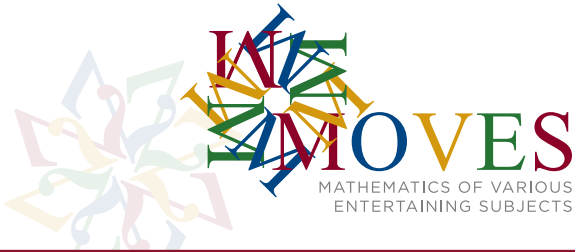


**MOVES**  
2013  
MOVES

MATHEMATICS OF VARIOUS  
ENTERTAINING SUBJECTS



## Flatiron District Map



# Welcome, researchers, educators, and families, to the first MOVES conference, hosted by MoMath!



MOVES conference events will be held August 4-6, 2013 at the following locations:



National Museum of Mathematics, 11 East 26th Street  
Baruch College Conference Center, 24th and Lexington, 14th Floor  
Simons Foundation, Gerald D. Fischbach Auditorium, 160 5th Avenue, 2nd Floor

MoMath is pleased to acknowledge MOVES sponsor



## Sunday Evening

### Opening Events for All

5:00-7:00 Prix fixe dinner option for those who want to meet up early with other MOVES participants

- SD26 Restaurant & Wine Bar, 19 East 26th Street, two doors down from MoMath
- \$16/person lounge and café menu or \$35/person dining menu
- Call 212-265-5959 to make a reservation, and say you are with MoMath MOVES

7:00-8:30 Private MoMath opening for MOVES attendees

- Explore the Museum without the crowds; meet MoMath founders and exhibit creators
- Close-up magic with Prakash Puru, Matthew Holtzclaw, & Jeff Grow
- MOVES conference registration (at MoMath)

8:15 Special dessert reception: Wafels & Dinges, courtesy of MoMath, floor 0

MoMath is pleased to host more than 40 research talks over the course of the inaugural MOVES conference.

For the research track, follow the blue listings in the program.

MoMath is happy to provide a change of pace with 18 guided mathematical activities, and a variety of games, over the course of the inaugural MOVES conference.

For the activity track, follow the yellow listings in the program.

## Monday Morning

### Conference Kick-off

Baruch, Room 14-220

9:00-9:30 Registration and coffee

9:30-9:40 Welcome

Glen Whitney and Cindy Lawrence, Executive Directors, MoMath  
John Overdeck, Co-Chairman, Two Sigma Investments

### Research Program

Baruch, Room 14-220

9:40-10:20 Opening address

*Geometric puzzles: algorithms and complexity*

Erik Demaine, Massachusetts Institute of Technology

10:30-10:50

*Making the impossible possible: how to trisect an angle*

David Richeson, Dickinson College

11:00-11:20

*Puzzling the 120-cell*

Henry Segerman, Oklahoma State University

### Activity Program

MoMath, Tesseract Room

10:00-10:25

*The Fitch-Cheney Five-Card Trick*

Derek Smith, Lafayette College

10:30-10:55

*The most MatheMagical number*

Skona Brittain, SB Family School

11:00-11:25

*Survivor: a card puzzle and a magic trick*

Ron Lancaster, University of Toronto

11:30-1:00 Lunch in Baruch, Room 14-220 for those who pre-ordered.

## Monday Afternoon

### Research Program

Baruch parallel sessions:  
Rooms 14-270, 14-285, 14-266.  
Coffee, games, meet-ups, and display tables: Room 14-280.

1:00-1:20

Room 14-270

*Universal trajectory of a ball rolling on a tilted, planar surface*

Robert Grober, Yale University,  
Stephen and Vincent Della Pietra, Renaissance Technologies

Room 14-285

*One-move puzzles with mathematical content*

Anany Levitin, Villanova University

Room 14-266

*The Cookie Monster Problem*

Leigh Marie Braswell, Phillips Exeter Academy

Continued on next page

### Activity Program

MoMath, Tesseract Room

1:00-1:40

*Sphere dressing*

Patrick Honner, Brooklyn Technical HS

1:45-2:25

*The dynamic world of mathematics*

Ethan Brown, Phillips Academy Andover

2:30-3:10

*Math circle on chaotic dynamics*

Ted Theodosopoulos, Saint Ann's School

3:15-3:55

*SET game theory*

Tanya Khovanova, Massachusetts Institute of Technology

4:00-4:40

*Kaleidoscopic mathematics*

Jeff Johannes, SUNY Geneseo

## Monday Afternoon, continued

1:30-1:50

Room 14-270

*Duels, truels, gruels, and survival of the unfittest*

Dominic Lanphier, Western Kentucky University

Room 14-285

*Elliptical and hyperbolic fractal tilings*

Robert Fathauer, Tessellations

Room 14-266

*Modern coin weighing puzzles*

Tanya Khovanova, Massachusetts Institute of Technology

2:00-2:20

Room 14-270

*Arrowgrams over finite groups*

Kenneth Price, University of Wisconsin Oshkosh

Room 14-285

*Representing numbers using Fibonacci variants*

Stephen Lucas, James Madison University

Room 14-266

*The Kaprekar Routine: an exploration of patterns*

Eliana Lorch, Museum of Mathematics

2:30-2:50

Room 14-270

*The graphs of Hanoi: visualizing solutions to the Tower of Hanoi puzzle*

Suzanne Dorée, Augsburg College

Room 14-285

*Non-attacking arrangements of  $n$  queens with initial placements*

Tricia Brown, Armstrong Atlantic State University

Room 14-266

*On a complex valued Sudoku*

David Nacin, William Paterson University

3:00-3:20

Room 14-270

*Solving the Tower of Hanoi with random moves*

Max Alekseyev, University of South Carolina

Continued above

Room 14-285

*The  $N$ - $k$  Queens Problem*

Doug Chatham, Morehead State University

Room 14-266

*Boggle logic puzzles: new solutions, and even more questions*

Jonathan Needleman, Le Moyne College

3:30-3:50

Room 14-270

*Symmetry group of the tetraflexagon*

Carolyn Yackel, Mercer University

Room 14-285

*From the Gilbreath Principle to new types of numbers*

Robert Vallin, Slippery Rock University

Room 14-266

*Spot it! Solitaire*

Donna Dietz, American University

4:00-4:20

Room 14-270

*Solving generalizations of the Slothouber-Graatsma puzzle*

Derek Smith, Lafayette College

Room 14-285

*Solitaire Mancala games and the Chinese Remainder Theorem*

Brant Jones, James Madison University

Room 14-266

*Tessellations on bead crochet bracelets*

Susan Goldstine, St. Mary's College of Maryland

4:30-4:50

Room 14-270

*Should you be happy?*

Peter Winkler, Dartmouth College

Room 14-285

*Graph theory-based analysis of crossword puzzle difficulty*

John McSweeney, Rose-Hulman Institute of Technology

Room 14-266

*Problems of imbalance*

Paul Salomon, John Burroughs School

## Monday Evening

### Monday Night MOVES

5:00 Dinner—Baruch, Room 14-220 (pre-registration required)

6:30 Entertainment—Simons Foundation (pre-registration was required; event now full)

- *Mime-matics*, Tim and Tanya Chartier
- *Mathematical Juggling*, Greg Warrington
- *Sphereland*: special screening followed by Q&A with Dano Johnson, Director
- Dessert reception, sponsored by Math for America
- *Mathematics, Magic, and Mystery with a Deck of Cards*, Colm Mulcahy (during dessert)

## Tuesday Morning

### Research Program

Baruch parallel sessions:

Rooms 14-270, 14-285.

Coffee, games, meet-ups, and display tables: Room 14-280.

9:00-9:20

Room 14-270

*Super-orthogonal Sudoku*

John Lorch, Ball State University

Room 14-285

*Connection games and  
Sperner's Lemma*

David Molnar, Felician College

9:30-9:50

Room 14-270

*k-Potent Groebner basis*

*computations for Sudoku*

Elizabeth Arnold, James Madison University

Room 14-285

*Take a walk on the Boardwalk*

Stephen Abbott, Middlebury College

10:00-10:20

Room 14-270

*Tic-tac-toe on an affine plane*

Maureen Carroll, University of Scranton

Room 14-285

*What's the deal? Mathematics  
inspired by dealing cards into a pile*

Colm Mulcahy, Spelman College

Continued on next page

### Activity Program

Split program: choose MoMath/park or Baruch Conference Center

MoMath, Tesseract Room

10:00-12:00 Meet at MoMath, then continue on to Madison Square Park (in case of inclement weather, indoor activities will be provided) *Math Trail*, a mathematical morning walk, fun for all ages

Ron Lancaster, University of Toronto

OR

Baruch, Room 14-266

9:00-9:45

*Shortest paths, soap films, and  
mathematics*

Michael Dorff, Brigham Young University

9:55-10:40

*A workshop on stellation based  
sculpture*

Eve Torrence, Randolph-Macon College

10:50-11:35

*Tower of Hanoi*

Debbie Yuster, SUNY Maritime College

11:40-12:25

*Graph theory on LEGO grids*

Ted Welsh, Westfield State University

## Tuesday Morning, continued

10:30-10:50

Room 14-270

*Using fractional matchings to pairing strategy draws in  $N^d$  Tic-tac-toe*

Klay Kruczek, Southern Connecticut State University

Room 14-285

*Sequential mathematical games based on additive and subtractive color mixing arithmetic*

Ron Taylor, Berry College

11:00-11:20

Room 14-270

*Bobo's favorite card trick*

John Harris, Furman University

Room 14-285

*Henryk Eriksson's variation on Bulgarian solitaire*

Brian Hopkins, Saint Peter's University

Continued, above right

11:30-11:50

Room 14-270

*Chip firing puzzles on graphs*

Darren Glass, Gettysburg College

Room 14-285

*Game: SET, and math*

Jeff Johannes, SUNY Geneseo

12:00-12:20

Room 14-270

*The world's hardest elementary domino tiling problems*

Sam Vandervelde, St. Lawrence University

Room 14-285

*Error detection in the card game SET*

Elizabeth McMahon, Lafayette College

12:30-2:00 Lunch on your own; see recommendations at end of program. Baruch, Room 14-220 is available for group meetings and take-out lunch seating.

## Tuesday Afternoon

Research Program

Baruch, Room 14-220

2:00-2:20

*Some of the A-B-Cs (and Ds) of graphs and games*

Jennifer Beineke, Western New England University and Lowell Beineke, Indiana University - Purdue University Fort Wayne

2:30-2:50

*Shapes of space: the challenge of negative curvature*

Jade Vinson, Renaissance Technologies

Continued next page

Activity Program

MoMath, Tesseract Room

2:00-4:00 Game room and explorations featuring:

*TesselManiac and The Flipping Tile Game*

Kevin Lee, Normandale Community College

*Connection games*

David Molnar, Felician College

Continued next page

## Tuesday Afternoon, Continued

3:00-3:20

*Lights Out for gamers and mathematicians*

Bruce Torrence, Randolph-Macon College

3:30-3:50

*Non-classical knights and knaves*

Jason Rosenhouse, James Madison University

4:00-4:40 Closing address

*The Numberplay arithmetic progression challenge*

Noam Elkies, Harvard University

*Making polyhedra: a hands-on experience*

Saba Nafees and Udaya Jayatilake, Texas Tech University

*Move over Sudoku, your fun cousin Kakuro is sum puzzle!!*

Robin Schwartz, College of Mount Saint Vincent

*Criss-Cross, exploring the Euler characteristic*

Brandy Wieggers, National Association of Math Circles

4:40-5:00 Concluding remarks and farewell prizes, Baruch, Room 14-220

Glen Whitney and Cindy Lawrence, Executive Directors of MoMath  
Laura Taalman, Conference Organizer

The National Museum of Mathematics wishes to thank the following MOVES supporters:



**TWO SIGMA**

The Artifice Group  
Cambridge University Press

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Mathematical Association of America

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Tessellations

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## **MOVES Conference Committee**

**Laura Taalman**, James Madison University

**Glen Whitney**, Co-Executive Director, MoMath

**Cindy Lawrence**, Co-Executive Director, MoMath

**Tim Chartier**, Davidson College

**Paul Coe**, Dominican University

**Alissa Crans**, Mathematical Sciences Research Institute

**Tanya Khovanova**, Massachusetts Institute of Technology

**Ron Lancaster**, National Council of Teachers of Mathematics

**John Lorch**, Ball State University

**Tony Nance**, Mathematical Biosciences Institute

**Jonathan Needleman**, Le Moyne College

**Ted Theodosopoulos**, Saint Ann's School

**Bruce Torrence**, Randolph-Macon College

**Eve Torrence**, Randolph-Macon College

**Anna Weltman**, St. Ann's School

**Lamarr Widmer**, Journal of Recreational Mathematics

## Recommended places to eat near Baruch

### **Franchia, 12 Park Avenue (between 34th and 35th Streets)**

Asian vegan café (\$\$)

### **Starbucks, 50 Lexington Avenue (between 24th and 25th Streets)**

Coffee shop (\$)

### **Pret A Manger, 303 Park Avenue (between 22nd and 23rd Streets)**

Fresh, ready-to-eat sandwiches (\$\$)

### **Vezzo, 178 Lexington Avenue (between 31st and 32nd Streets)**

Thin crust pizza (\$\$), 10% off

### **Saravanaa Bhavan, 81 Lexington Avenue (at 26th Street)**

Indian food (\$\$)

### **Le Pain Quotidien, 931 Broadway (between 21st and 22nd)**

Baked goods, soup, salads, quiches (\$\$), 15% off

### **Penelope's, 159 Lexington Avenue (between 30th and 31st)**

Café, bakery, and bar (\$\$)

### **Organique, 110 East 23rd Street (between Park and Lexington Avenues)**

Hamburgers, sandwiches (\$), 10% off

**Show your MOVES badge and receive discounts as noted above.**

## Recommended places to eat near MoMath

### **Melt Shop, 55 West 26th Street (at 6th Avenue)**

Gourmet grilled cheese (\$\$)

### **Essen, 60 Madison Avenue (at 27th Street)**

Always-open delicatessen buffet (\$)

### **California Pizza Kitchen, 440 Park Avenue South (at 30th Street)**

Innovative, hearth-baked pizza (\$\$)

### **Birch Coffee, 5 East 27th Street (between 5th and Madison Avenues)**

Breakfast, sandwiches, and salads (\$\$)

### **Eataly, 200 5th Avenue (between 23rd and 24th Streets)**

Italian food market with various restaurants throughout; can get very busy (\$\$\$)

### **Hill Country Chicken, 1123 Broadway (at 25th Street)**

Chicken and homemade pies (\$\$)

### **Shake Shack, Southeast corner of Madison Square Park (near 23rd Street)**

Burgers and shakes, line can get very long (\$\$)

### **Schnippers Quality Kitchen, 23 East 23rd Street (between Madison and Park)**

Classics like burgers and hot dogs and some very special salads, tacos and shakes (\$\$)

## Future Opportunities with MoMath

- Know a mathematician who gives a great public interest talk? Nominate a *Math Encounters* presenter: email [mathencounters@momath.org](mailto:mathencounters@momath.org).
- Participate in the AMS Special Session on *Communication of Mathematics via Interactive Activities*, at the JMM in Baltimore, MD, Saturday, January 18, 2014, 1:00 pm-5:50 pm. For more information regarding submitting an abstract for this session, please email [education@momath.org](mailto:education@momath.org).
- Want to help expand MoMath's explanatory material? Email [content@momath.org](mailto:content@momath.org).

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**The coolest thing that ever  
happened to math!**

