

# Heat Kernels and Analysis on Manifolds and Fractals

University of Bielefeld, July 11-16, 2016

*A satellite event of the 7<sup>th</sup> European Congress of Mathematics  
Berlin, July 18-22, 2016*



Sponsored by the University of Bielefeld and CRC 701  
Organizers: Alexander Grigor'yan and Michael Hinz

[https://www.math.uni-bielefeld.de/sfb701/2016\\_HKAMF](https://www.math.uni-bielefeld.de/sfb701/2016_HKAMF)  
<http://www.7ecm.de/satellite/eventlist.html>

**Monday July 11**

**Lecture room: V2-105/115**

09:00 - 10:00 **Hansen, Wolfhard (University of Bielefeld)**

Darning and gluing of diffusions

10:00 - 11:00 **Verbitsky, Igor (University of Missouri)**

Pointwise estimates of positive solutions to semilinear equations

11:00 - 11:30 **Coffee break and registration (Room V3-201)**

11:30 - 12:30 **Carron, Gilles (University of Nantes)**

Harmonic functions on manifold whose large geodesic spheres are small

12:30 -14:00 **Lunch**

14:00 - 15:00 **Vershik, Anatoly (Steklov Institute, St. Petersburg)**

Absolute boundary of the random walks on the groups

15:00 - 16:00 **Hinz, Michael (University of Bielefeld)**

Fractal snowflake domain diffusion with boundary and interior drifts

16:00 - 16:30 **Coffee break (Room V3-201)**

16:30 - 17:30 **Netrusov, Yuri (University of Bristol)**

Upper estimate for the counting function of the number of negative eigenvalues of the Schrödinger operator  $(-\Delta)^{\mu}$

**Tuesday July 12**

**Lecture room: V2-105/115**

09:00 - 10:00 **Andres, Sebastian (University of Bonn)**  
Quenched invariance principle for the Random Conductance Model in a degenerate dynamic environment

10:00 - 11:00 **Reimbursement of travel expenses**

11:00 - 11:30 **Coffee break (Room V3-201)**

11:30 - 12:30 **Chen, Zhen-Qing (University of Washington, Seattle)**  
Stability of heat kernel estimates and parabolic Harnack inequalities for symmetric jump processes on metric measure spaces

12:30 -14:00 **Lunch**

14:00 - 15:00 **Keller, Matthias (University of Potsdam)**  
On compactifications of graphs

15:00 - 16:00 **Liu, Liguang (Renmin University of China, Beijing)**  
Restrictions for solutions of the heat equations with Newton-Sobolev data on metric measure spaces

16:00 - 16:30 **Coffee break (Room V3-201)**

16:30 - 17:30 **Telcs, Andras (Budapest University of Technology and Economics)**  
Lifetime of the Brownian Sheep

**Wednesday July 13**

**Lecture room: V2-105/115**

- 09:00 - 10:00 **Bendikov, Alexander (University of Wrocław)**  
Oscillating heat kernels on ultrametric spaces
- 10:00 - 11:00 **Molchanov, Stanislav (University of Northern Carolina)**  
Spectral theory of the Schrödinger operators on the infinite fractals
- 11:00 - 11:30 **Coffee break (Room V3-201)**
- 11:30 - 12:30 **Kassmann, Moritz (University of Bielefeld)**  
Regular nonlocal Dirichlet forms with singular and anisotropic measures
- 12:30 - 14:00 **Lunch**
- 14:00 - 15:00 **Coulhon, Thierry (Research University, Paris)**  
Gaussian heat kernel estimates: from functions to forms
- 15:00 - 16:00 **Stollmann, Peter (TU Chemnitz)**  
The Kato condition for potentials on manifolds: the role of curvature
- 16:00 - 16:30 **Coffee break (Room V3-201)**
- 16:30 - 17:30 **Zegarlinski, Boguslaw (Imperial College, London)**  
Crystallographic groups for Hoermander fields and heat kernels

**Thursday July 14**

**Lecture room: V2-105/115**

09:00 - 10:00 **Grigorian, Sergey (University of Texas )**  
Flows of G2-structures

10:00 - 11:00 **Herr, Sebastian (University of Bielefeld)**  
Nonlinear Schrödinger equations on compact manifolds

11:00 - 11:30 **Coffee break (Room V3-201)**

11:30 - 12:30 **Bobkov, Sergey (University of Minnesota)**  
On the deficit in the logarithmic Sobolev inequality

12:30 -14:00 **Lunch**

14:00 - 15:00 **Grzywny, Tomasz (University of Wroclaw)**  
Heat kernels of isotropic unimodal Lévy processes (asymptotics and estimates)

15:00 - 16:00 **Hu, Jiaxin (Tsinghua University, Beijing)**  
The Davies method for heat kernel upper bounds of regular Dirichlet forms

16:00 - 16:30 **Coffee break (Room V3-201)**

16:30 - 17:30 **Ishiwata, Satoshi (Yamagata University)**  
Heat kernel on connected sums of parabolic manifolds

18:00 **Conference Dinner at "Univarza"**

**Friday July 15**

**Lecture room: V2-105/115**

- 09:00 - 10:00 **Lenz, Daniel (University of Jena)**  
Long time behaviour of heat kernels
- 10:00 - 11:00 **Lau, Ka-Sing (Chinese University of Hong Kong)**  
Random walks and induced Dirichlet forms on self-similar sets
- 11:00 - 11:30 **Coffee break (Room V3-201)**
- 11:30 - 12:30 **Kajino, Naotaka (Kobe University)**  
The Laplacian on the Apollonian gasket and its Weyl type eigenvalue asymptotics
- 12:30 -14:00 **Lunch**
- 14:00 - 15:00 **Lin, Yong (Renmin University of China, Beijing)**  
Volume doubling, Poincaré inequality and Gaussian heat kernel estimate for non-negatively curved graphs
- 15:00 - 16:00 **Liu, Shiping (University of Durham)**  
Higher order Buser inequalities for the graph connection Laplacian
- 16:00 - 16:30 **Coffee break (Room V3-201)**
- 16:30 - 17:30 **Sun, Yuhua (Nankai University, Tianjin)**  
On nonnegative solutions to elliptic differential inequalities on Riemannian manifolds

**Saturday July 16**

**Lecture room: V2-105/115**

09:00 - 10:00 **Qian, Zhongmin (University of Oxford)**  
Stochastic processes associated with the Navier-Stokes equations

10:00 - 11:00 **Trojan, Bartosz (University of Wrocław)**  
Asymptotics of heat kernels for random walks on  $\mathbb{Z}^d$

11:00 - 11:30 **Coffee break (Room V3-201)**

11:30 - 12:30 **Saloff-Coste, Laurent (Cornell University)**  
Random walks on bubble groups

12:30 - 14:00 **Lunch**

14:00 - 15:00 **Masamune, Jun (Tohoku University, Sendai)**  
Existence of non-constant integrable harmonic functions on Riemannian manifolds

15:00 - 16:00 **Teplyaev, Sasha (University of Connecticut)**  
Existence, uniqueness and vector analysis on Sierpinski carpets

Time \ Date	Monday, July 11	Tuesday, July 12	Wednesday, July 13	Thursday, July 14	Friday, July 15	Saturday, July 16
09:00 - 10:00	<b>Wolfhard Hansen</b>	<b>Sebastian Andres</b>	<b>Alexander Bendikov</b>	<b>Sergey Grigorian</b>	<b>Daniel Lenz</b>	<b>Zhongmin Qian</b>
10:00 - 11:00	<b>Igor Verbitsky</b>	Reimbursement of expenses	<b>Stanislav Molchanov</b>	<b>Sebastian Herr</b>	<b>Ka-Sing Lau</b>	<b>Bartosz Trojan</b>
11:00 - 11:30			- Coffee break -			
11:30 - 12:30	<b>Gilles Carron</b>	<b>Zhen-Qing Chen</b>	<b>Moritz Kassmann</b>	<b>Sergey Bobkov</b>	<b>Naotaka Kajino</b>	<b>Laurent Saloff-Coste</b>
12:30 - 14:00			- Lunch -			
14:00 - 15:00	<b>Anatoly Vershik</b>	<b>Matthias Keller</b>	<b>Thierry Coulhon</b>	<b>Tomasz Grzywny</b>	<b>Yong Lin</b>	<b>Jun Masamune</b>
15:00 - 16:00	<b>Michael Hinz</b>	<b>Liguang Liu</b>	<b>Peter Stollmann</b>	<b>Jiaxin Hu</b>	<b>Shiping Liu</b>	<b>Sasha Teplyaev</b>
16:00 - 16:30			- Coffee break -			
16:30 - 17:30	<b>Yuri Netrusov</b>	<b>Andras Telcs</b>	<b>Boguslaw Zegarlinski</b>	<b>Satoshi Ishiwata</b>	<b>Yuhua Sun</b>	
				18:00 - Conference dinner		



Andres, Sebastian (University of Bonn, Germany)  
*Quenched invariance principle for the Random Conductance Model in a degenerate dynamic environment*

Bendikov, Alexander (University of Wroclaw, Poland)  
*Oscillating heat kernels on ultrametric spaces*

Bobkov, Sergey (University of Minnesota, USA)  
*On the deficit in the logarithmic Sobolev inequality*

Carron, Gilles (University of Nantes, France)  
*Harmonic functions on manifold whose large geodesic spheres are small*

Chen, Joe (University of Connecticut and Colgate University, USA)

Chen, Li (Instituto de Ciencias Matemáticas, Madrid, Spain)

Chen, Zhen-Qing (University of Washington, Seattle, USA)  
*Stability of heat kernel estimates and parabolic Harnack inequalities for symmetric jump processes on metric measure spaces*

Coulhon, Thierry (Research University, Paris, France)  
*Gaussian heat kernel estimates: from functions to forms*

Dodziuk, Jozef (City University of New York, USA)

Grigorian, Sergey (University of Texas , USA)  
*Flows of G<sub>2</sub>-structures*

Grzywny, Tomasz (University of Wroclaw, Poland)  
*Heat kernels of isotropic unimodal Lévy processes (asymptotics and estimates)*

Han, Bangxian (HCM, University of Bonn, Germany)

Hansen, Wolfhard (University of Bielefeld, Germany)  
*Darning and gluing of diffusions*

Herr, Sebastian (University of Bielefeld, Germany)  
*Nonlinear Schrödinger equations on compact manifolds*

Hinz, Michael (University of Bielefeld, Germany)  
*Fractal snowflake domain diffusion with boundary and interior drifts*

Hu, Eryan (University of Bielefeld, Germany)

Hu, Jiaxin (Tsinghua University, Beijing, China)  
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*On compactifications of graphs*

Lau, Ka-Sing (Chinese University of Hong Kong, Hong Kong)  
*Random walks and induced Dirichlet forms on self-similar sets*

Lenz, Daniel (University of Jena, Germany)  
*Long time behaviour of heat kernels*

Lierl, Janna (University of Illinois at Urbana-Champaign, USA)

Lin, Yong (Renmin University of China, Beijing, China)  
*Volume doubling, Poincaré inequality and Gaussian heat kernel estimate for non-negatively curved graphs*

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Rose, Christian (TU Chemnitz, Germany)

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Schmidt, Marcel (University of Jena, Germany)

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Ucar, Eren (Humboldt University, Berlin, Germany)

Verbitsky, Igor (University of Missouri, USA)

*Pointwise estimates of positive solutions to semilinear equations*

Vershik, Anatoly (Steklov Institute, St. Petersburg, Russia)

*Absolute boundary of the random walks on the groups*

Yang, Meng (University of Bielefeld, Germany)

Zegarlinski, Boguslaw (Imperial College, London, England)

*Crystallographic groups for Hoermander fields and heat kernels*

## General Information

### Conference rooms

All lectures take place in the room V2-105/115 that is located in section “V” of the main building at the 2<sup>nd</sup> floor (see the attached map of the Bielefeld University). Once in the large hall of the main building, look out for a big letter “V” and turn to the corridor under “V”, leading to a lift hall. Take lift or stairs to the level 2, turn right twice and proceed to the room V2-105/115. Coffee breaks take place in the room V3-201 (Common Room) that is one level above.

### WiFi

In the building of the University of Bielefeld you can use your eduroam account. If you don't have an eduroam account, you will be given a guest account at registration.

### Library

The math library is located on levels U1 and V1. You can use the library without registration (except for taking books/journals away). Bags and overcoats are not allowed in; they can be stored in the lockers in front of the entrance.

### Lunch

*Mensa (Canteen)* (“Building X”) offers menus and a buffet, open Mo-Fr 11:30-14:30. Look out for “Barzahlung” checkout in order to pay cash.

*Westend* (“Main Building”) offers grill, pasta, main courses, salads, snacks and beverages, open Mo-Fr 8:00-20:00, Sat 9:00-14:30

*Cafeteria* (“Building X”) offers warm and cold snacks, beverages, open Mo-Fr 8:00-20:00.

*Univarza Restaurant* (“Main Building”) open Mo-Fr 10:00-21:00

Cash machines are located in the large hall of the main building (Sparkasse)

## Public Transportation in Bielefeld

You are recommended to use a tram (U-Bahn) that runs partly on ground, partly underground. It has four lines numbered 1,2,3,4. Each of them departs at 10 min intervals. The line that goes to University is no. 4 (direction “Lohmashof”, stop “Universität”). All lines go through “Hauptbahnhof” (railway station) and “Jahnplatz” (city center); see also the attached map.

Tickets for public transportation can be bought from vending machines at the stations/platforms. It is recommend to buy a ticket for 4 rides. For that, choose a button with the following options: “adult”, “4” rides, “1” zone. The cost 8.20 EUR will show up on the screen.

In a tram, stamp one of the four short sides of the ticket in a ticket-cancelling machine. Each stamp allows a 90 min travel with unlimited number of changes on all trams and buses.

Alternatively, weekly tickets for about 20 EUR are available at Information Center at the station “Jahnplatz”.

# Tram Map



**University**  
Line 4 - direction  
'Lohmannshof'

- 1** Senne – Jahnplatz – Schildesche
- 2** Sieker – Jahnplatz – Milse
- 3** Stieghorst – Jahnplatz – Babenhausen Süd
- 4** Rathaus – Jahnplatz – Universität – Lohmannshof

