



THE HEBREW UNIVERSITY OF JERUSALEM  
ISRAEL INSTITUTE FOR ADVANCED STUDIES

# In and around Combinatorics

**The 18th Midrasha Mathematicae**

**January 18-30, 2015**

All lectures will take place at the Israel Institute for Advanced Studies,  
on the Edmond J. Safra, Givat Ram Campus

## **Organizers:**

**Noga Alon** (Tel Aviv University)

**Irit Dinur** (Weizmann Institute of Science)

**Gil Kalai** (The Hebrew University of Jerusalem)

**Nati Linial** (The Hebrew University of Jerusalem)

**Benny Sudakov** (ETH Zurich )

# Program

## Sunday, 18 January

- 08:45 - 09:15      Registration
- 09:15 - 09:30      Greetings - Michal Linial (Director, IAS)
- 09:30 - 11:00      **Irit Dinur** (Weizmann Institute of Science)  
Direct Products of Games and Graphs I
- 11:00 - 11:30      Coffee Break
- 11:30 - 13:00      **Peter Keevash** (University of Oxford)  
The Existence of Designs I
- 13:00 - 13:15      Group Photograph
- 13:15 - 14:30      Lunch- Wise Cafeteria
- 14:30 - 16:00      **David Steurer** (Cornell University)  
Sum of Squares Method I
- 16:00 - 16:30      Coffee Break
- 16:30 - 18:00      **Nati Linial** (The Hebrew University of Jerusalem)  
High Dimensional Combinatorics: A  
Combinatorial Perspective of Simplicial  
Complexes
- 18:00 - 20:00      **Reception at the IAS**

## Monday, 19 January

- 09:30 - 11:00      **David Steurer** (Cornell University)  
Sum of Squares Method II
- 11:00 - 11:30      Coffee Break

- 11:30 - 13:00    **Peter Keevash** (University of Oxford)  
The Existence of Designs II
- 13:00 - 14:30    Lunch- The French House on Givat Ram Campus
- 14:30 - 16:00    **Alexandru Nica** (University of Waterloo)  
Combinatorial Aspects of Free Probability Theory  
I
- 16:00 - 16:30    Coffee Break
- 16:30 - 18:30    Meet and Greet, getting to know each other and  
poster session

### Tuesday, 20 January

- 09:30 - 11:00    **Alexandru Nica** (University of Waterloo)  
Combinatorial Aspects of Free Probability Theory  
II
- 11:00 - 11:30    Coffee Break
- 11:30 - 12:30    **Ehud Friedgut** (Weizmann Institute of Science)  
Analysis of Boolean Functions on Graph Products,  
Dictatorships and Juntas I
- 12:30 - 13:45    Lunch-Belgium House
- 13:45 - 14:45    **Ehud Friedgut** (Weizmann Institute of Science)  
Analysis of Boolean Functions on Graph Products,  
Dictatorships and Juntas II
- 14:45 - 15:15    Coffee Break
- 15:15 - 16:45    **David Steurer** (Cornell University)  
Sum of Squares Method III
- 16:45 - 18:45    Film Event: Film Collage on the subject of Melting  
Pot vs Multiculture in Israeli Cinema by script  
writer, Galit Roichman

18:45 - 19:45 Pizza and Beer

### Wednesday, 21 January

09:30 - 11:00 **David Steurer** (Cornell University)  
Sum of Squares Method IV

11:00 - 11:30 Coffee Break

11:30 - 13:00 **Peter Keevash** (University of Oxford)  
The Existence of Designs III

13:00 - 14:00 Lunch-Wise Cafeteria

14:00 - 18:00 **Tour of the Old City of Jerusalem**

18:15 - 19:45 **School Dinner - for all participants**

### Thursday, 22 January

09:30 - 11:00 **Alexandru Nica** (University of Waterloo)  
Combinatorial Aspects of Free Probability Theory  
III

11:00 - 11:30 Coffee Break

11:30 - 12:30 **Ron Peled** (Tel Aviv University)  
Probabilistic Existence of Regular Combinatorial  
Structures

12:30 - 14:30 Lunch-Belgium House

14:30 - 15:30 **Peter Keevash** (University of Oxford)  
Math colloquium talk: Hypergraph Matchings

15:30 - 16:15 Coffee Break

16:15 - 17:45 **Alexander Postnikov** (MIT)  
The Combinatorics of the Grassmanian I

## Friday, 23 January

09:15 - 10:45    **Peter Keevash** (University of Oxford)  
The Existence of Designs IV

11:00 - 11:30    Coffee Break

11:30 - 13:00    **Alexander Postnikov** (MIT)  
Combinatorics of the Grassmannian II

13:00 - 13:30    Light Lunch- IAS

## Saturday, 24 January

08:30 - 18:00    **Day-Long Excursion, optional**

## Sunday, 25 January

09:30 - 11:00    **Alexandru Nica** (University of Waterloo)  
Combinatorial Aspects of Free Probability Theory  
IV

11:00 - 11:30    Coffee Break

11:30 - 13:00    **Irit Dinur** (Weizmann Institute of Science)  
Direct Products of Games and Graphs II

13:00 - 14:30    Lunch-Wise Cafeteria

14:30 - 15:30    **Tali Kaufman** (Bar-Ilan University)  
High Dimensional Expanders: What, Why and  
How

15:30 - 16:00    Coffee Break

16:00 - 17:30    **Alexander Postnikov** (MIT)  
The Combinatorics of the Grassmanian III

## Monday, 26 January

- 09:30 - 11:00     **Wojciech Samotij** (Tel Aviv University)  
The Kleitman - Winston Lemma: Counting  
Independent Sets in Graphs
- 11:00 - 11:30     Coffee Break
- 11:30 - 13:00     **Joel Hass** (University of California, Davis)  
Knots - Definitions and Descriptions
- 13:00 - 14:30     Lunch-Belgium House
- 14:30 - 15:30     **Tamar Ziegler** (The Hebrew University of  
Jerusalem)  
Narrow Progressions in Primes
- 15:30 - 16:00     Coffee Break
- 16:00 - 18:00     **Open Problem Session**

## Tuesday, 27 January

- 09:30 - 11:00     **Joel Hass** (University of California, Davis)  
Classical Knot Invariants
- 11:00 - 11:30     Coffee Break
- 11:30 - 12:45     **Irit Dinur** (Weizmann Institute of Science)  
Direct products of Games and Graphs III
- 12:45 - 14:30     Lunch- The French House on Givat Ram Campus
- 14:30 - 16:00     **Alexander Postnikov** (MIT)  
The Combinatorics of the Grassmanian IV
- 16:00 - 16:30     Coffee Break
- 16:30 - 18:30     **Free time; homework, discussion**

## Wednesday, 28 January

- 09:30 - 11:00     **Wojciech Samotij** (Tel Aviv University)  
The Hypergraph "Container" Theorems;  
Szemerédi's Theorem in Random Sets of Integers
- 11:00 - 11:30     Coffee Break
- 11:30 - 12:30     **Chaim Even-Zohar** (The Hebrew University of  
Jerusalem)  
Invariants of Random Knots and Links
- 12:30 - 13:30     Lunch-Wise Cafeteria
- 13:30 - 15:00     **Ben-Zion Shilo** (Weizmann Institute of Science)  
Life's Blueprint: The Science and Art of Embryo  
Creation
- 15:00 - 16:30     Tour at the Israel Museum

## Thursday, 29 January

- 09:30 - 11:00     **Wojciech Samotij** (Tel Aviv University)  
Turan-Type Problems in  $G(n,p)$  and the Structure  
of a Typical  $H$ -free Graph II
- 11:00 - 11:30     Coffee Break
- 11:30 - 13:00     **Joel Hass** (University of California, Davis)  
Classical Knot Invariants
- 13:00 - 14:30     Lunch-Belgium House
- 14:30 - 15:30     **Postnikov - Math colloquium**
- 17:15 - 20:15     **Farewell Dinner and Party**

**Friday, 30 January**

- 09:30 - 11:00    **Wojciech Samotij** (Tel Aviv University)  
A Sketch of the Proof of the Hypergraph  
“Container” Theorems
- 11:00 - 11:30    Coffee Break
- 11:30 - 13:00    **Joel Hass** (University of California, Davis)  
Random Topics and Random Knots
- 13:00 - 13:30    Light Lunch- IAS