"The Mathematics of Disorder"

Young Women Academy
and
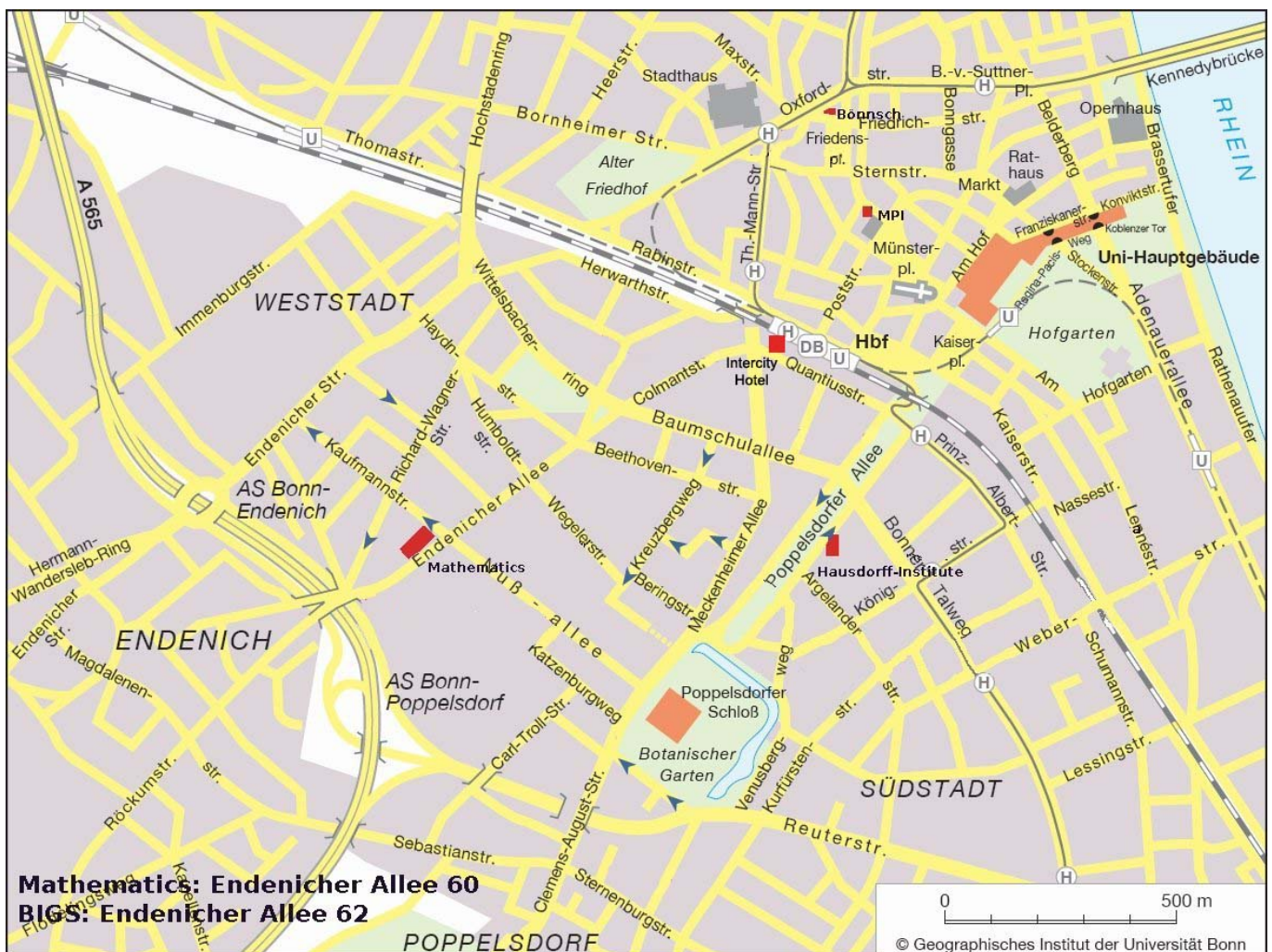# Young Women in Probability and Analysis

Mathematikzentrum
University of Bonn

October 4 - 8, 2016.

Organizers: Margherita Disertori and Constanza Rojas-Molina

Venue: Endenicher Allee 60, 53115 Bonn.

Accommodation Intercity Hotel, Quantiusstrasse , 53115 Bonn.

Program summary 04 - 08 October

	Tue 4		Wed 5		Thur 6		Fr 7		Sat 8
9.00-9.50	Welcome					9.00-10.00	Péché		
9.50-10.00	Intro. WA	9.00-10.30	Gubinelli	9.00-10.30	Klopp	10.10-10.30	Delplancke	9.30-10.30	Rolles
		10.30-11.00	Coffee	10.30-11.00	Coffee	10.30-11.00	Coffee	10.30-11.00	Coffee
10.00-11.00	Gubinelli			11.00-11.05	Intro. YW	11.00-11.45	de Suzzoni	11.00-11.45	Coquille
11.00-11.30	Coffee	11.00-12.00	Klopp	11.05-12.05	Wang	11.45-12.05	Goto	11.45-12.30	Hamza
11.30-13.00	Gubinelli	12.00-14.00	Lunch	12.05-14.00	Lunch	12.05-14.00	Lunch	12.30-13.00	Closure
				14.00-14.45	Pulvirenti	14.00-14.45	Nota		
13.00-15.30	Lunch	14.00-15.30	Klopp	14.45-15.25	Jatuviriyapornchai Birmpa	14.45-15.25	Giunti Okada	15.00 –	Arithmeum
		15.30-16.00	Coffee	15.30-16.00	Coffee	15.30-16.00	Coffee		
15.30-16.30	Maïda	16.00-16.30	Discussions	16.00-16.40	Ziemlanska Raithel	16.00-16.40	Akdim Vorkastner		
16.30-17.00	Coffee			16.40-17.00	Pause				
		16.30-18.00	Maïda	17.00-17.40	Rossi Lang	16.40-17.30	Pause		
17.00-18.30	Maïda					17.30-19.00	Poster Sess.		
19.00-21.00	Reception					19.00-21.00	Reception		

WA: Women Academy
YW: Young Women in Probability and Analysis

Lectures and talks are in the Lipschitz room. Coffee breaks and Receptions are in the Plücker room. The Poster Session will take place in the Hausdorff room.

Program

Young Women Academy

Tuesday October 4th

9h00 - 09h50	Welcome
09h50–10h00	Introduction
10h00–11h00	Massimiliano Gubinelli (Bonn University)
	Mini-course on Stochastic PDEs I
11h00-11h30	Coffee
11h30-13h00	Massimiliano Gubinelli (Bonn University)
	Mini-course on Stochastic PDEs II
13h00- 15h30	Lunch break
15h30-16h30	Mylène Maïda (Lille University)
	Mini-course on Random Matrices I
16h30-17h00	Coffee
17h00-18h30	Mylène Maïda (Lille University)
	Mini-course on Random Matrices II
19h00-21h00	Reception (Plücker room)

Wednesday October 5th

9h00 - 10h30	Massimiliano Gubinelli (Bonn University)
	Mini-course on Stochastic PDEs III
10h30-11h00	Coffee
11h00-12h00	Frédéric Klopp (University of Paris 6)
	Mini-course on Random Schrödinger Operators I
12h00- 14h00	Lunch break
14h00-15h30	Frédéric Klopp (University of Paris 6)
	Mini-course on Random Schrödinger Operators II
15h30-16h00	Coffee
16h00-16h30	Open discussions
16h30-18h00	Mylène Maïda (Lille University)
	Mini-course on Random Matrices III

Thursday October 6th

9h00 - 10h30	Frédéric Klopp (University of Paris 6)
	Mini-course on Random Schrödinger Operators III
10h30-11h00	Closing remarks and coffee

Program

Young Women in Probability and Analysis

Thursday October 6th

11h00-11h05	Introduction
11h05-12h05	Wei-Min Wang (CNRS and University of Cergy-Pontoise)
	Exponential approach to equilibrium for a stochastic NLS
12h05- 14h00	Lunch break
14h00-14h45	Elena Pulvirenti (Leiden University)
	Metastability for the Widom-Rowlinson model
14h45-15h05	Watthanan Jatuviriyapornchai (University of Warwick)
	Coarsening dynamics in condensing stochastic particle systems
15h05-15h25	Panagiota Birmpa (University of Sussex)
	Minimal cost for the macroscopic motion of an interface
15h30-16h00	Coffee
16h00-16h20	Maria Ziemlańska (Leiden University)
	Lie-Trotter product formula for locally equicontinuous Markov operators
16h20-16h40	Claudia Raithel (MPI, Leipzig)
	A Large-Scale Regularity Theory for Random Linear Elliptic Operators on the Half-Space
16h40-17h00	Pause
17h00-17h20	Maurizia Rossi (University of Luxembourg)
	Nodal lengths of arithmetic random waves in the high-energy limit
17h20-17h40	Oana Lang (Imperial College London)
	Asymptotic results in approximate nonlinear filtering

Friday October 7th

9h00 - 10h00	Sandrine Péché (University of Paris 7)
	Some results on delocalization and localization of eigenvectors of random matrices
10h10-10h30	Claire Delplancke (University Paul Sabatier, Toulouse)
	Intertwinings and Stein's magic factors for birth-death processes
10h30-11h00	Coffee
11h00-11h45	Anne-Sophie de Suzzoni (University of Paris 13)
	On large systems of particles
11h45-12h05	Yukimi Goto (University of Tokyo)
	Absence of the Ground State for Bosonic Coulomb Systems with the Critical Charge
12h05- 14h00	Lunch break
14h00-14h45	Alessia Nota (Bonn University)
	On the growth of a particle coalescing in a Poisson distribution of obstacles
14h45-15h05	Arianna Giunti (MPI, Leipzig)
	Quenched invariance principles for random walks in random environments and interacting particles systems
15h05-15h25	Izumi Okada (Tokyo institute of Technology)
	Geometric structures of favorite points, late points and high points in two dimensions
15h30-16h00	Coffee
16h00-16h20	Khadija Akdim (Cadi Ayyad University)
	Reflected Backward Stochastic Differential Equation with Jumps in a Convex Polyhedron
16h20-16h40	Isabell Vorkastner (TU Berlin)
	Noise dependent synchronization of a degenerate SDE
16h40-17h30	Pause
17h30-19h00	Poster Session
19h00-21h00	Reception (Plücker room)

Saturday October 8th

9h30 - 10h30	Silke Rolles (TU München)
	Processes with reinforcement
10h30-11h00	Coffee
11h00-11h45	Loren Coquille (University of Grenoble)
	The recovery of a recessive allele in a Mendelian diploid model
11h45-12h30	Eman Hamza (Cairo University)
	The Dynamics of Random Quantum Walks
12h30-	Closing remarks
15h00-	Group visit to Arithmeum

Abstracts

Young Women in Probability and Analysis

All lectures and talks take place in the Lipschitz room, and the coffee breaks in the Plücker room.

Introductory talks

Sandrine Péché (University Paris 7) *Some results on delocalization and localization of eigenvectors of random matrices*

Abstract: We will discuss what can impact on the delocalization of eigenvectors of random matrices. The talk will make a review of some recent results for Hermitian random matrices.

Silke Rolles (TU München) *Processes with reinforcement*

Abstract: In recent years, processes with reinforcement have attracted a lot of attention. Sabot and Tarrès discovered exciting connections between vertex-reinforced jump processes, linearly edge-reinforced random walks and a supersymmetric sigma model. In particular, a discrete time version of vertex-reinforced jump processes has the same law as a random walk in a random environment, where the environment can be described in terms of a supersymmetric sigma model. In the talk I will describe these connections and indicate how they can be used to prove properties of the reinforced processes. The talk is based on joint papers with Margherita Disertori and Franz Merkl.

Wei-Min Wang (CNRS and University of Cergy-Pontoise) *Exponential approach to equilibrium for a stochastic NLS*

Abstract: We discuss relaxation to the equilibrium Gibbs measure for a stochastic NLS on the circle. We shall explain the Witten-Laplacian approach and compare it with other methods, such as that of Bacry-Emery.

Invited talks

Loren Coquille (University of Grenoble) *The recovery of a recessive allele in a Mendelian diploid model*

Abstract: I will review some important works about individual-based models of adaptive dynamics, which describe the Darwinian evolution of asexual populations as birth and death processes with competition. Then I will present the counterpart of these models for diploid populations, reproducting according to Mendelian rules. I will present a result of genetic coexistence, showing that diploid populations have a selective advantage with respect to haploid ones: they are able to survive environmental changes much longer. This is a joint work with Anton Bovier and Rebecca Neukirch (Uni Bonn).

Eman Hamza (Cairo University) *The Dynamics of Random Quantum Walks*

Abstract: Random Quantum Walks have enjoyed an increasing popularity in recent years due to the roles they play in quantum search algorithms and condensed matter physics. I will present several deterministic and almost sure results about the location and nature of the spectrum of such walks as a function of their parameters.

Alessia Nota (Bonn University) *On the growth of a particle coalescing in a Poisson distribution of obstacles*

Abstract: In this talk we consider the coalescence dynamics of a tagged particle in a random distribution of fixed particles with volumes independently distributed according to a probability distribution. We present a rigorous derivation of a kinetic equation for the probability density for the size and position of the tagged particle in the kinetic limit where the volume fraction ϕ filled by the background of particles tends to zero. Moreover, we prove that the particle system is well posed for a small but finite volume fraction with probability one. This is a joint work with Juan J.L. Velázquez.

Elena Pulvirenti (Leiden University) *Metastability for the Widom-Rowlinson model*

Abstract: In this talk I describe the metastable behavior of the Widom-Rowlinson model on a finite two-dimensional torus subject to a Metropolis stochastic dynamics. In this model particles are randomly created and annihilated inside the torus as if outside the torus were an infinite reservoir with a given chemical potential. The particles are viewed as points carrying disks and the energy of a particle configuration is the volume of the union of the disks minus the sum of the volumes of the disks. Consequently, the interaction between the particles is attractive. We are interested in the metastable behaviour of the system at low temperature when the chemical potential is supercritical. In particular, we start with the empty box and are interested in the first time when the box is fully covered by disks. In order to achieve the transition from empty to full, the system needs to create a sufficiently large droplet, called critical droplet, which triggers the crossover. We compute the asymptotic scaling of the average crossover time, show that the average time divided by its average is exponentially distributed, and identify the size and the shape of the critical droplet. This is a joint work in progress with F. den Hollander, S. Jansen, R. Kotecky'.

Anne-Sophie de Suzzoni (University Paris 13) *On large systems of particles*

Abstract: I will present an equation on random variables which can in some sense be reduced to the Hartree equation. I will explain the relations between the two equations. Then, based on the similarity between the equation on random variables and the cubic nonlinear Schrödinger equation, I will give some of its properties, including global well-posedness in the energy space on the Euclidean spaces, torus and spheres of dimensions 2 and 3 in the defocusing case. I will finally come back to large systems of particles by interpretating the results in terms of density operators.

Contributed talks

Khadija Akdim (Cadi Ayyad University, Morocco) *Reflected Backward Stochastic Differential Equation with Jumps in a Convex Polyhedron*

Abstract: A Backward Stochastic Differential Equation is forced to stay within a d–dimensional bounded convex polyhedral domain, thanks to the action of oblique reflecting process at the boundary. Existence and uniqueness of solution are established assuming Lipschitz continuity of the drift and Lipschitz continuity and uniform spectral radius conditions on the reflection matrix.

Panagiota Birmpa (University of Sussex, UK) *Minimal cost for the macroscopic motion of an interface*

Abstract: We will discuss an one dimensional model where the interface is the stationary solution of a non local evolution equation which has been derived by a stochastic Ising spin system. Deviations from this evolution equation can be quantified by obtaining the large deviations cost functional from the underlying stochastic process. For such a functional, we investigate the optimal way for an interface to move from an initial to a final position R within fixed time T. For small values of R/T the interface moves with a constant speed, while for larger values there appear nucleations of the other phase ahead of the front.

Claire Delplancke (University Paul Sabatier, France) *Intertwinings and Stein's magic factors for birth-death processes*

Abstract: In this work, we establish a link between, on one hand, intertwining relations for birth-death semi-groups, which are an instance of Markov processes on the set of natural integers, and on the other hand the Stein-Chen method, which is a way to estimate the distance between discrete probability distributions. Firstly, a second order intertwining relation between birth-death processes and the discrete gradient is stated. It can be seen as a second derivative relation, and involves also Feynman-Kac semi-groups. It extends a recent work of Chafaï and Joulin which establishes a first order intertwining relation. Secondly, we apply the intertwining relations to provide quantitative bounds for the Stein's factors of discrete laws.

Arianna Giunti (MPI for Mathematics in the Sciences Leipzig, Germany) *Quenched invariance principles for random walks in random environments and interacting particles systems*

Abstract: In this talk we discuss two models: In the first part we consider a random conductance model with stationary, independently distributed and degenerate conductances; in the second one we study the walk of a tagged particle in the simple (symmetric) exclusion process. In both cases it is known that an annealed invariance principle holds; we are interested into upgrading it to a quenched one. In the random conductance model, we give a sufficient and necessary condition on the laws of the conductances in order to have that the relaxation of the environment viewed from the particle is diffusive in the sense of every polynomial moment. This implies a quenched invariance principle, together with quantitative informations on the sublinearity of the corrector.

In the case of the exclusion process, our long-term goal is to obtain, as for the first model, estimates on the relaxation of the environment seen from the tagged particle. We start by giving an optimal upper bound on the transition probability of the tagged particle in the exclusion process. This talk is based on joint works with Yu Gu (Stanford University), Jean-Christophe Mourrat (ENS Lyon) and Felix Otto (MPI Leipzig).

Yukimi Goto (University of Tokyo, Japan) *Absence of the Ground State for Bosonic Coulomb Systems with the Critical Charge*

Abstract: We consider a N-particles Schrödinger operator with Coulomb interaction with K static nuclei. Let $E(N, Z)$ denote the ground state energy of a molecule of the total nuclear charge Z. We prove that the system has no ground state when $E(N, N - 1) = E(N - 1, N - 1)$.

Watthanan Jatuviriyapornchai (University of Warwick, UK) *Coarsening dynamics in condensing stochastic particle systems*

Abstract: Zero-range processes and inclusion processes are well known to exhibit a condensation transition under certain conditions on the jump rates, and the dynamics of this transition continues to be a subject of current research interest. Starting from homogeneous initial conditions, the time evolution of the condensed phase exhibits an interesting coarsening phenomenon of mass transport between cluster sites. The single site dynamics of the processes form a birth death chain describing the coarsening behaviour. We introduce a size-biased version of the single site process, which provides an effective tool to analyze the dynamics of the condensed phase without finite size effects.

Oana Lang (Imperial College London, UK) *Asymptotic results in approximate nonlinear filtering*

Abstract: The purpose of nonlinear filtering is to deduce the state of an evolving dynamical system at any time instant, using noisy observations of the system made up to that time. In most of the cases the optimal solution cannot be computed explicitly, therefore, several approximation methods were developed. The aim of the talk is to present an error analysis for the projection filter – an approximation method which is just partially rigorous at this moment. Special emphasis will be put on the stability of the filtering system.

Izumi Okada (Tokyo institute of Technology, Japan) *Geometric structures of favorite points, late points and high points in two dimensions*

Abstract: We are working on the relation between the local time of random walks and Gaussian free fields, especially asymptotic properties of points where the local time are large or small namely, so-called favorite points or late points and where the value of the Gaussian free field are large or small namely, so-called high points in two dimensions. In this talk, I will introduce the results about the geometric structures of three points.

Claudia Raithel (MPI Leipzig, Germany) *A Large-Scale Regularity Theory for Random Linear Elliptic Operators on the Half-Space*

Abstract: I will speak about a large-scale regularity theory for random linear elliptic operators on the half-space with homogeneous Dirichlet boundary data. More precisely, we obtain a first order Liouville principle, which follows from an appropriate excess decay. This excess decay is proved through means of a stochastic homogenization-inspired Campanato iteration. The main difficulty turns out to be the construction of a sublinear "half-space-adapted" homogenization corrector. This is joint work with Julian Fischer.

Maurizia Rossi (University of Luxembourg, Luxembourg) *Nodal lengths of arithmetic random waves in the high-energy limit*

Abstract: "Arithmetic random waves" are the Gaussian Laplace eigenfunctions on the two-dimensional torus (Rudnick and Wigman (2008), Krishnapur, Kurlberg and Wigman (2013)). In this talk we find that their nodal length converges to a non-universal (non-Gaussian) limiting distribution, depending on the angular distribution of lattice points lying on circles. Our argument has two main ingredients. An explicit derivation of the Wiener-Ito chaos expansion for the nodal length shows that it is dominated by its 4th order chaos component (in particular, somewhat surprisingly, the second order chaos component vanishes). The rest of the argument relies on the precise analysis of the fourth order chaotic component. This talk is based on the paper "Non-universality of nodal length distribution for arithmetic random waves" (2016), joint work with Marinucci, Peccati and Wigman.

Isabell Vorkastner (TU Berlin, Germany) *Noise dependent synchronization of a degenerate SDE*

In the talk, I will present an example of an SDE with degenerate additive noise where synchronization depends on the strength of noise. Here, synchronization means that the weak random attractor consists of a single random point. We show how to compute the top Lyapunov exponent and observe a change of sign. Then, we prove synchronization in case of negative top Lyapunov exponent and no (weak) synchronization in case of positive Lyapunov exponent.

Maria Ziemlańska (Leiden University, The Netherlands) *Lie-Trotter product formula for locally equicontinuous Markov operators*

Abstract: In this talk I will present a Lie-Trotter product formula for Markov semigroups on spaces of measures. We relate our results to those of strongly continuous semigroups and show that our approach is an extension of existing results. As Markov semigroups are usually neither strongly continuous nor bounded, we prove the convergence of Lie-Trotter product formula under weaker assumptions. We replace the strong continuity of semigroups by local equicontinuity and tightness. We also remove all the "classical" assumptions on generators and domains of generators of semigroups. A crutial tool we use in the proofs is a Schur-like property for spaces of measures.

Posters

The Poster Session will take place on Friday 7 October at 17h30 in the Hausdorff room

Salwa Bajja (ENSA, Cadi Ayyad University Morocco)
Least squares estimator of fractional Ornstein Uhlenbeck processes with periodic mean

Carina Geldhauser (WIAS Berlin)
The scaling limit of a particle system with long-range interaction

Arianna Giunti (MPI for Mathematics in the Sciences Leipzig, Germany)
Quenched invariance principles for random walks in random environments and interacting particles systems

Mouna Haddadi (Cadi Ayyad university, Morocco)
Characterization of submartingales of a new class Σ^r

Soukaina Hadiri (Faculty of Sciences Meknes, Morocco)
Feynman-Kac representation of fully nonlinear PDEs and applications

Oana Lang (Imperial College London, UK)
Asymptotic Results in Approximate Nonlinear Filtering.

Claudia Raithel (MPI for Mathematics in the Sciences, Leipzig, Germany)
A Large-Scale Regularity Theory for Random Elliptic Operators on the Half-Plane

Izumi Okada (Tokyo institute of Technology, Japan)
Geometric structures of favorite sites of random walk

List of participants

Khadija Akdim (Cadi Ayyad University, Morocco)
Salwa Bajja (ENSA, Cadi Ayyad University, Morocco)
Panagiota Birmpa (University of Sussex, UK)
Loren Coquille (University of Grenoble, France)
Claire Delplancke (University Paul Sabatier, France)
Margherita Disertori (Bonn University, Germany)
Nora Doll (Friedrich-Alexander Universität Erlangen-Nürnberg, Germany)
Shimaa Elesaely (TU Berlin, Germany)
Carina Geldhauser (WIAS Berlin, Germany)
Fatma Ghribi (IPEST, Tunis, Tunisia)
Arianna Giunti (MPI for Mathematics in the Sciences Leipzig, Germany)
Yukimi Goto (University of Tokyo, Japan)
Massimiliano Gubinelli (Bonn University, Germany)
Mouna Haddadi (Cadi Ayyad university, Morocco)
Soukaina Hadiri (Faculty of Sciences Meknes, Morocco)
Eman Hamza (Cairo University, Egypt)
Suzanne Hilger (Bonn University, Germany)
Jonas Jansen (Bonn University, Germany)
Watthanan Jatuviriyapornchai (University of Warwick, UK)
Frédéric Klopp (University of Paris 6, France)
Oana Lang (Imperial College London, UK)
Martin Lohmann (Bonn University, Germany)
Rachele Luzi (University of Bologna, Italy)
Mylène Maïda (Lille University, France)
Alessia Nota (Bonn University, Germany)
Alessandra Occelli (Bonn University, Germany)
Izumi Okada (Tokyo institute of Technology, Japan)
Sandrine Péché (University Paris 7, France)
Elena Pulvirenti (Leiden University, The Netherlands)
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Constanza Rojas-Molina (Bonn University, Germany)
Silke Rolles (TU München, Germany)
Maurizia Rossi (University of Luxembourg, Luxembourg)
Anne-Sophie de Suzzoni (University Paris 13, France)
Anastasiya Tanana (Bonn University, Germany)
Anna Paola Todino (Gran Sasso Science Institute, L'Aquila, Italy)
Anna Vidotto (University of Luxembourg, Luxembourg)
Isabell Vorkastner (TU Berlin, Germany)
Wei-Min Wang (CNRS and University of Cergy-Pontoise, France)
Maria Ziemlańska (Leiden University, The Netherlands)

It's good to keep in mind

Suggestions for lunch break: Clemens-August Strasse (highlighted in orange on the map below), near Poppelsdorfer Schloss, has many options for restaurants and snacks.
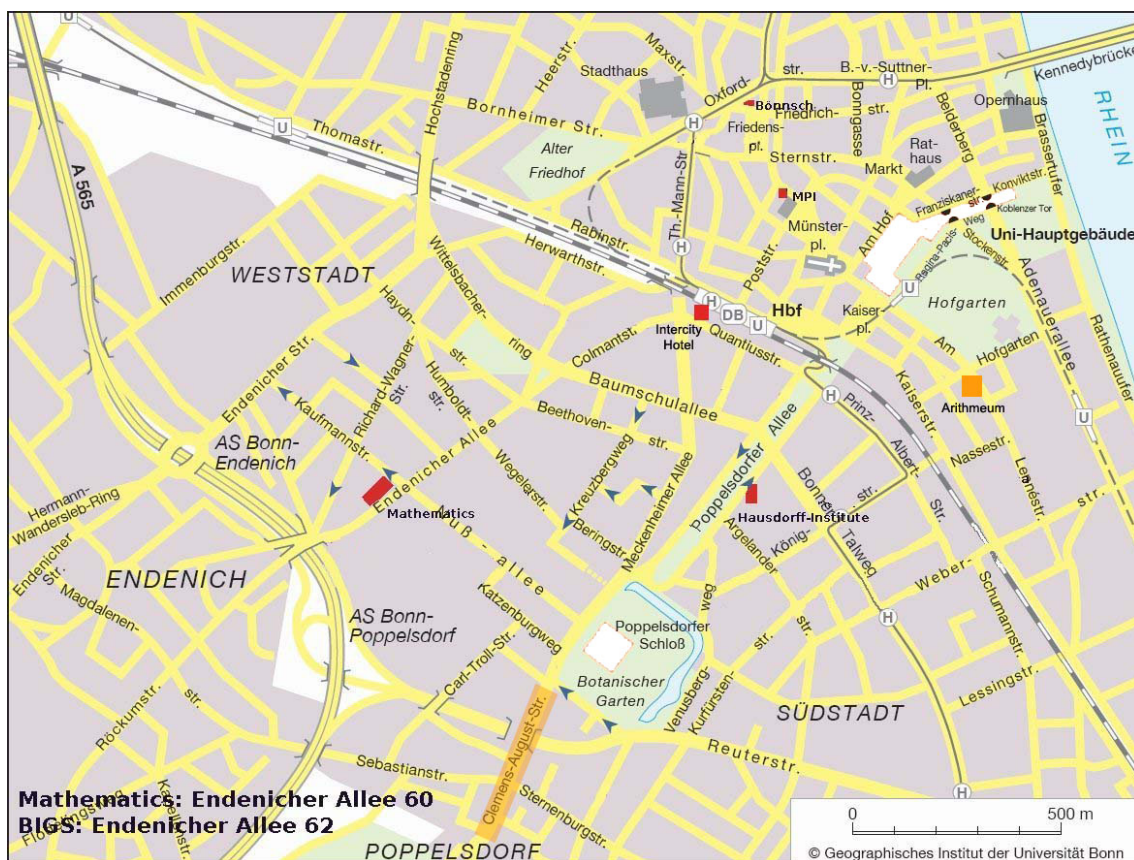
The Arithmeum: Lennéstrasse 2, 53115 Bonn (in orange on the map).

The reimbursement form: You will find in your welcome package a reimbursement form. After your trip we will need you to send it back to us duly filled, together with the original tickets (flight, train, bus,...), addressed to:

Mrs Susanne Switala
Administration
Collaborative Research Centre 1060
University of Bonn, Room No. N2.014
Endenicher Allee 60
53115 Bonn, Germany

If you already have all the documents during your stay, you can hand them to the organizers. Please do not forget to sign the form, indicate your bank coordinates (IBAN), and your home as well as your professional address.

Please state the price of the tickets in the original currency of the purchase, if this was not in euros. Do not do the conversion to euros yourself.

Please note that the last frame in the form ('Confirmation by Project Managment') is reserved to the administration and should not be touched.

You do not need to keep the lunch/dinner receipts, since you will receive a fixed *per diem* (to be paid after the conference together with your travel expenses).