences Institutes Diversity Initiative, with funding from the National Science Foundation Division of Mathematical Sciences.

PUMA 2024

FRONTIERS SOCIETY

IPAM offers 3 distinct elevated Frontiers Society membership levels. These membership levels are valid from the day of the donation until December 31 of the following calendar year. Couples may join with a single membership.

Innovator ($200+): Benefits include: An IPAM gift (T-shirt, mug, or other), mention of your name in the annual newsletter and on the IPAM webpage, regular updates about IPAM, and a print copy of the annual newsletter.

Visionary ($1000+): Benefits include: All the benefits of the Innovator level membership, an invitation to at least one special (annual) IPAM event, and reserved seating at all public (general audience) IPAM events.

Champion ($2000+): Benefits include: All the benefits of the Visionary level membership, and the naming of a seat in the IPAM lecture hall.

There are additional naming opportunities for larger donations.

FUNDRAISING PRIORITIES

Facilities Improvement. Upkeep and enhancement of IPAM's space is essential in ensuring a healthy and safe workplace. Your gift will help create and maintain a welcoming place for our participants and the math community.

Dependent Care Fund. Help IPAM support participants with depedent care needs.

Diversity, Equity, and Inclusion. Help IPAM improve DEI in all of its activities. Last year this fund supported two PUMA events and the graduate summer school, GOALS.

Directors Endowment. Donations to this fund will allow the director to fund activities and programs that cannot easily be funded by other sources. It will also support the research activities of the director, and thus help with the recruitment of future directors.

Renovations at IPAM

DONOR RECOGNITION

IPAM wishes to thank everyone who gave to the Frontiers Society in the past year:

SPECIAL RECOGNITION

James Cavendar Fraser
J.B. Berland Foundation
Egbert Sau-Nam Tse Ph.D.

CHAMPIONS

Robert S. Baker
Michael Webb Thacher
John Brady Garnett

VISIONARIES

James Cavendar Fraser
Vanguard Charitable Trust
Ronald J. Stern
Alfred W. Hales
Dimitri Y. Shlyakhtenko

INNOVATORS

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Christian Ratsch
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Teagan Johnson
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Michael Joseph Popelar
Stan Schein
Michael Sheffler

CORPORATE GIVING

IPAM received gifts from the following companies and government agencies in the past year:

Advanced Micro Devices Inc
The Aerospace Corporation
Air Force Research Labratory
Toyota
Raytheon Technologies
Relay Therapeutics
IBM
Lawernce Livermore National Labratory
SAP

JOIN NOW!

To learn more about IPAM's Frontiers society, fundraising priorties, or to make a contribution, please go to:

ipam.ucla.edu/frontiers-society/donate/.

UPCOMING PROGRAMS

LONG PROGRAMS

Mathematics of Intelligences
September 9 – December 13, 2024

Non-commutative Optimal Transport
March 10 – June 13, 2025

Bridging the Gap: Transitioning from Deterministic to Stochastic Interaction Modeling in Electrochemistry
September 3 – December 12, 2025

Multi-Fidelity Methods for Fusion Energy
March 9 – June 12, 2026

WORKSHOPS

Sampling, Inference, and Data-Driven Physical Modeling in Scientific Machine Learning
January 13 – 17, 2025

Rotating Turbulence: Interplay and Separability of Bulk and Boundary Dynamics
January 27 – 31, 2025

Computational Interactions between Algebra, Combinatorics, and Discrete Geometry
February 10 – 14, 2025

Free Entropy Theory and Random Matrices
February 24 – 28, 2025

Latinx in the Mathematical Sciences Conference 2025
March 6 – 8, 2025

Research Collaboration Workshop, "Women in Randomized Numerical Linear Algebra"
August 11 – 14, 2025

SUMMER RESEARCH PROGRAMS

RIPS Los Angeles 2025
June 23 – August 22, 2025

RIPS Singapore 2025
May 19 – July 18, 2025

G–RIPS Berlin 2025
June 23 – August 15, 2025

G–RIPS Sendai 2025
June 17 – August 7, 2025

CALL FOR PROPOSALS

IPAM seeks proposals from the mathematical, statistical, and scientific communities for its long programs, winter workshops, summer schools, and exploratory workshops. Programs are selected on the basis of their scientific impact and contribution to IPAM's goals of improving equity, diversity and inclusion in mathematics and other sciences. Please send your proposals by September 30th to the IPAM Director at director@ipam.ucla.edu.

WINTER WORKSHOPS

Winter workshops are typically five days in length, with 20–25 presentations. The proposal should include a short description of the mathematical and scientific content, names of individuals to serve on the organizing commit tee, and names of potential speakers and participants, and a statement of broader impacts of the workshop.

EXPLORATORY PROGRAMS

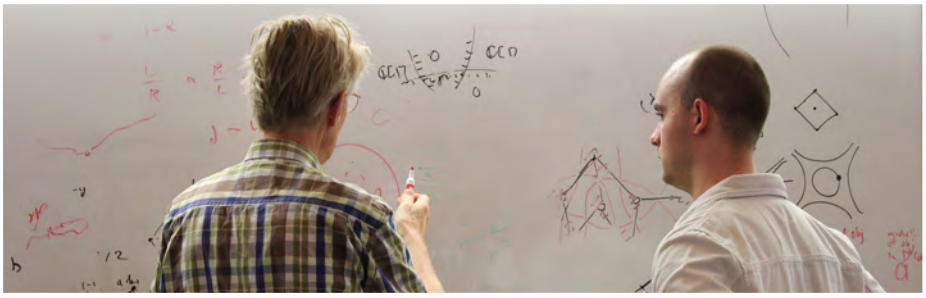
Exploratory workshops address urgent problems that mathematics may help solve. They are two or three days long, and can be organized in less than a year. The proposal should follow the guidelines for winter workshops.

LONG PROGRAMS

Long Programs generally have two complementary streams: one mathematical and one (or more) from other related scientific disciplines where there is the potential for a fruitful and exciting interaction. The proposal should include a brief description of the topic, names of individuals to serve on the organizing committee, and a preliminary list of senior researchers and representatives of industry and government you would like to invite. In addition, a statement of broader impacts, including the goal of improving DEI in mathematical and other sciences, should be included.

SUMMER SCHOOLS

Summer schools are one to three weeks in length and incorporate both tutorials (a series of 3–4 talks) and research talks illustrating applications. They are directed toward graduate students and postdocs.



MARK YOUR CALENDARS

January 27, 2025. Robert Ecke will give a public lecture on "Tales of Rotating Thermal Convection."

February 3 - 5, 2025. Quantum Winter School.

IMPORTANT DEADLINES

February 3, 2025. Application deadline for IPAM's Research in Industrial Projects for Students (RIPS) Programs in Singapore and Los Angeles.

February 23, 2025. Application deadline for IPAM's Graduate-level Research in Industrial Projects for Students (G-RIPS) Programs in Berlin and Sendai.

For more information, go to **www.ipam.ucla.edu.**

With PRIMES Award, Anastasia Chavez Builds Her Research Program

(continued from page 1)

theory while attending IPAM's spring 2024 long program Geometry, Statistical Mechanics, and Integrability (GSI2024). PRIMES was established to boost the participation of members of groups underrepresented in the mathematical sciences through their increased involvement in research programs at IPAM and other mathematical sciences institutes. The award includes funding for teaching relief and travel both before and after Chavez's participation in GSI2024, as well as support during her visit.

"This has given me a great opportunity to take a step away from teaching and focus on my research in a way I haven't been able to do since my postdoc years," Chavez says. "It's rejuvenating, while providing the foundational experience of thinking about these ideas differently."

Chavez's first IPAM experience came as a graduate student in 2015, when she attended that year's LatMath conference. Now funded by NSF's Mathematical Sciences Diversity Initiative, LatMath addresses the underrepresentation of Latinx in the mathematical sciences by showcasing the research contributions and achievements of junior and senior members of the Latinx mathematics community, as well as providing mentoring and career advice to Latinx individuals at the high school, undergraduate, graduate, postdoctoral, and junior faculty levels. Chavez found herself energized, and returned to speak at sessions for the 2018 and 2022 LatMath conferences. "It was an amazing experience to be in a community with people who share similar cultural backgrounds and interests, while at the same time being able to talk about the math that we are all excited about," she says.

The desire to motivate more Latinx individuals to go into the mathematical sciences has been a driving force for Chavez for many years. "That was a big part of why I decided to pursue a PhD," she says. "And now that I'm in this position, I try to provide mentorship that is both challenging and supportive, and to show students that math is not something they need to fear — that it can be fun." Toward that end, Chavez co-organized IPAM's most recent Practicum for Undergraduate MAthematicians (PUMA) program in combinatorics, held in April. Over the course of two weekend days, PUMA seeks to build curiosity and confidence in students as they transition into upper-division mathematics courses, offering a learning experience in which they are exposed to various directions in modern-day math.

Chavez says she greatly benefited from her experience at GSI2024, which included researchers from disparate realms. "Besides bringing together people who think, like I do, about combinatorial objects, it brought folks into the room who do probabilistic and statistical mechanical work — areas of math I've never done research in before," she says. "Often what's exciting about combinatorics, and math in general, is that you see things from other areas that look similar to what you've seen, and you start asking questions about what the relationship is. Being able to have those free-flowing conversations with people from other areas of math expanded the way I see my own work."

Beyond her GSI2024 experience, Chavez says she intends to use the support provided by the two-year PRIMES award to build her research program while also bringing the benefits to her students. Plans are underway for Chavez to lead a special-topics course at St. Mary's College based on her research interests, aimed at students in computer science and applied mathematics as well as pure math. She is also taking advantage of her time away from teaching to write more papers and attend additional conferences, and hopes that the PRIMES award will position her for future grants. "I'm going to keep this snowball rolling, building on the momentum that was started," Chavez says. "I'm incredibly grateful for the supportive community at IPAM and Saint Mary's College that's made this possible." ■

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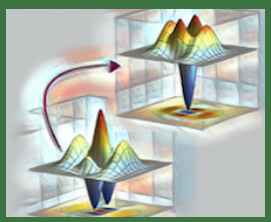
math changes everything.

2025 LONG PROGRAMS

SPRING 2025

NON-COMMUTATIVE OPTIMAL TRANSPORT

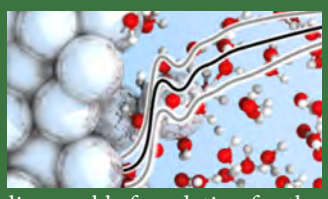


Optimal transportation (OT) has become a key field, exploring applications across mathematics, economics, meteorology, geometry, statistics, fluid mechanics, and engineering. Recently, OT theory has expanded to state spaces like density matrices, operators, or more generally C* and von Neumann algebras, which are non-commutative. Despite a shared mathematical feature, a unified geometrical perspective is lacking. Additionally, many crucial analytical, computational, and statistical challenges remain unsolved, impeding the development of practical applications.

The program fosters collaboration among math areas interested in OT, focusing on: Evolution equations and Wasserstein distances for density operators, Quantum optimal transport, Semidefinite relaxation of non-commutative transport, Statistical and probabilistic aspects of non-commutative transport, Matrix and Operator Functional inequalities, Computational algorithms solving non-commutative optimal transport.

FALL 2025

BRIDGING THE GAP: TRANSITIONING FROM DETERMINISTIC TO STOCHASTIC INTERACTION MODELING IN ELECTROCHEMISTRY



Electrochemistry is an interdisciplinary field that bridges chemistry, materials science, biomolecular science, and mathematics to explore the atomic-scale interplay between electrical and chemical processes. It is an increasingly crucial and indispensable foundation for the development and implementation of green-technology solutions to broad classes of industrial domains. Indeed, electrochemical reactions and interfaces are integral to understanding the intricate biochemical processes that govern life. This program seeks to bridge the gap between deterministic and stochastic modeling in electrochemistry by facilitating collaboration among applied mathematicians, electrochemists, and computational scientists. By fostering discussions and knowledge exchange, the program aims to unlock the potential of a stochastic approach to interaction kernel learning, leading to more accurate and realistic electrochemical simulations.