REPORT ON THE SCIENTIFIC MEETING "RANDOM WALKS – CROSSROADS AND PERSPECTIVES" BUDAPEST, 24-28 JUNE 2013 SUPPORTED BY THE ESF THROUGH THE RGLIS PROGRAM

1. Basic data:

Title: *Random Walks – Crossroads and Perspectives*

Timing: 24-28 June, 2013
(The workshop was satellite meeting to the *Erdős Centennial Conference* held in Budapest on the week 1-5 July, 2013)

Web page: http://www.renyi.hu/conferences/walk2013/index.html

Venue: Alfréd Rényi Institute of Mathematics of the Hungarian Academy of Sciences
http://www.renyi.hu/

Format:
- 74 registered participants
  (+ ca. a dozen unregistered local mathematicians, who attended sporadically)
- 26 invited lectures (60 min. each)
- No contributed talks, no parallel sessions, no posters.
- Plenty of free time left for informal collaboration.

Schedule: See the information booklet attached to this report.

2. Scientific detail:

List of invited speakers:

Elie Aïdékon (Paris), **Noam Berger** (Munich), **Nicholas Crawford** (Haifa), **Dmitry Dolgopyat** (Maryland), **Simon Harris** (Bath), **Gady Kozma** (Rehovot), **Pierre Mathieu** (Marseille), **Péter Nándori** (Budapest), **Yuval Peres** (Seattle), **Pál Révész** (Budapest), **Zhan Shi** (Paris), **Pierre Tarrès** (Oxford), **Ofer Zeitouni** (Rehovot), **Amine Asselah** (Paris), **Fabienne Castell** (Marseille), **Endre Csáki** (Budapest), **Alan Hammond** (Oxford), **Dmitry Ioffe** (Haifa), **Wolfgang König** (Berlin), **Peter Mörters** (Bath), **Françoise Pène** (Brest), **Alejandro Ramirez** (Santiago), **Christophe Sabot** (Lyon), **Gordon Slade** (Vancouver), **Bálint Virág** (Toronto), **Martin Zerner** (Tübingen)

Main topics of the meeting:

The 26 invited lectures covered most recent outstanding results from the following wide range of topics:

Random walks and local time (Csáki, König, Mörters, Révész)

Random walks in random environment (Beger, Pène, Ramirez)
Random walks on groups and graphs (Mathieu, Peres, Virág)
Self-Interacting and reinforced random walks (Kozma, Sabot, Tarrès, Zerner)
Random walk representations in statistical physics (Crawford, Hammond, Asselah)
Random walks and branching (Aïdekon, Harris, Shi, Zeitouni)
Self-avoiding random walks (Ioffe, Slade**)**
Self-intersection local time (Castell)
Walks and diffusions in deterministic systems (Dolgopyat, Nándori)

For fully detailed information about the scientific content (program, titles and abstracts of talks, list of registered participants) see the information booklet attached where abstracts of all lectures are available.

3. Financial details:

Hotel accommodation of 38 participants was fully covered.
Expenses of reception and coffee breaks for all registered participants were fully covered.
Restaurant menu lunch for the five days of the meeting was paid for all registered participants.

Details:

TYPE OF EXPENSE	HUF*	EUR**
Accommodation	4,630,817	15,783
Meals (lunches, coffee breaks, reception)	1,455,480	4,967
Administration (stationary, overhead, bank fees, etc.)	593,618	1,993
TOTAL	**6,679,915**	**22,743**

*: Actual expenses paid in Hungarian currency (Hungarian Forint = HUF)
**: Expenses in Euro calculated with the official exchange rate of the National Bank of Hungary, on the day of payment. This fluctuated between 292.47-300.25 HUF/1 EUR in the period of payments

The full support offered by ESF was EUR 26,425.00.

Budapest, 27 August 2013

Bálint Tóth
(on behalf of the organizers)

RANDOM WALKS: CROSSROADS AND PERSPECTIVES

BUDAPEST, 24-28 JUNE 2013

An ESF RGLIS meeting held at the ALFRÉD RÉNYI INSTITUTE OF MATHEMATICS HUNGARIAN ACADEMY OF SCIENCES

SATELLITE MEETING OF THE ERDŐS CENTENNIAL, BUDAPEST, 1-5 JULY 2013

ORGANIZERS:

Nina Gantert and Bálint Tóth

SPONSORS:

MAIN TOPICS OF THE WORKSHOP:

……. /// Random walks and local time /// Random walks in random environment /// Random walks on groups and graphs /// Self-Interacting and reinforced random walks /// Random walk representations in statistical physics /// Random walks and branching /// Self-avoiding random walks, self-intersection local time /// Walks and diffusions in deterministic systems /// …….

INVITED SPEAKERS:

Elie Aïdékon (Paris)
Noam Berger (Munich)
Nicholas Crawford (Haifa)
Dmitry Dolgopyat (Maryland)
Simon Harris (Bath)
Gady Kozma (Rehovot)
Pierre Mathieu (Marseille)
Péter Nándori (Budapest)
Yuval Peres (Seattle)
Pál Révész (Budapest)
Zhan Shi (Paris)
Pierre Tarrès (Oxford)
Ofer Zeitouni (Rehovot)

Amine Asselah (Paris)
Fabienne Castell (Marseille)
Endre Csáki (Budapest)
Alan Hammond (Oxford)
Dmitry Ioffe (Haifa)
Wolfgang König (Berlin)
Peter Mörters (Bath)
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Alejandro Ramirez (Santiago)
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Gordon Slade (Vancouver)
Bálint Virág (Toronto)
Martin Zerner (Tübingen)

PROGRAM OF THE WORKSHOP AT A GLANCE

	MON	TUE	WED	THU	FRI
09:00-10:00	9:00: registr. 9:25: opening 9:35: Révész	Zeitouni	Crawford	Dolgopyat	Zerner
10:00-11:00	Virág	Ramirez	Kozma	Pène	König
11:00-11:20	*coffee*	*coffee*	*Coffee*	*coffee*	*coffee*
11:20-12:20	Mörters	Berger	Tarrès	Nándori	Mathieu
12:20-13:20	*lunch*	*lunch*	Sabot	*lunch*	Slade
13:30-14:30			*lunch*		*lunch*
14:30-15:30	Csáki	Hammond		Harris	
15:30-15:50	*coffee*	*coffee*		*coffee*	
15:50-16:50	Castell	Ioffe		Shi	
16:50-17:50	Asselah	Peres		Aïdekon	
18:00-19:00	*reception*				

ABSTRACTS

Elie Aïdékon: *Speed of a Biased Random Walk on a Galton-Watson Tree*

THU 16:50-17:50

We consider a biased random walk on a Galton-Watson tree, the bias being towards the root of the tree. When the bias is smaller than a critical value, the walk is transient. In this case, we are interested in the asymptotic distribution of the tree seen from the particle. As a consequence, we derive an expression for the speed of the walk. The results are expressed in terms of the conductance of the tree, which stands for the quenched probability for the random walk of never returning to the root. Similar results were known in the case of the simple random walk (Lyons, Pemantle, Peres) or more recently in the recurrent (Peres, Zeitouni) and near-recurrent (Ben Arous, Hu, Olla, Zeitouni) cases.

Amine Asselah: *On a Simple Model of Diffusion Limited Aggregation*

MON 16:50-17:50

We discuss some properties of a model of diffusion limited columnar deposition.

This is joint work in progress with Elisabetta Scoppola, Benedetto Scoppola, and EmilioCirillo.

Noam Berger: *Local Limit Theorems for Ballistic RWRE*

TUE 11:20-12:20

We show how to prove a version of a local limit theorem for ballistic RWRE, and a few applications.

This is based on joint work in progress with Moran Cohen and Ron Rosenthal.

Fabienne Castell: *Very Large Deviations for Self-Intersection Local Times of Stable Random Walks*

MON 15:50-16:50

I will present large deviations results on self-intersection local times for stable random walks in supercritical, subcritical and critical cases. The proof of these results relies on Eisenbaum's isomorphism theorem.

This is a joint work with Laurent Clement and Clothilde Melot.

Nicholas Crawford: *Large Deviation Estimates for Emptiness Formation*

WED 9:00-10:00

In this talk I will introduce a class of equilibrium quantum systems, called Anisotropic Heisenberg Models, on the d-dimensional integer lattice. In the quantum setting, the Hamiltonian is an operator (rather than a function on phase space). Nevertheless, in 1 dimension in particular and by varying a certain parameter in the definition, it is possible (through path integral expansions) to connect this family of models to a number of more conventional classical particle systems and statistical mechanics models, including the 6 vertex model, self-dual 4 state Potts model, Dyson random walk, and the random stirring model. In finite volume, it is possible to view (the amplitude squared of) the eigenfunctions of the Hamiltonian operator as probability distributions over the collection of all subsets, or configurations of particles, of the fixed volume of interest. The question we study concerns certain "large deviation events" of the ground-state (i.e. minimal eigenvalue) eigenfunctions. In particular we show, in the thermodynamic limit, that the probability of having no particles in a box of side-length L around the origin decays with L as exp(- cL^{d+1}) (upper and lower bounds). This signifies a very strong correlation structure in the underlying probability measures reminiscent of and connected to large deviations for eigenvalue spacing in GUE.

The talk is based on joint work with Stephen Ng and Shannon Starr.

Endre Csáki: *On the Local Time of a Simple Random Walk on the 2-Dimensional comb*

MON 14:30-15:30

Consider a simple random walk on the 2-dimensional comb lattice on the plane that is obtained from the square lattice by removing all horizontal lines except the x-axis. This random walk is an irreducible recurrent Markov chain. Limiting distributions, weak and strong approximations were given for the components of this random walk. In this talk we study the properties of its local times. Limiting distributions and strong limit theorems will be presented for local times at fixed points. The limit process is a so-called iterated local time, i.e., a local time process, time changed by an independent local time. We study also the maximal local time. It will be shown that its order of magnitude can be much larger than the typical local time at a fixed point. Some results on the range will also be given.

The talk is based on joint work with Miklós Csörgő, Antónia Földes and Pál Révész.

Dmitry Dolgopyat: *Piecewise Linear Fermi-Ulam Pingpongs*

THU 9:00-10:00

We consider a particle moving freely between two periodically moving infinitely heavy walls. We assume that one wall is fixed and the second one moves with piecewise linear velocities. We study the question about existence and abundance of accelerating orbits for that model. In particular we show that for some values of the parameters the system behaves similarly to a random walk.

The talk is based on joint work with Jacopo de Simoi.

Alan Hammond: *A Sharp Phase Transition in a Model of Spatial Random Permutations*

TUE 14:30-15:30

Liquid helium at very low temperatures undergoes a phase transition, partially condensing into a superfluid. In 1953, Feynman used the path integral formulation of quantum mechanics to re-express the lambda transition of liquid helium associated with this condensation in terms of a vivid probabilistic representation involving interacting Brownian

particles. The particles are conditioned to return collectively to their starting points after a certain time beta; in this way, a permutation of the particle indices is defined. The reciprocal of beta has the interpretation of being the temperature of the helium. Feynman argued that, were beta to be large enough, the particles would undergo a transition so that long cycles would arise in the associated permutation, and that this behaviour corresponds to the condensation of the helium. In this talk, I will review this model, give a brief discussion of the literature of the question of how introducing an interaction into the model changes the value of the critical point of the transition, and then turn to a closely associated model of spatial random permutations, the random stirring model. For this model on regular trees of high degree, recent independent work alongside results of Omer Angel are sufficient to prove the existence of the critical point for the transition to infinite cycles. I will explain these results and discuss some ideas used in the proofs.

Simon Harris: *Near Critical Survival of Branching Brownian Motion With Killing*

THU 14:30-15:30

We will discuss the behaviour of the survival probability near criticality in some models of branching Brownian motion with killing. Firstly, we consider a BBM where particles have a drift towards the origin, a constant branching rate and are killed the instant they hit it (hard killing). Secondly, we will consider drifting BBM where there is killing on exiting a strip. Some recent analogous results concerning models with inhomogeneous branching rates may also be discussed.

The talk will be partly based on joint work with Elie Aidekon, respectively, with Marion Hesse and Andreas Kyprianou.

Dmitry Ioffe: *Self-Interacting Random Walks: Some Recent Results and Open Problems*

TUE 15:50-16:50

I shall discuss ballistic phase for a class of random walks with repulsive and attractive self-interactions, and for random walks in random potentials. In the repulsive case the set of critical drifts is always a singleton, and it is in general an open question whether the model is sub-ballistic at criticality (for the simple self-avoiding walk this was recently established by Duminil-Copin and Hammond and the argument can be extended to a larger class of walks with symmetries and more general repulsive potentials). For non-critical drifts the ballistic phase is completely understood. In the attractive case the set of sub-critical drifts is always a

proper convex set. The transition from ballistic to sub-ballistic behaviour is of the first order; with an exception of Wiener sausage type interactions in dimension one. The ballistic phase is completely understood both for super-critical and critical drift. Ballistic walks in random potentials inherit all the open problems for directed polymers in strong disorder. On the top of it one encounters new open questions about classification of weak and strong disorder in higher (four and larger) dimensions. It particular, even when disorder is very weak, it is not clear whether quenched and annealed sets of sub-critical drifts coincide. On the other hand, the ballistic phase is relatively well understood at fixed drifts and sufficiently weak random potentials.

Gady Kozma: *Having Two Hats*

WED 10:00-11:00

We analyse linearly reinforced random walk with small initial steps by judicious use of its two representations (as a self-interacting random walk, and as a random walk in random environment).

The talk is based on joint work with Omer Angel and Nicholas Crawford

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Wolfgang König: *Large Deviations for the Local Times of a Random Walk among Random Conductances*

FRI 10:00-11:00

We derive an annealed large deviation principle for the normalised local times of a continuous-time random walk among random conductances in a finite state space in the spirit of Donsker-Varadhan. We work in the interesting case that the conductances may assume arbitrarily small values. Thus, the underlying picture of the principle is a joint strategy of small values of the conductances and large holding times of the walk. The speed and the rate function of our principle are explicit in terms of the lower tails of the conductance distribution. As an application, we identify the logarithmic asymptotics of the lower tails of the principal eigenvalue of the randomly perturbed negative Laplace operator in the domain. We discuss also the case where the state space is a subset of the integer lattice and grows with time.

The talk is based on joint work with Michele Salvi and Tilman Wolff.

Pierre Mathieu: *About the Regularity of the Rate of Escape of Random Walks*

FRI 11:20-12:20

I will discuss some regularity -and lack of regularity!- properties of the rate of escape and entropy of (simple enough examples of) random walks on hyperbolic and non-hyperbolic groups and related issues.

Peter Mörters: *Shifting Brownian Motion and Random Walk*

MON 11:20-12:20

Given a two-sided Brownian motion (B(t): t real) and a probability measure mu, is it possible to find a stopping time T such that the shifted process (B(t+T)-B(T): t real) is a Brownian motion independent of B(T), and B(T) has law mu? The positive answer to this embedding problem reveals a deep connection to the world of random allocation problems. We also look at the analogous problem for simple random walk and show that here the answer is not always positive.

The talk is based on joint work with Günter Last and Hermann Thorisson (Brownian motion), and with István Redl (random walk).

Péter Nándori: *Statistical Properties of Lorentz Processes in a Tube*

THU 11:20-12:20

Sinai billiard and its extended version to the plane (periodic Lorentz process) are among the most interesting examples of hyperbolic dynamical systems. Since the pioneering results of Chernov and Dolgopyat, it became realistic to prove delicate statistical properties for these models. In the talk, I will shortly review the development of the theory and focus on some recent results for periodic Lorentz processes in a strip (i.e. a Sinai billiard configuration extended in one direction). In particular, I will discuss the scaling limit of the trajectory of the particle in the presence of an almost reflecting wall in the tube and mention some work in progress on the limiting density profile of non-interacting particles in a long tube with absorbing boundaries.

The talk is based on work in collaboration with Domokos Szász, respectively, with Dmitry Dolgopyat.

Françoise Pène: *Limit Theorems for Random Walks in Random Scenery (in Dimension 1 or 2)*

THU 10:00-11:00

Consider a random walker winning at each step the amount associated to his position (these amounts are i.i.d. and constitute the scenery). The random walk in random scenery describes the evolution of the total amount won by the random walker. The study of these processes started with the works of Kesten and Spitzer (1979) and of Bolthausen (1989). In this talk, we state results of convergence in distribution and local limit theorems for random walks in random scenery. We study namely the two-dimensional simple symmetric random walk in non-square-integrable scenery. In this case, the convergence in distribution does not hold for the J1-topology but holds (in general) for the M1-topology.

The results presented in this talk are joint works with Fabienne Castell, Nadine Guillotin-Plantard, and Bruno Schapira.

Yuval Peres: *Markov Type and Threshold Embeddings*

TUE 16:50-17:50

A metric space X has Markov type 2 if every reversible stationary Markov chain taking values in X escapes at most diffusively from its starting point. In 1992, Keith Ball showed that Hilbert space has Markov type 2, and this was extended to L^p for p>2, to trees and hyperbolic spaces by Naor, Schramm, Sheffield and the speaker in [NPSS](2004). In joint work with Jian Ding and James Lee, we answer a question raised in [NPSS], by proving that planar graph metrics and doubling metrics also have Markov type 2. The behavior of random walks on metric spaces can sometimes be understood by embedding such a walk into a more approachable space. We offer a new twist on this study by showing that one can employ mappings that are significantly weaker than bi-Lipschitz. A key tool in NPSS was a martingale decomposition for real-valued reversible Markov chains; A crucial new ingredient in the present paper is a local-to-global bound for Martingales. As an application, I will describe a sharp bound obtained recently with A. Stauffer and J. Steif on the rate of escape of simple random walk on dynamical percolation.

Alejandro Ramirez: *Ellipticity Criteria for Ballistic Behaviour of Random Walks in Random Environment*

TUE 10:00-11:00

We introduce ellipticity criteria for random walks in i.i.d. random environments under which we can extend the ballisticity conditions and some of their consequences originally defined for uniformly elliptic environments. We prove under these ellipticity criteria the equivalence of Sznitman's (T') condition with the polynomial effective criterion (P)_M, for M large enough, recently introduced by Berger, Drewitz and Ramirez. We furthermore give ellipticity criteria under which a random walk satisfying the polynomial effective criterion is ballistic.

This talk is based on a joint work with David Campos.

Pál Révész: *What is Your P-Erdős Number?*

MON 9:35-10:00

What is your P-Erdős number?

Christophe Sabot: *r-Dependent Edge Reinforced Random Walk*

WED 12:20-13:20

From the point of view of Bayesian statistics the mixing measure of the Edge Reinforced Random Walk gives a convenient prior on reversible Markov chains on finite sets. In many applications the processes have longer time dependence and are often modelled by Markov chains of order r. Motivated by this question, we analyse a generalization of the ERRW which is naturally defined on a graph with an involution. The associated continuous time process, which generalizes the Vertex Reinforced Jump process, shows some weak form of exchangeability.

This is joint work with Sergio Bacallado and Pierre Tarrès.

Zhan Shi: *The Potential Energy of Biased Random Walks on Trees*

THU 15:50-16:50

I am going to make some elementary discussions on biased random walks on super-critical Galton-Watson trees.

The talk is based on joint work with Yueyun Hu.

Gordon Slade: *Weakly Self-Avoiding Walk in Dimension Four*

FRI 12:20-13:20

We report on recent and on-going work on the continuous-time weakly self-avoiding walk on the 4-dimensional integer lattice, with focus on a proof that the susceptibility diverges at the critical point with a logarithmic correction to mean-field scaling. The method of proof, which is of independent interest, is based on a rigorous renormalisation group analysis of a supersymmetric field theory representation of the weakly self-avoiding walk.

The talk is based on collaborations with David Brydges, and with Roland Bauerschmidt and David Brydges.

Pierre Tarrès: *Transience of Edge-Reinforced Random Walk, and a New Approach to Ray-Knight Theorem*

WED 11:20-12:20

We prove transience of the Edge-Reinforced Random Walk (ERRW) in dimension at least 3 on the lattice. Our argument develops techniques in the spirit of those originally introduced by Disertori, Spencer and Zirnbauer (2010) for the proof of delocalization of the supersymmetric hyperbolic sigma model, using the explicit link of the ERRW with the Vertex-Reinforced Jump Process and this model. We also provide a new approach towards the analysis of this Vertex-Reinforced Jump Process, which yields as a by-product a short proof of the Ray-Knight second generalized theorem.

The talk is based on joint work with Margherita Disertori and Christophe Sabot.

Bálint Virág: *Rate of Escape for Random Walks on Groups*

MON 10:00-11:00

Random walks escape at square root rate in Euclidean lattice and at linear rate in regular trees. It is an open problem to specify what exponents between 1/2 and 1 are achieved in vertex transitive graphs. We show that all rates between 3/4 and 1 are possible.

The talk is based on joint work with Gidi Amir.

Ofer Zeitouni: *Slowdown for Inhomogeneous Branching Brownian Motion*

TUE 9:00-10:00

I will describe work how modifying, in a macroscopic way, the variance of walkers in the branching Brownian motion model leads to non-classical slowdown regimes. This will be contrasted with local (microscopic) changes.

Martin Zerner: *On the Forward Branching Process for One-Dimensional Excited Random Walks*

FRI 9:00-10:00

We consider one-dimensional excited random walks in random environments and explain how their relation to certain branching processes with migration can be used to obtain various recurrence/transience properties of these walks.

This talk is partially based on joint work with Elena Kosygina.

REGISTERED PARTICIPANTS

Aïdékon, Elie	Université Paris VI	
Amir, Gideon	Bar-Ilan University	
Asselah, Amine	Université Paris XII	
Aymone, Marco	Instituto de Matemática Pura e Aplicada	
Backhausz, Ágnes	Eötvös University, Budapest	
Balázs, Márton	Rényi Institute and TU Budapest	
Berger, Noam	TU München and Hebrew University	
Biskup, Marek	UCLA	
Castell, Fabienne	Université Aix-Marseille	
Crawford, Nicholas	Technion	
Csáki, Endre	Rényi Institute	
Czabarka, Éva	University of South Carolina	
Dolgopyat, Dmitry	University of Maryland	
dos Santos, Renato Soares	Université de Lyon 1	
Drewitz, Alexander	Columbia University	
Dumaz, Laure	École Normale Supérieure	
Földes, Antónia	City University of New York	
Georgakopoulos, Agelos	University of Warwick	
Gerencsér, Balázs	Rényi Institute	
Gois, Bruno	Instituto de Matemática Pura e Aplicada	
Guillotin-Plantard, Nadine	Université de Lyon 1	
Guo, Xiaoqin	Technische Universität München	

Hammond, Alan	University of Oxford	
Harris, Simon	University of Bath	
Heydenreich, Markus	Universiteit Leiden	
Huss, Wilfried	Technische Universität Graz	
Ioffe, Dmitry	Technion and Universität Bonn	
Kiss, Demeter	CWI Amsterdam	
Kolesko, Konrad	Uniwersytet Wrocławski	
Kosygina, Elena	City University of New York	
Kozma, Gady	Weizmann Institute	
König, Wolfgang	Weierstrass Institute	
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Martin, James	University of Oxford	
Mathieu, Pierre	Université Aix-Marseille	
Mester, Péter	Bar-Ilan University	
Mészáros, Gábor	Central European University	
Mörters, Peter	University of Bath	
Nagel, Jan	Technische Universität München	
Nándori, Péter	Budapest University of Technology	
Orenshtein, Tal	Technische Universität München	
Pachon, Angelica	Technische Universität Graz	
Pène, Francoise	Université de Brest	
Peres, Yuval	Microsoft Research	
Pete, Gábor	Budapest University of Technology	
Peterson, Jonathon	Purdue University	
Popov, Serguei	Universidade Estadual de Campinas	
Prokaj, Vilmos	Eötvös University, Budapest	

Ramirez, Alejandro	Pontificia Universidad Católica de Chile	
Ráth, Balázs	University of British Columbia	
Redl, István	University of Bath	
Révész, Pál	TU Wien and Renyi Institute	
Sabot, Christophe	Université de Lyon 1	
Sava-Huss, Ecaterina	Technische Universität Graz	
Schapira, Bruno	Université Aix-Marseille	
Shi, Zhan	Université Paris VI	
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Smith, Heather	University of South Carolina	
Szabados, Tamás	Budapest University of Technology	
Szász, Domokos	Budapest University of Technology	
Székely, László	University of South Carolina	
Tarrès, Pierre	University of Oxford	
Telcs, András	Budapest University of Technology	
Torres, Felipe	Universität Münster	
Tóth, Bálint	TU Budapest and University of Bristol	
Tran, Manh Tuan	Freie Universität Berlin	
Valkó, Benedek	University of Wisconsin	
Vető, Bálint	Universität Bonn and TU Budapest	
Virág, Bálint	University of Toronto and Rényi Institute	
Völlering, Florian	Universität Göttingen	
Vysotsky, Vladislav	Arizona State Univ. and Steklov Inst.	
Yilmaz, Atilla	Bogazici University	
Zeitouni, Ofer	Weizmann Inst. and Univ. of Minnesota	
Zerner, Martin	Universität Tübingen