2016 meeting – program

2016 Annual Meeting of the Israel Mathematical Union

Dead Sea, 2-5 June 2016

Program outline

Thursday, June 2nd.	**Friday, June 3rd.**	**Saturday, June 4th.**	**Sunday, June 5th.**
Special Sessions & Mini Workshops	**Plenary Lectures & Special Sessions**	**Informal discussions & Collaborations**	**Special Sessions & Mini Workshops**
Special Sessions: **16:00-17:30: Algebra; Combinatorics and Discrete Mathematics; Geometric, Analytic and Measurable Group Theory.**	**09:30 – 15:15: Plenary Lectures**		**Special Sessions:** **09:30 – 11:00: Algebra; Analysis;** **Geometric, Analytic and Measurable Group Theory.**

Special Sessions: **17:45-19:15: Analysis; Applied Mathematics; Geometry and Topology.** **21:00-22:30: Mathematical Education & Poster Session.**	**Special Sessions:** **15:30 – 16:15: Algebra; Asymptotic Geometric Analysis.** **16:30 – 18:30: Applied Mathematics; Geometry & Topology; Probability.**		**Special Sessions:** **11:30 – 13:00: Algebra; Combinatorics and Discrete Mathematics; Probability.**

Detailed Program

General Session – Friday, June 3rd.		
Location: Qumran hall		
09:00 – 09:20	***Business Meeting***	
09:30 – 10:15	**Yisrael Aumann** (Hebrew University)	Deducing what Others Know from what They Do (abstract)
10:15 – 10:30	Coffee break	
10:30 – 11:00	***Prize Ceremony***	
11:00 – 11:45	**Emanuel Milman** (Technion) – Erdos Prize recepient	Isoperimetric and Concentration Inequalities under Curvature-Dimension Condition (abstract)
12:00 – 12:45	**Alexander Olevskii** (Tel Aviv University)	Fourier quasicrystals (abstract)

13:00 – 14:30	Lunch	
14:30 – 15:15	**Michal Linial** (Hebrew University)	Time and Space: The Secrets of the Secretory Proteome (abstract)
15:30 – 16:15	***Special Sessions*** (Algebra, Asymptotic Geometric Analysis) – see details below	
16:30 – 18:30	***Special Sessions*** (Applied Mathematics, Geometry & Topology, Probability) – see details below	

Special Sessions & Mini Workshops – Thursday, June 2nd

Algebra Organizer: Dima Gourevitch (Weizmann)		
Room: Qumran hall		
16:00-16:40	**Tomer Schlank** (HUJI)	Sieves and the Minimal Ramification Problem (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Tomer_Schlank))
16:45-17:30	**Daniel Neftin** (Technion)	Rational functions and their monodromy (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Daniel_Neftin))
17:30-19:30	Informal discussions & Collaborations – Location TBA	
Geometric, Analytic and Measurable Group Theory. Organizer: Tobias Hartnick (Technion)		

Room : Ein Gedi Hall		
16:00-16:40	**Anton Hase** (Technion)	Dynamics of the outer automorphism group on the second bounded cohomology of a free group (abstract (///Users/admin/IMU/2016/Program2016.html#Anton_Hase))
16:50-17:30	**Felix Pogorzelski** (Technion)	Non-commutative quasicrystals (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Felix_Pogorzelski))
17:30-19:30	Informal discussions & Collaborations – Location TBA	
Combinatorics and Discrete Mathematics Organizer: Asaf Shapira (TAU)		
Room: Masada Hall		
16:00-16:30	**Nati Linial** (HUJI)	High-dimensional permutations and discrepancy (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Nati_Linial))
16:30-17:00	**Eran Nevo** (HUJI)	On Betti numbers of flag complexes with forbidden induced subgraphs (abstract)
17:00-17:30	**Noga Alon** (TAU)	Uniformly discrete forests with poor visibility (abstract)
17:30-19:30	Informal discussions & Collaborations – Location TBA	

Analysis Organizer: Nir Lev (BIU) and Gady Kozma (Weizmann)		
Room: Qumran hall		
16:00-17:30	Informal discussions & Collaborations – Location TBA	
17:45-18:25	**Jonathan Breuer** (HUJI)	Perturbation theory for Schroedinger Operators and Mesoscopic Fluctuations for Random Matrix Ensembles (abstract)
18:35-19:15	**Itay Londner** (TAU)	Interpolation sets and arithmetic progressions (abstract)
Applied Mathematics Organizer: Koby Rubinstein (Technion)		
Room: Ein Gedi Hall		
16:00-17:30	Informal discussions & Collaborations – Location TBA	
17:45-18:10	**Jeremy Schiff** (BIU)	Multiscale analysis near a 1-1 Hamiltonian resonance (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Jeremy_Schiff))
18:15-18:40	**Raz Kupferman** (HUJI)	Homogenization of defects: the emergence of torsion and non-metricity (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Raz_Kupferman))

18:45-19:10	**Boaz Nadler (**WIS**)**	Vectorial Phase Retrieval (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Boaz_Nadler))

Geometry and Topology

Organizer: Michael Brandenbursky (BGU)

Room: Masada Hall

16:00-17:30	Informal discussions & Collaborations – Location TBA	
17:45-18:25	**Michael Polyak** (Technion)	From the mapping class group to planar graphs and discrete vector fields (abstract)
18:35-19:15	**Michal Marcinkowski** (Universität Regensburg)	Examples of topologically large but homologically small manifolds (abstract)

Mathematical Education

Organizer: Avi Berman (Technion)

Room: Masada Hall

21:00-21:30	**Roza Leikin** (Haifa U.)	The new curriculum for high school math (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Leikin))
21:30-22:00	**Avi Berman** (Technion)	The 5++ program for students who need and deserve more (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Berman))

22:00-22:30	**Nitsa Movshovitz-Hadar** (Technion)	Mathematics news snapshots for high school students – a call for mathematicians to take part in an innovative project (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Movshovitz))

Special Sessions & Mini Workshops – Friday, June 3rd

Algebra Organizer: Dima Gourevitch (Weizmann)		
Room: Masada Hall		
15:30-16:15	**Nir Avni** (WIS + Northwestern)	Counting Z/N-points on varieties and canonical singularities (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Nir%20Avni))
Applied Mathematics Organizer: Koby Rubinstein (Technion)		
Room: Ein Gedi Hall		
16:30-16:55	**Rami Band** (Technion)	Universality of the band-gap density- from periodic graphs to laminates (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Rami_Band))
17:00-17:25	**Alex Nepomnyashchy** (Technion)	Phase-transition fronts in systems with subdiffusive transport (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Alex_Nepomnyashchy))
17:30-17:55	**Yoel Shkolinsky** (TAU)	Approximation of space/frequency concentrated functions (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Yoel_Shkolinsky))
18:00-18:25	**Nir Sochen** (TAU)	TBA(abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Nir_Sochen))

Asymptotic Geometric Analysis

Organizer: Vitali Milman (TAU)

Room: Ein Gedi Hall

15:30-15:50	**Ronen Eldan** (WIS)	An exploratory distribution for convex functions and an application to bandit convex optimization (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Ronen_Eldan))
15:55-16:15	**Boaz Klartag** (TAU)	Super-Gaussian directions of random vectors (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Boaz_Klartag))

Geometry & Topology

Organizer: Michael Brandenbursky (BGU) and Yaron Ostrover (TAU)

Room: Masada Hall

16:30-17:10	**Alex Caviedes Castro** (TAU)	Calabi quasimorphisms and symplectic capacities on coadjoint orbits of compact Lie groups. (abstract)
17:20-18:00	**Jarek Kedra** (University of Aberdeen)	Strongly bounded groups (http://homepages.abdn.ac.uk/kedra/pages/HTML/dead-sea.pdf) (abstract)

Probability

Organizers: Ron Peled (TAU) and Asaf Nachmias (TAU)

Room: Qumran hall

16:30-17:15	**Julia Komjathy** (Eindhoven University of Technology)	Fixed speed competition on the configuration model with infinite variance degrees (abstract (http://www.imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Julia_Komjathy))
17:30-18:15	**Tim Hulshof** (Eindhoven University of Technology)	Higher order corrections for anisotropic bootstrap percolation (abstract (http://www.imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Tim_Hulshof))

Special Sessions & Mini Workshops – Sunday, June 5th

Algebra Organizers: Dima Gourevitch (Weizmann)		
Room: Qumran hall		
09:30-10:10	**Michael Temkin** (HUJI)	On transcendental extensions of real-valued fields (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Michael_Temkin))
10:15-11:00	**Andrey Minchenko** (WIS and Vienna U.)	Differential algebraic groups and their applications (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Andrey_Minchenko))
11:00-11:30	Coffee Break	
11:30-11:55	**Yoni Stancescu** (Afeka Engineering College)	Inverse problems of small doubling type in torsion-free groups (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Yoni_Stancescu))
12:00-12:25	**Yotam Hendel** (WIS)	On the Gelfand-Kazhdan criterion through the commutativity of a Hecke algebra (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Yotam_Hendel))

12:30-12:55	**Mark Shusterman** (TAU)	Squarefree polynomials with prescribed coefficients (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Mark_Shusterman))

Analysis Organizer: Nir Lev (BIU) and Gady Kozma (Weizmann)		
Room: Masada Hall		
09:30-10:10	**Igor Wigman** (King's College London)	Nodal intersections of random toral eigenfunctions with a test curve (abstract)
10:20-11:00	**Naomi Feldheim (**Stanford University**)**	The small ball inequality and binary nets (abstract)
11:00-14:00	Informal discussions & Collaborations – Location TBA	

Geometric, Analytic and Measurable Group Theory Organizer: Tobias Hartnick (Technion)		
Room: Ein Gedi Hall		
09:30-10:10	**Emily Stark** (Haifa U.)	Relatively hyperbolic surface group amalgams (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Emily_Stark))
10:20-11:00	**Mark Shusterman** (TAU)	Schreier's formula for profinite groups (abstract (///Users/admin/IMU/2016/Program2016.html#Mark_Shusterman1))

11:00-14:00	Informal discussions & Collaborations – Location TBA	
Combinatorics and Discrete Mathematics Organizer: Asaf Shapira (TAU)		
Room: Masada Hall		
09:30-11:00	Informal discussions & Collaborations – Location TBA	
11:30-12:00	**Eoin Long** (TAU)	Forbidden vector-valued intersections (abstract)
12:00-12:30	**Gal Kronenberg** (TAU)	On MAXCUT in supercritical random graphs, and coloring of random graphs and random tournaments (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Gal_Kronenberg))
12:30-13:00	**Mykhaylo Tyomkyn** (TAU)	A Blow-up lemma for approximate edge-decompositions. (abstract)
Probability Organizers: Ron Peled (TAU) and Asaf Nachmias (TAU)		
Room: Ein Gedi Hall		

09:30-11:00	Informal discussions & Collaborations – Location TBA	
11:30-12:15	**Ohad Feldheim** (Stanford university)	The Power of two-choices in Regulating Interval Norms (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Ohad_Feldheim))
12:30-11:00	**Idan Perl** (BGU)	Harmonic functions on discrete groups (abstract (http://imu.org.il/Meetings/IMUmeeting2016/Program2016.html#Idan_Perl))

Abstracts

Noga Alon (TAU)

Uniformly discrete forests with poor visibility

Abstract: We prove that there is a set F in the plane so that the distance between any two points of F is at least 1, and for any positive $\epsilon<1$, and every line segment in the plane of length at least $\epsilon^{-1-o(1)}$ there is a point of F within distance ϵ of the segment. This is tight up to the $o(1)$ term in the exponent, improving earlier estimates of Peres, of Solomon and Weiss, and of Adiceam.

Yisrael Aumann (HUJI)

Deducing what Others Know from what They Do

Abstract: TBA.

Nir Avni (WIS + Northwestern)

Counting Z/N-points on varieties and canonical singularities

Abstract: I'll talk about the relationship between the singularities of a variety and the number of points it has over finite rings. This is a joint work with Rami Aizenbud.

Rami Band (Technion)

Universality of the band-gap density – from periodic graphs to laminates

Abstract: The spectrum of periodic objects has a band-gap structure. We show that such spectrum can be described in terms of a linear flow on a torus. This characterization is valid for various periodic structures, such as quantum graphs and electroelastic laminates. Using this approach allows to prove the universality of the band-gap density and provides estimates on gap widths and other spectral statistics. The talk is based on joint works with Gregory Berkolaiko and Gal Shmuel.

Jonathan Breuer (HUJI)

Perturbation theory for Schroedinger Operators and Mesoscopic Fluctuations for Random Matrix Ensembles

Abstract: The talk will discuss a mesoscopic central limit theorem for certain random matrix ensembles and its connection to the spectral theory of discrete Schroedinger operators. This is joint work with Maurice Duits.

Alex Caviedes-Castro (TAU)

Calabi quasimorphisms and symplectic capacities on coadjoint orbits of compact Lie groups.

Abstract: In this talk I will explain how from the quantum cohomology ring of coadjoint orbits of compact Lie groups, we can compute some of their relevant symplectic invariants such as their Gromov width and Hofer-Zehnder capacity, and determine the existence of Calabi quasimorphisms defined on them.

Ronen Eldan (TBA)

An exploratory distribution for convex functions and an application to bandit convex optimization

Abstract: Given a positive convex function f defined on a convex domain $D \subset \mathbb{R}^n$, we construct a probability measure μ on D with the following "exploration" property: for every $\epsilon > 0$ and every convex function g with $g(x) < -\epsilon$ for some $x \in D$, the set where f,g differ by $\eps c_n$ h as measure at least c_n where c_n is some constant depending only (and polynomially) on the dimension n. We will explain how this construction settles a long-standing gap in the theory of convex bandit optimization (joint work with Sebastien Bubeck).

Naomi Feldheim (Stanford university)

The small ball inequality and binary nets

Abstract: A one-dimensional Haar function is a step-function on an interval taking the value -1 on its left half and +1 on the right. A d-dimensional Haar function is simply the product of a Haar function on each coordinate. The "small ball conjecture" is an inequality which bounds the supremum of the weighted sum of Haar functions of dyadic boxes of a certain fixed volume in R^d. As the Haar functions are the natural basis in

many settings, this inequality has implications in Discrepancy theory, PDE and Probability. In the talk we give a simple proof of the inequality in dimension 2, inspired by lacunary Fourier series. As an outcome, we get an exact

description of all 2-dimensional binary nets, i.e. – finite sets which are perfectly distributed w.r.t. dyadic rectangles. We then discuss ideas (and difficulties) in generalizing our methods to higher dimensions. Joint work with Dmitriy Bilyk.

Ohad Feldheim (Stanford university)

The Power of two-choices in Regulating Interval Norms

Abstract: It is well known that when N balls are tossed uniformly into M bins where N>>M, then the number of balls in every bin deviates by roughly sqrt(N\log M)/M from its expectation. A classical result of Azar, Broder, Karlin, and Upfal tells us, however, that if an overseer is given an on-line choice to toss each ball into one of two uniformly chosen bins, then he can significantly regulate the distribution of balls, obtaining a typical deviation of O(1) for a particular bin and maximal deviation of O(lg M) among all bins, simply by picking the less occupied bin. This result is now viewed as part of a general paradigm known by the name "the power of two-choices". In fact, even if this overseer is merely given the opportunity to re-toss each ball once, he can obtain the same asymptotic bounds; we call this, accordingly, "the power of one-retry". In the talk, we present a new probabilistic perspective on the power of one-retry, by analyzing the stochastic processes which the overseer

is able to simulate using his choice. Using this approach we recover the original result and extend it – allowing control the not only on the deviation of the number of balls in each bin but that of the number of balls in any collection of consecutive bins, obtaining a typical deviation of O(log^2 M) and a maximal deviation of O(log^3 M) for this quantity. A continuous counterpart will also be introduced and used to answer a question of Benjamini about the power of two choices in regulating interval partitions, related to the celebrated Kakutani process. Joint work with Ori Gurel-Gurevich.

Anton Hase (Technion)

Dynamics of the outer automorphism group on the second bounded cohomology of a free group

Abstract: The Out(G)-action on the group cohomology H^n(G) of a group G is an important object of study in group theory. On the contrary, almost nothing is known about the corresponding Out(G)-action on the bounded group cohomology H^n_b(G). This talk will introduce bounded group cohomology and then look at the case of G=F_2 and n=2. There the dynamics of the unipotent elements in Out(F_2) on a dense subset C(F_2) of H^2_b(F_2) will be presented concretely and visualized. In particular we will show that no element of C(F_2) is fixed by the Out(F_2)-action, partly answering a question of Miklós Abért.

Yotam Hendel (WIS)

On the Gelfand-Kazhdan criterion through the commutativity of a Hecke algebra

Abstract: For a finite group G and a subgroup H, we say that (G,H) is a Gelfand pair if the decomposition of C[G/H], the G-representation of complex valued functions on G/H, to irreducibles has no repetitions. In this case, the Gelfand property is equivalent to the commutativity of the Hecke algebra C[H\G/H] of bi-H-invariant functions on G. Given a reductive group G and a closed subgroup H, there are three standard ways to define when (G,H) is a Gelfand pair, and a result of Gelfand and Kazhdan gives a sufficient condition under which two of these definitions hold.Unfortunately, in contrast to the finite case, here the Gelfand property is not known to be equivalent to a commutativity of a Hecke algebra. In this talk we define a Hecke algebra for the pair (G,H) in the non-Archimedean case, and show that if the Gelfand-Kazhdan conditions hold then it is commutative. We then explore the connection between the commutativity of this algebra and the Gelfand property of (G,H).

Tim Hulshof (Eindhoven University of Technology)

Higher order corrections for anisotropic bootstrap percolation

Abstract: Bootstrap percolation is a very simple model for growth from a random initial configuration on finite lattices. The model has many applications, for instance to model the spread of infections and magnets at low temperatures, to name two, but it is also interesting from a purely mathematical perspective. The model parameter has a critical value, at which the behaviour changes sharply. One interesting feature of bootstrap percolation is a phenomenon called the "bootstrap paradox" which relates to a big discrepancy between numerical and theoretical estimates of the critical value of bootstrap percolation models. I will discuss recent work in which we give the most accurate theoretical estimate for the critical value of any bootstrap model to date, compare it with new numerical estimates, and show how it (tentatively) resolves the paradox. This talk is based on joint work with Hugo Duminil-Copin, Aernout van Enter, and Rob Morris, and ongoing work with Robert Fitzner.

Jarek Kedra (University of Aberdeen) (http://homepages.abdn.ac.uk/kedra/pages/HTML/dead-sea.pdf)

Strongly bounded groups (http://homepages.abdn.ac.uk/kedra/pages/HTML/dead-sea.pdf)

Abstract: Strong boundedness of a group is a notion that strengthens the concept of boundedness and generalises uniform simplicity. I will present a definition and discuss examples (Lie groups, lattices and diffeomorphism groups). I will present two applications: * examples of groups which don't act on closed symplectic manifolds,

* a uniform bound on the covering number of PSL(n,q), where n is fixed – it is a very special case of a result of Liebeck-Shalev. This is a joint work (in progress) with Assaf Libman.

Boaz Klartag (TAU)

Super-Gaussian directions of random vectors

Abstract: We will discuss the following universality property in high dimensions: Let X be a random vector with density in an n-dimensional Euclidean space. Its density function can be arbitrary. Then there exists a fixed unit vector v, such that the random variable Y = <X, v> has a tail distribution which is heavier than the Gaussian tail distribution for c sqrt{n} standard deviations, where c is a positive universal constant. The

dependence on the dimension n is optimal, up to universal constants.

Julia Komjathy (Eindhoven University of Technology)

Fixed speed competition on the configuration model with infinite variance degrees

Abstract: In this talk we consider competition of two spreading colors starting from single sources on the configuration model with i.i.d. degrees following a power-law distribution with exponent tau in (2,3). In this model two colors spread with not necessarily equal speed on the unweighted random graph. We answer the question of how many vertices the two colors paint eventually. When the speeds are fixed but not equal, (i.e., it takes a deterministic time to pass trough an edge) then the faster color paints almost all vertices. When the speeds are equal, we show that coexistence sensitively depends on the initial local neighbourhoods of the source vertices. This reinforces the common sense that speed and location are very important features in advertising. We also mention what happens if it takes a random time to pass trough an edge: in this case, a `universal winner takes it all' phenomenon occurs under some conditions on the passing time distribution. These projects are joint with Enrico Baroni and Remco van der Hofstad.

Gal Kronenberg (TAU)

On MAXCUT in supercritical random graphs, and coloring of random graphs and random tournaments

Abstract: We determine the asymptotic behavior of maximum cut in supercritical random graphs G(n,(1+\epsilon)/n) as a function of \epsilon. The argument is based on a theorem of Ding, Lubetzky and Peres, describing the typical structure of the giant component of random graphs in this regime.

We then apply this result to prove the following conjecture of Frieze and Pegden. For every \epsilon>0 there exists k_{\epsilon} such that with high probability a random graph G~G(n,(1+\epsilon)/n) is not homomorphic to the cycle on 2k+1 vertices. Finally, we analyze typical coloring properties of biased random tournaments.

A p-random tournament is obtained from the transitive tournament on n vertices by reversing each edge independently with probability p. We show that for p ~ 1/n the chromatic number of a p-random tournament behaves similarly to that of a random graph with the same edge probability. We use the aforementioned result

for MAXCUT in sparse random graphs to treat the supercritical case p=(1+\epsilon)/n. A joint work with Lior Gishboliner and Michael Krivelevich, Tel Aviv University.

Raz Kupferman (HUJI)

Homogenization of defects: the emergence of torsion and non-metricity

Abstract: The modeling of defects in solids has a long ongoing history. One approach, which goes back to the early 1900s, views defects as geometric singularities in locally-Euclidean manifolds. Another approach, dating from the 1950s, models continuously-distributed defects as smooth manifolds endowed with extra fields representing the defects. In this lecture, the two approaches are reconciled. It will be shown that the continuum models of defects are genuine limits of singular defects as their density tends to infinity. By introducing a new notion of convergence, we show how torsion arises as a homogenization limit of manifolds with distributed singular dislocations, and similarly, how non-metricity arises a homogenization limit of manifolds with distributed point defects.

Michal Linial (HUJI)

Time and Space: The Secrets of the Secretory Proteome

Abstract: See Here. (http://imu.org.il/Meetings/IMUmeeting2016/MLinial.pdf)

Nati Linial (HUJI)

High-dimensional permutations and discrepancy

Abstract: This is part of our ongoing effort to develop what we call "High-dimensional combinatorics". We equate a permutation with its permutation matrix, namely an nxn array of zeros and ones in which every line (row or column) contains exactly one 1. In analogy, a two-dimensional permutation is an nxnxn array of zeros and ones in which every line (row, column or shaft) contains exactly one 1. It is not hard to see that a two-dimensional permutation is synonymous with a Latin square. It should be clear what a d-dimensional permutation is, and those are still very partially understood. We mostly start from a familiar phenomenon in the study of permutations and seek its high dimensional counterparts. Specifically we consider in this talk: -The enumeration problem of these permutations, and -The discrepancy problem, namely, to what extent the 1's in the array can be uniformly spread out. These results were achieved jointly with my ex-student Zur Luria There are several additional advances in this area for which we will not discuss for lack of time and are mentioned just for completeness. -Birkhoff von-Neumann theorem and d-stochastic arrays (also with Luria) -Erdos-Szekeres theorem and monotone sub-sequences (with Michael Simkin).

Itay Londner (TAU)

Interpolation sets and arithmetic progressions

Abstract: Given a set S of positive measure on the unit circle, a set of integers K is an interpolation set (IS) for S if for any data {c(k)} in l^2(K) there exists a function f in L^2(S) such that its Fourier coefficients satisfy f^(k)=c(k) for all k in K. In the talk I will discuss the relationship between the concept

of IS and the existence of arbitrarily long arithmetic progressions with specified lengths and step sizes in K. Multidimensional analogues of this subject will also be considered. This talk is based on joint work with A. Olevskii.

Eoin Long (TAU)

Forbidden vector-valued intersections

Abstract: Given vectors ${\cal V} = ({\mathbf v}_i: i \in [n])$ in ${\mathbb R}^D$, we define the ${\cal V}$-intersection of $A,B \subset [n]$ by $A \cap_{{\cal V}} B = \sum_{i \in A \cap B} {\bf v}_i$. We prove an essentially optimal supersaturation theorem for ${\cal V}$-intersections, which can be roughly stated as saying that any large family of sets contains many pairs (A,B) with $A \cap_{{\cal V}} B = {\bf w}$, for any given ${\cal V}$ and ${\bf w}$ satisfying certain conditions that are in a sense best possible. A famous theorem of Frankl and Rödl corresponds to the case $D=1$ and all ${\bf v}_i=1$ of our theorem. The case $D=2$ and ${\bf v}_i=(1,i)$ solves a conjecture of Kalai. Joint work with Peter Keevash.

Michal Marcinkowski (Universität Regensburg)

Examples of topologically large but homologically small manifolds

Abstract: An n dimensional manifold is macroscopically large in a sense of Gromov, if its universal cover does not fiber over a simplicial complex of dimension less then n, such that the fibers are uniformly bounded. An orientable manifold is rationally inessential, if its fundamental class vanishes in the rational homology of a classifying space of the fundamental group. During the talk we shall discuss a construction of manifolds which are macroscopically large but rationally inessential. The construction is motivated by a conjecture of Gromov, that macroscopically large manifolds do not admit Riemannian metrics of positive scalar curvature. The construction uses Coxeter groups and the reflection trick of M.Davis.

Emanuel Milman (Technion)

Isoperimetric and Concentration Inequalities under Curvature-Dimension Condition

Abstract: What is the optimal way to cut a convex bounded domain K in Euclidean space R^n into two halves of equal volume, so that the interface between the two halves has least surface area? A conjecture of Kannan, Lovasz and Simonovits from the 90's asserts that, if one does not mind gaining a constant numerical factor (independent of n) in the surface area, one might as well dissect K using a hyperplane. This conjectured essential equivalence between the former non-linear isoperimetric inequality and its latter linear relaxation, is of fundamental importance to the understanding of volumetric and spectral properties of convex domains.

To overcome the inherent flatness of Euclidean space and of the uniform measure on K, we extend the scope and study the isoperimetric problem on a general Riemannian manifold endowed with a probability density. For such weighted-manifolds, a notion of Curvature-Dimension CD(R,N) has been introduced by Bakry and Emery in the 80's. Roughly put, the parameter R serves as a lower bound on the "generalized Ricci curvature", whereas N serves as an upper bound on the "generalized dimension".

We first provide a complete description of all sharp isoperimetric inequalities under the Curvature-Dimension condition CD(R,N), characterizing all one-dimensional model-spaces for the isoperimetric problem. Of particular interest is when the curvature R is strictly positive, yielding a new single model space (besides the previously known N-sphere and Gaussian measure): the sphere of (possibly negative) dimension N<1. We then describe

an equivalence between Cheeger-type isoperimetric inequalities and concentration inequalities when the curvature R is non-negative. This equivalence is then used to obtain stability results for the Cheeger isoperimetric constant of convex domains, furthering our understanding of the KLS conjecture and establishing it for unit-balls of generalized Orlicz norms.

Andrey Minchenko (WIS & Vienna U.)

Differential algebraic groups and their applications

Abstract: At the most basic level, differential algebraic geometry studies solution spaces of systems of differential polynomial equations. If a matrix group is defined by a set of such equations, one arrives at the notion of a linear differential algebraic group, introduced by P. Cassidy. These groups naturally appear as Galois groups of linear differential equations with parameters. Studying linear differential algebraic groups and their representations is important for applications to finding dependencies among solutions of differential and difference equations (e.g. transcendence properties of special functions). This study makes extensive use of the representation theory of Lie algebras. Remarkably, via their Lie algebras, differential algebraic groups are related to Lie conformal algebras, defined by V. Kac. We will discuss these and other aspects of differential algebraic groups, as well as related open problems.

Movshovitz-Hadar Nitsa (Technion)

Mathematics news snapshots for high school students – a call for mathematicians to take part in an innovative project

Abstract: See Here. (http://imu.org.il/Meetings/IMUmeeting2016/Movshovitz.pdf)

Boaz Nadler (WIS)

Vectorial Phase Retrieval

Abstract:TPhase retrieval – namely the recovery of a signal from its absolute Fourier transform is a problem of fundamental importance in many fields. In 1-D Phase retrieval is ill-posed, admitting multiple solutions. In 2-D it often admits a unique solution, but finding it is challenging. Current iterative algorithms are computationally intensive and most have no theoretical guarantees on the properties of their obtained solution. In this talk I'll present a novel framework, denoted vectorial phase retrieval. The key underlying idea is that in many physical scenarios one can measure not only one signal, but also another independent one, and their interference.

From a mathematical perspective, we show that vectorial phase retrieval leads to uniqueness already in the 1-D case. We next derive computationally efficient and robust to noise algorithms for recovery of the phases under several 1-D and 2-D settings of practical physical interest.

Daniel Neftin (Technion)

Rational functions and their monodromy

Abstract: The monodromy group is a fundamental invariant associated to every rational function f(x)/g(x), where f and g are polynomials. We shall discuss the program of determining which indecomposable rational functions admit a given monodromy group and its applications. .

Alex Nepomnyashchy (TBA)

Phase-transition fronts in systems with subdiffusive transport

Abstract: During the last decades, the phenomenon of subdiffusion has attracted much attention of researchers. Subdiffusive transport has been detected in numerous physical and biological systems, specifically in gels. Still, the influence of anomalous diffusion on phase transitions has hardly been investigated. In the present talk, we consider two problems where the role of subdiffusion is significant. The first example is the growth of a solid nucleus in a supersaturated gel. The process is governed by subdiffusion of the solute towards the nucleus surface. The second example is the dissolution of a solid particle (glass/gel transition) when the solute is subjected to subdiffusion. The latter problem may be relevant to drug release from a pill. In each case we formulate a Stefan problem for a fractional partial differential equation. We obtain exact self-similar solutions describing propagation of the phase-transition front and discuss their stability.

Eran Nevo (HUJI)

On Betti numbers of flag complexes with forbidden induced subgraphs

Abstract: We analyze the asymptotic growth rate of the homology groups of clique complexes of graphs on n vertices not containing a fixed forbidden induced subgraph H.

In particular, we prove a theorem of the alternative: for any H the growth rate achieves exactly one of five possible exponentials, that is, independent of the field of coefficients, the nth root of the maximal total Betti number over n-vertex graphs with no induced copy of H has a limit, as n tends to infinity, and, ranging over all H, exactly five different limits are attained.

For the interesting case where H is the 4-cycle, the above limit is 1, and we prove a slightly superpolynomial upper bound.

Joint work with Karim Adiprasito and Martin Tancer.

Alexander Olevskii (TAU)

Fourier quasicrystals

Abstract: By Fourier quasicrystal one usually means a discrete measure in R^n with pure point spectrum. The classical example of such a measure is given by the Poisson summation formula. A family of examples of aperiodic discrete measures with dense spectrum was constructed in the early 70-s by Yves Meyer.

A new peak of interest to the subject appeared in 80-s after the experimental discovery of physical quasicrystals by Dan Shechtman. I'll discuss the necessary background and present our joint results with Nir Lev on periodic structure of discrete quasicrystals.

Idan Perl (BGU)

Harmonic functions on discrete groups

Abstract: We study the correspondence between algebraic/geometric properties of groups, and properties of their spaces of harmonic functions. In the past, the focus was mainly on bounded and positive harmonic functions on groups, but lately there is a growing body of results in the study of unbounded harmonic functions. In the talk we will mention some of the classic results about spaces of bounded harmonic functions, and present recent results about the unbounded ones. This is based on joint works with Tom Meyerovitch, Matthew Tointon, and Ariel Yadin.

Felix Pogorzelski (Technion)

Non-commutative quasicrystals

Abstract: The theory of mathematical quasicrystals essentially goes back to work of Meyer in the 70ies, who investigated aperiodic point sets in Euclidean space. Shechtman's discovery of physical quasicrystals (1982) via laser experiments (diffraction) triggered a boom of the mathematical analysis of the arising scatter patterns.

In recent work with Michael Björklund and Tobias Hartnick, we developed a diffraction theory for cut-and-project sets in general lcsc groups, thus advancing into the non-commutative world. This talk aims at describing these quasicrystals, as well as the dynamical systems which naturally arise from them. It will be explained how the underlying dynamics can be translated into a group action on a "nice" quotient space originating from the cut-and-project scheme. Time permitting, we draw connections to diffraction theory such as existence or approximation of the autocorrelation measure.

Michael Polyak (Technion)

From the mapping class group to planar graphs and discrete vector fields

Abstract: Starting from a word in the standard generators in the mapping class group of a surface, we construct a weighted planar graph. Braid relations in the mapping class group correspond to the well-known Y-Delta transform of electric networks. Heegaard decompositions of closed 3-manifolds lead to

similar planar graphs. Counting critical points and closed orbits of discrete vector fields on such a graph, we obtain simple formulas for some celebrated 3-manifold invariants. A combinatorial counterpart of a certain complicated duality (between Chern-Simons theory and closed strings on a resolved conifold)

turn out to be a generalization of the Matrix-Tree Theorem.

Jeremy Schiff (TBA)

Multiscale analysis near a 1-1 Hamiltonian resonance

Abstract: We study certain 2 degree-of-freedom Hamiltonian systems arising from an approximation scheme for solutions of the 2d nonlinear Schrodinger equation with cubic-quintic or saturated nonlinearities (possibly in a grade-indexed medium). The solutions of these systems exhibit different types of long-time behavior, depending on values of the parameters and initial conditions. We show how these effects are associated with a 1-1 Hamiltonian resonance, and use multiscale analysis to successfully predict some, but not all, of the transitions between types of solutions. Joint work with David Ianetz.

Tomer Schlank (HUJI)

Sieves and the Minimal Ramification Problem

Abstract: The minimal ramification problem may be considered as a quantitative version of the inverse Galois problem. For a nontrivial finite group G, let m(G) be the minimal integer m for which there exists a Galois extension N/Q that is ramified at exactly m primes (including the infinite one). So, the problem is to compute or to bound m(G). In this paper, we bound the ramification of extensions N/Q obtained as a specialization of a branched covering φ: C → P^1_Q . This leads to novel upper bounds on m(G), for finite groups G that are realizable as the Galois group of a branched covering. Some instances of our general results are: 1 ≤ m(S_m) ≤ 4 and n ≤ m(S_m^n) ≤ n + 4, for all n, m > 0. Here Sm denotes the symmetric group on m letters, and S_m^n is the direct product of n copies of S_m. We also get the correct asymptotic of m(G^n), as n → \infty for a certain class of groups G. Our methods are based on sieve theory results, in particular on the GreenTao-Ziegler theorem on prime values of linear forms in two variables, on the theory of specialization in arithmetic geometry, and on finite group theory.

Yoel Shkolinsky (TAU)

Approximation of space/frequency concentrated functions

Abstract: We describe an approximation scheme for bandlimited functions which are sufficiently concentrated in a disk, based on their equally spaced samples on a Cartesian grid. The scheme is based on expanding the given function into a series of two-dimensional prolate spheroidal wave-functions, and approximating the expansion coefficients using the available samples of the function. The approximate expansion coefficients have particularly simple formulas, in the form of dot products of the available samples with samples of the basis functions. We also present error bounds for the error incurred both by approximating the expansion coefficients, and by truncating the expansion. In particular, we derive a bound on the approximation error in terms of the assumed space concentration. These results generalize to functions which are not strictly bandlimited but whose Fourier transform is sufficiently concentrated. Joint work with Boris Landa, Tel Aviv University.

Mark Shusterman (TAU)

Squarefree polynomials with prescribed coefficients

Abstract: In many classical and recent works the existence of primes with some of the coefficients (say, in base 10) prescribed has been studied. I will talk about a variant of the function field analogue of this problem – squarefree polynomials with coefficients chosen beforehand. For this variant, combinatorial tools can be applied to prove existence in surprisingly sparse sets. Joint work with Gal Dor and Amotz Oppenheim..

Mark Shusterman (TAU)

Schreier's formula for profinite groups

Abstract:IThe famous Nielsen-Schreier theorem asserts that a subgroup H of a finitely generated free group F is itself free, and if it is of finite index, then d(H) = (d(F)-1)[F : H] + 1. This formula is called Schreier's formula, and we say that a finitely generated group G satisfies it, if the above formula holds for any finite index subgroup H of G. It turns out that free groups are the only finitely generated residually finite groups that satisfy Schreier's formula. In light of that, and of the prevalence of the approach of studying groups via their (asymptotic) numerical invariants, it is tempting to consider the profinite analogue. In this talk I plan to present a classification of all prosupersolvable groups that satisfy Schreier's formula. Time permitting, I will also discuss some arithmetic applications.

Nir Sochen (TAU)

TBA

Abstract: TBA.

Yoni Stancescu (Afeka Engineering College)

Inverse problems of small doubling type in torsion-free groups

Abstract: This talk will review some results and problems concerning small sum sets in torsion-free groups. We will discuss recent advancements in different classes of abelian and non-abelian groups. We will describe the structure of the extremal sets and we are going to prove some precise structure theorems for sets of lattice points of small doubling.

Emily Stark (Haifa U.)

Relatively hyperbolic surface group amalgams

Abstract: Suppose S and S′ are closed hyperbolic surfaces and the boundary curves of an annulus are glued to a non-trivial multiple of a simple closed curve on each surface. The fundamental group of this complex is hyperbolic relative to a subgroup that is virtually a product. In this talk, I will discuss the geometry and algebraic structure of these groups, and the quasi-isometry and abstract commensurability classifications within this class. I will highlight the differences between the hyperbolic and relatively hyperbolic settings. This is joint work with Chris Hruska and Hung Tran.

Michael Temkin (HUJI)

On transcendental extensions of real-valued fields

Abstract: In a recent joint work with K. Kedlaya we constructed for any field k of positive characteristic a non-surjective continuous k-linear endomorphism of the completed algebraic closure of k((t)). As a consequence we answered negatively the question of Fargues and Fontaine whether any complete real-valued field K whose tilt is the completed algebraic closure of F_p is isomorphic to C_p as a topological field. In my talk, I will explain how such examples are constructed by use of completed modules of differentials and why they do not exist for k of characteristic zero. If time permits I will also explain the consequences for types of points in Berkovich analytic spaces and topological transcendence degree of extensions of complete real-valued fields.

Mykhaylo Tyomkin (TAU)

A Blow-up lemma for approximate edge-decompositions.

Abstract: The Blow-up lemma of Komlos, Sarkozy and Szemeredi states, very roughly speaking, that a quasi-random graph G contains any bounded degree graph H as a subgraph. In a recent paper we proved that in fact G can be almost decomposed into any collection of uniformly bounded degree graphs H_1,…,H_m. In particular, if n>n_0(\alpha,k), any n-vertex graphs H_1,…,H_m of degree at most k satisfying \sum e(H_i) <(1-\alpha)\binom{n}{2} can be packed into K_n edge-disjointly. This extends a number of prior results on graph packing. Joint work with Jaehoon Kim, Daniela Kuhn and Deryk Osthus.

Igor Wigman (King's College London)

Nodal intersections of random toral eigenfunctions with a test curve

Abstract: We investigate the number of nodal intersections of random Gaussian Laplace eigenfunctions on the standard 2-dimensional flat torus ("arithmetic random waves") with a fixed reference curve. The expected intersection number is universally proportional to the length of the

reference curve, times the wavenumber, independent of the geometry. Our first result prescribes the asymptotic behaviour of the nodal intersections variance for generic smooth curves in the high energy limit; remarkably, it is dependent on both the angular distribution of lattice points lying on the circle with radius corresponding to

the given wavenumber, and the geometry of the given curve. For these curves we can prove the Central Limit Theorem. In a work in progress we construct some exceptional examples of curves where the variance is of smaller order of magnitude, and the limit distribution is non-Gaussian.

This is based on joint works with Zeev Rudnick, and Maurizia Rossi.

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