



The Abdus Salam  
**International Centre  
for Theoretical Physics**



## Advanced Workshop on Energy Transport in Low-Dimensional Systems: Achievements and Mysteries

Organizer(s): A. Dhar, M.N. Kiselev, Yuriy A. Kosevich and R. Livi. Local Organiser: M. Marsili  
Trieste - Italy, 15 - 24 October 2012

### Programme

**Monday, 15 October 2012** (Room:Adriatico Guest House Kastler Lecture Hall)

**15 October 2012**

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| <b>09:00 - 10:15</b> | <b>Registration of Attendance to Workshop</b>  |
| <b>10:15 - 10:30</b> | <b>Opening Remarks by Organizers</b>   |
| <b>10:30 - 12:00</b> | <b>S. FLACH / Massey Univ., Auckland, New Zealand</b><br><b>Nonlinear waves in low-dimensional systems - Part I</b>                      |
| <b>12:00 - 14:00</b> | --- Lunch break ---  |
| <b>14:00 - 15:30</b> | <b>A. SHAKOURI / Purdue Univ., West Lafayette, U.S.A.</b><br><b>Nanoscale thermal and thermoelectric characterization techniques - I</b> |
| <b>15:30 - 16:00</b> | --- Break ---  |
| <b>16:00 - 17:00</b> | <b>H. SPOHN / TUM, Garching, Germany</b><br><b>Kinetic approach to 1D energy transport</b>   |
| <b>19:00 - 20:30</b> | --- Welcome Reception - Adriatico Guest House Cafeteria ---  |

Tuesday, 16 October 2012 (Room:Adriatico Guest House Kastler Lecture Hall)

16 October 2012

- 09:00 - 10:30 **S. FLACH** / *Massey Univ., Auckland, New Zealand*  
**Nonlinear waves in low-dimensional systems -Part II**
- 10:30 - 11:00 --- Break ---
- 11:00 - 12:30 **A. SHAKOURI** / *Purdue Univ., West Lafayette, U.S.A.*  
**Nanostructured materials for thermoelectric energy conversion**
- 12:30 - 14:00 --- Lunch break ---
- 14:00 - 15:00 **Jian-Sheng WANG** / *Nat. Univ. of Singapore*  
**Nonequilibrium Green's function method in thermal transport and some applications**
- 15:00 - 16:00 **T. PROSEN** / *Univ. of Ljubljana, Slovenia*  
**Nonequilibrium steady states of boundary driven open spin chains**
- 16:00 - 16:30 --- Break ---
- 16:30 - 17:30 **S. LEPRI** / *Istituto dei Sistemi Complessi CNR, Sesto Fiorentino, Italy*  
**The nonequilibrium, discrete nonlinear Schroedinger equation**

Wednesday, 17 October 2012 (Room:Adriatico Guest House Kastler Lecture Hall)

17 October 2012

- 09:00 - 10:30 **S. FLACH** / *Massey Univ., Auckland, New Zealand*  
**Nonlinear waves in low-dimensional systems -Part III**
- 10:30 - 11:00 --- Break ---
- 11:00 - 12:30 **A. SHAKOURI** / *Purdue Univ., West Lafayette, U.S.A.*  
**Ultrafast characterization of heat transport and thermoelectric energy exchange at interfaces**
- 12:30 - 14:00 --- Lunch break ---
- 14:00 - 15:00 **D. SANTAMORE** / *Temple Univ., Philadelphia, U.S.A.*  
**Vibrational mode enhanced electron transport in nanobridges**
- 15:00 - 18:00 **CONTRIBUTED TALKS and SHORT ORAL PRESENTATIONS OF POSTERS (including coffee break from 3.15 to 3.45)**
- Geometric Phase and Topological Band in Energy Transport: Geometric Heat Flux and Topological Thermal Insulator (Jie REN - Los Alamos Nat. Laboratory, U.S.A.) 20'
- Full Counting Statistics in Thermal Transport and Fluctuation Theorems (Bijay Kumar AGARWALLA - Dept. of Physics & Center for Computational Science and Engineering, Nat. University of Singapore) 05'
- Electronic Transport in Quantized Low Dimensional Semiconductor Systems and Metal Nanoparticles (Sanju SHRESTHA - Tribhuvan University, Kathmandu, Nepal) 05'
- Selection Rules and Manipulating Energy and Spin Currents in Driven XXZ Chain under Lindblad Dynamics (Vladislav POPKOV - University of Florence, Sesto Fiorentino, Italy) 05'
- Thermal Transport in Anharmonic Molecular Junctions (Juzar THINGNA - Dept. of Physics & Center for Computational Science, National University of Singapore) 05'

Analytical Microscopic Study of the Heat Flow: Integral Formalism and Nontrivial Properties via Analysis of Trivial Models (Ricardo AVILA - Dept. Fisica, UFMG, Belo Horizonte, Minas Gerais, Brazil) 05'

Energy Diffusion and Heat Conduction Near Thermal Equilibrium (Sha LIU - Dept. of Physics & Center for Computational Science, National University of Singapore) 05'

Quantum Heat Fluctuations of Single Particle Sources (Francesca BATTISTA - Div. of Mathematical Physics, Lund University, Sweden) 05'

Synthesis of Thermoelectric Nanowires and Core-shell Structures via Nanoelectrochemical Route (Kuan-Ying KOK - Malaysian Nuclear Agency, Bangi, Kajang, Selangor, Malaysia) 05'

Thermal Rectification in Graded Materials (Jiao WANG - Dept. of Physics, Xiamen University, People's Republic of China) 05'

Thermal Boundary Resistance at Solid-Fluid Interface (Sanghamitra NEOGI - Max-Planck-Institute for Polymer Reserach, Mainz, Germany) 05'

Quantum Thermal Conduction through Anharmonic Nano-junctions: A Self-consistent Phonon Approach (Dahai HE - Dept. of Physics, Xiamen University, People's Republic of China) 05'

Nonequilibrium Steady States of the One-dimensional Discrete Nonlinear Schroedinger (DNLS) equation (Stefano IUBINI - Dept. Physics & Astronomy, Univ. of Florence, Sesto Fiorentino, Firenze, Italy) 05'

Directed Transport in Equilibrium (Arijit BHATTACHARYAY - Indian Institute of Science Education & Research, Pune, India) 05'

Tuning Thermal Conductivity of Bilayer Graphene by Inter-layer sp<sup>3</sup> Bonding: A Molecular Dynamics Study (Ali RAJABPOUR - Imam Khomeini International University of Qazvin, Islamic Republic of Iran) 05'

Thermal Rectification in Asymmetric Carbon-based Nanostructures: Molecular Dynamics Studies (S. MEHDI VAEZ ALLAEI - University of Tehran, Islamic Republic of Iran) 05'

How does a Variety of T-shaped Waveguides Size Affect to Thermoelectric Efficiency (Sabudhi BADALOV - Bilkent University Physics, Ankara, Turkey)

Probing Wigner Molecular States of a 1D Quantum Dot via an AFM Tip (Fabio CAVALIERE - Dept. of Physics, University of Genova, Italy) 05'

The Wiedemann-Franz Law in 1D and 2D Systems: Two Examples (Vladan CELEBONOVIC - Institute of Physics, University of Belgrade, Serbia) 05'

Diffusion Thermopower in Supported Bilayer Graphene (S.S. KUBAKADDI - Dept. of Physics, Karnatak University, Dharwad, India) 05'

Numerical Calculations on Transport Properties of Graphene Having Adatoms (NGUYEN THI THUY NHUNG - Institute of Physics, Vietnam Academy of Science & Technology, Hanoi, Vietnam) 05'

Finite-size Effect in Computing the Autocorrelation Function of Flux (Shunda CHEN - Dept. of Physics, Xiamen University, People's Republic of China) 05'

**Thursday, 18 October 2012 (Room:Adriatico Guest House Kastler Lecture Hall)**

**18 October 2012**

**09:00 - 10:30**     **Yu. A. KOSEVICH** / *Semenov Inst. of Chemical Physics, Moscow, Russian Federation*  
**Semiquantum molecular dynamics approach: A new simulation tool for carbon-based low-dimensional nanostructures - Part I**

**10:30 - 11:00**     --- Break ---

**11:00 - 12:30**     **R. LIVI** / *Univ. di Firenze, CSDC, Sesto Fiorentino, Italy*  
**Heat transport in low dimensions: A survey about a puzzle - I**

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

**14:00 - 15:00**     **K. MATVEEV** / *Argonne Nat. Laboratory, U.S.A.*  
**Thermal conductance of uniform quantum wires**

**15:00 - 16:00**     **M. SASSETTI** / *Univ. di Genova & INFN, Genova, Italy*  
**Transport and energy exchange in nanoelectromechanical systems**

- 16:00 - 16:30 --- Break ---
- 16:30 - 17:30 **L. MOLENKAMP** / *Univ. Wuerzburg, Germany*  
**Thermoelectric properties of semiconductor nanostructures**
- 17:30 - 18:30 **S. VOLZ** / *Ecole Centrale Paris, Chatenay-Malabry Cedex, France*  
**Advances in nanostructure based thermal interface and thermoelectric materials**

Friday, 19 October 2012 (Room:Adriatico Guest House Kastler Lecture Hall)

19 October 2012

- 09:00 - 10:30 **A. CANTARERO** / *Univ. of Valencia, Spain*  
**Thermal and electrical transport and thermoelectric figure-of-merit in low-dimensional nanostructures**
- 10:30 - 11:00 --- Break ---
- 11:00 - 12:30 **R. LIVI** / *Univ. di Firenze, CSDC, Sesto Fiorentino, Italy*  
**Heat transport in low dimensions: A survey about a puzzle - II**
- 12:30 - 14:00 --- Lunch break ---
- 14:00 - 15:00 **S. DENISOV** / *Univ. of Augsburg, Germany*  
**Anomalous energy transport in many-body classical systems: Levy-walk approach**
- 15:00 - 16:00 **K. SAITO** / *Keio Univ. Yokohama, Japan*  
**Exact results of a levy walk model for anomalous heat transport**
- 16:00 - 16:30 --- Break ---
- 16:30 - 17:30 **D. DONADIO** / *MPI for Polymer Research, Mainz, Germany*  
**Atomistic simulations of thermal transport in nanostructured semiconductors**

Monday, 22 October 2012 (Room:Adriatico Guest House Kastler Lecture Hall)

22 October 2012

- 09:00 - 10:30 **A. DHAR** / *Raman Research Institute, Bangalore, India*  
**Heat conduction in harmonic crystals - I**
- 10:30 - 11:00 --- Break ---
- 11:00 - 12:30 **Y. DUBI** / *Ben-Gurion Univ., Beer Sheva, Israel*  
**Quantum energy transport in electronic nano- or molecular junctions - I**
- 12:30 - 14:00 --- Lunch break ---
- 14:00 - 15:30 **Yu. A. KOSEVICH** / *Semenov Inst. of Chemical Physics, Moscow, Russian Federation*  
**Semiquantum molecular dynamics approach: A new simulation tool for carbon-based low-dimensional nanostructures - Part II**
- 15:30 - 16:00 --- Break ---

**16:00 - 17:30**     **R. LIVI / Univ. di Firenze, CSDC, Sesto Fiorentino, Italy**  
**Heat transport in low dimensions: A survey about a puzzle - III**

**17:30 - 18:30**     **A. CANTARERO / Univ. of Valencia, Spain**  
**Unified theory of thermal transport in bulk, thin films and nanowires**

**Tuesday, 23 October 2012 (Room:Adriatico Guest House Kastler Lecture Hall)**

**23 October 2012**

**09:00 - 10:30**     **A. DHAR / Raman Research Institute, Bangalore, India**  
**Heat conduction in harmonic crystals - II**

**10:30 - 11:00**     --- Break ---

**11:00 - 12:30**     **Y. DUBI / Ben-Gurion Univ., Beer Sheva, Israel**  
**Quantum energy transport in electronic nano- or molecular junctions - II**

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

**14:00 - 15:00**     **Bambi HU / Univ. of Houston, U.S.A.**  
**Asymmetric heat conduction and negative differential thermal resistance in nonlinear system**

**15:00 - 16:00**     **G. CASATI / Univ. dell'Insubria, Como, Italy**  
**Coupled particles and heat transport: A dynamical system's perspective**

**16:00 - 16:30**     --- Break ---

**16:30 - 17:30**     **Hong ZHAO / Xiamen Univ., Xiamen, People's Republic of China**  
**Heat transport in low-dimensional systems with asymmetric inter-particle interaction**

**Wednesday, 24 October 2012 (Room:Adriatico Guest House Kastler Lecture Hall)**

**24 October 2012**

**09:00 - 10:30**     **Y. DUBI / Ben-Gurion Univ., Beer Sheva, Israel**  
**Heat transport through DNA nano-junctions: Probing the denaturation transition using DNA nonlinearity**

**10:30 - 11:00**     --- Break ---

**11:00 - 12:30**     **Baowen LI / Nat. Univ. of Singapore**  
**Anomalous thermal transport in low-dimensional nanostructures: From experiment to theory**

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

**14:00 - 15:00**     **A. DHAR / Raman Research Institute, Bangalore, India**  
**Heat conduction in harmonic crystals - III**

**15:00 - 15:15**     **Closing Remarks by Organizers**