HMMT November 9, 2025 Education Events

Education Events Schedule

[Harvard Campus Map]

Time (EST)	Sever Hall 202	Sever Hall 213	Sever Hall 214
8:30 AM – 8:50 AM	**Breakfast** **Boylston Hall - Ticknor Lounge**		
9:00 AM – 9:50 AM	**Klara Barbic** *Saving Lives: More than Just a Statistic*	**Mark Saengrungkongka** *Primality Testing in Polynomial Time*	**Jacob Paltrowitz** *The Ungar Games*
10:00 AM – 10:50 AM	**Scott Sheffield** *Martingales and the Optional Stopping Theorem*	**L. Mahadevan** *Mathematics as Metaphor*	**Tanya Khovanova** *What I Learned from Doing Math Research with Kids*
11:00 AM - 11:50 AM	**Michael Penn** *Adding it All Up — the Basics of Integer Partitions* **Sever Hall 113**		
12:00 PM – 12:50 PM	**Lunch** **Boylston Hall - Ticknor Lounge**		
1:00 PM – 1:50 PM	**Undergraduate Panel** *Research in High School and Undergrad*	**Paul Seidel** *Billiards, Tilings, and Mechanical Systems*	**Themistoklis Haris** *Algorithms for Data Streams*

9:00 AM – 9:50 AM

Klara Barbic

Saving Lives: More than Just a Statistic

Location: Sever Hall 202

Many think of mathematics as geometry or proofs. But statistics is mathematics as well, and in my experience the hardest and most rewarding. I'll share why I decided to study statistics and how it let me answer real biomedical questions. We'll look at examples of bioinformatics tools that run on probability, inference, and optimization under the hood. Then I'll discuss my summer research and how I used statistical thinking to design analyses, test hypotheses, and help turn messy data into publishable medical results with actionable insights. My main message is simple: if you love math, don't limit yourself to "pure" problems. Statistics opens doors to medicine, biology, computer science, and design, and demands the same creativity and rigor.

Klara Barbic is a junior at Harvard studying Statistics (Biostatistics and Computational Biology track) and pursuing a concurrent master's degree in Statistics. Over the past two summers, she did biomedical research and statistical analyses for medical papers, resulting in several publications. She works at a startup focused on bilateral relations and AI, and will be working in healthcare consulting next summer.

Mark Saengrungkongka

Primality Testing in Polynomial Time

Location: Sever Hall 213

Given a positive integer n, how can we determine whether n is prime? In a 2002 breakthrough by Agrawal, Kayal, Saxena, there is an algorithm that does this in $O(\log^{10.5+\varepsilon}(n))$ *time, polynomial in number of digits of n. Unlike most recent breakthroughs in number theory, which often come with lengthy proof and complicated tools, the proof of this algorithm is relatively short and elementary. We will discuss the algorithm and the key elements of its proof.*

Mark Saengrungkongka is a senior at MIT studying math. He is interested in number theory and combinatorics. He is currently the historian of HMMT and has served as problems staff, problems czar, and problem czar advisor. In his freetime, he enjoys climbing and cooking.

Jacob Paltrowitz

The Ungar Games

Location: Sever Hall 214

Chocolate bars are often fun to Nibble. We look at strategies in a two-player game of nibbling away corners of chocolate bars. We also can generalize this game using partially ordered sets. Come ready to play games and have fun!

Jacob Paltrowitz is a junior at Harvard studying math. He has held all three problems-related roles in HMMT, currently serving as problems advisor. Outside of math, he enjoys watching baseball and cooking with Mark Saengrungkongka.

10:00 AM – 10:50 AM

Scott Sheffield

Martingales and the Optional Stopping Theorem

Location: Sever Hall 202

Martingales are random processes with certain special properties. They arise naturally in finance, politics, sports, gambling, and many areas of science and engineering. Under certain efficiency assumptions, they can be used to model the probabilities of unusual outcomes, like epic comebacks in sports and politics. I'll give an accessible and lighthearted overview of the fascinating theory involved.

Scott Sheffield is the Leighton Faculty Professor of Mathematics as of July 2017. He joined the MIT faculty as Professor in 2008, following a faculty appointment at the Courant Institute at NYU. He received a PhD in mathematics from Stanford University in 2003 under the supervision of Amir Dembo. Sheffield is a probability theorist, working on geometrical questions that arise in such areas as statistical physics, game theory and metric spaces, as well as long-standing problems in percolation theory.

L. Mahadevan

Mathematics as Metaphor

Location: Sever Hall 213

Mathematics is the language of all things quantitative and quantifiable, and thus ever more relevant in our increasingly complex, quantitative society. Using a series of examples, I will illustrate the development and evolution of this language in the analysis, prediction and synthesis of disparate phenomena, initially in the physical sciences and technology, and increasingly looking towards the life and social sciences.

L. Mahadevan is Lola England de Valpine Professor of Applied Mathematics and Professor of Organismic and Evolutionary Biology, and of Physics, at Harvard University. Mahadevan is a cross-disciplinary scientist who seeks to understand motion and matter at the human scale integrating the physical and biological sciences, mathematics and engineering, and using experiments, theory and computation. He is a MacArthur Fellow and a Fellow of the Royal Society of London.

Tanya Khovanova

What I Learned from Doing Math Research with Kids

Location: Sever Hall 214

In addition to serving as a Head Mentor at PRIMES and RSI, I run my own program, PRIMES STEP, where students in grades 6 through 9 write research papers in mathematics. How is it possible to do research with students who haven't even started calculus? Yet every year, each STEP group produces one or more papers --- many of which are later published.

In this talk, I will discuss the joys and pitfalls of doing mathematical research at an early age. I will share stories, lessons, and advice from mentoring young researchers who are discovering, often for the first time, what it means to create mathematics.

Tanya Khovanova is a lecturer at MIT and works with several programs that help young students gifted in math: PRIMES, PRIMES STEP, MathRoots, and RSI. Tanya Khovanova received her Ph.D. in Mathematics from Moscow State University in 1988. Her research was interrupted by a period of employment in industry, where she became interested in algorithms, complexity theory, cryptography, and networks. Her current interests lie in combinatorics, number theory, probability theory, geometry, and recreational mathematics. Her website is at tanyakhovanova.com, her highly popular math blog is at blog.tanyakhovanova.com, and her Number Gossip website is at numbergossip.com.

11:00 AM - 11:50 AM

Michael Penn

Adding it All Up — The Basics of Integer Partitions

Location: Sever Hall 113

A partition of an integer n is a way of writing n as a sum of positive integers. For example, 4+1 and 2+2+1 are both partitions of 5. Although the idea is simple, the study of integer partitions is remarkably deep and has fascinated mathematicians for centuries, including Leibniz, Euler, and Ramanujan. In this talk, we will explore some of the standard strategies used to prove results about integer partitions, and we will outline how to create your own partition identity.

Michael Penn is an Associate Professor of Mathematics at Randolph College, but that is not the whole story. Due to a very fortunate sequence of events he ended up with a popular Mathematics YouTube channel. Through YouTube, Michael seeks to make mathematics available to everyone, never shying away from difficult or technical problems. Outside of math, Michael enjoys rock climbing and spending time with his family.

1:00 PM – 1:50 PM

Undergraduate Panel

Research in High School and Undergrad

Location: Sever Hall 202

Curious about how to dive into research? In this panel, we'll be asking current students at MIT and Harvard about how to get started — from cold emailing professors and finding mentors to applying for selective research programs like SSP and RSI. Panelists will share practical advice on how to identify your interests, write effective outreach emails, and make the most of research opportunities both in high school and college. You'll also learn what research is really about, not just producing results, but developing creativity, persistence, and critical thinking. Whether you're aiming for a future in STEM or just want to explore new ideas, this session will show you how research can open doors and shape the way you learn.

Panelists: Lale Baylar (Harvard '28), Sophia Guan (MIT '28), Anmay Gupta (Harvard '27), Jasper Lee (MIT '28).

Paul Seidel

Billiards, Tilings, and Mechanical Systems

Location: Sever Hall 213

Take two tiny balls moving in a one-dimensional box. They bounce off the walls and each other.

What happens? Unsurprisingly, this is easier to understand if we say that balls are equally heavy. Less clearly, a weight ratio 1:3 is also easy, while general weight ratios are much messier! I will explain what this has to do with billiards in triangles, and with tiling the plane by reflection.

Paul Seidel is a Professor of Mathematics at MIT, a position he has held since 2007. He received his PhD in mathematics from Oxford University in 1998 under the supervision of Simon Donaldson. His research is primarily in symplectic topology and homological mirror symmetry. In 2000, he was awarded the EMS Prize, and in 2010 he was awarded the Oswald Veblen Prize in Geometry. In 2012, he became a fellow of the American Mathematical Society and a Simons Investigator.

Themistoklis Haris

Algorithms for Data Streams

Location: Sever Hall 214

How can we extract meaningful information from datasets so large that no computer can fit them in memory? Such situations appear daily in servers, satellites and internet routers. Solving such problems involves developing algorithms that make clever use of every available bit of memory in our system. This leads to fascinating connections with probability theory and geometry.

Themis Haris is a third year PhD student at BU. He finished his undergrad at Dartmouth College and subsequently worked as a software engineer at Microsoft, focusing on the Windows Kernel. His research focuses on theoretical computer science and machine learning.