

# Workshop

## *Low-dimensional emergent phenomena in correlated systems and topological quantum matter*

Tbilisi, Georgia, 01.06.-10.06.2019

### PROGRAM

#### 1 June, Saturday

##### Arrivals

9:30 - 10:00

##### Registration for Students

Lecture Hall, Andronikashvili Institute of Physics, Tamarashvili str. 6  
(9:00 Transport departs from Betsy's Hotel, Makashvili Str. 32-34)

##### Lectures for Students

10:00 - 11:40

**Yaroslav Bazaliy** "How spin currents defy our high-school intuition"

*Coffee break (20 min)*

12:00 - 13:00

**Ramaz Khomeriki** "All-optical Logic Gate Signal Processing in Photonic Crystals with Band-gap Solitons"

*Lunch (1.5 hr)*

14:30 - 16:30

**George Jackeli** "Spin-orbital frustration in Mott insulators: an introduction"

16:30-21:00

##### For Students

**Excursion to the ancient capital Mtskheta and dinner**

19:00-21:00

##### For Workshop Participants

**Welcome party**

Wine cellar '8000 Vintages', I. Abashidze str. 60

(18:45 Transport departs from Betsy's Hotel, Makashvili str. 32-34)

# Workshop

## 2 June, Sunday

Ilia state University, Building G, Giorgi Tsereteli str. 1  
(8:30 Transport departs from Betsy's Hotel, Makashvili str. 32-34)

9:00 - 9:25 **Registration**

9:25 - 9:30 **Workshop Opening: R. Egger et al**

(Talks are 30min+10min discussion)

### **Morning Session: Chair George Jackeli**

9:30 - 10:10

**Andrey Chubukov** "Quantum critical point in a metal: interplay between superconductivity and Non-Fermi-Liquid"

10:10 - 10:50

**Hidenori Takagi** "Exotic spin-orbital entangled states in  $4d$  and  $5d$  transition metal oxides"

*Coffee break (20 min)*

11:10 - 11:50

**Giniyat Khaliullin** "Exotic magnetism in spin-orbit Mott insulators"

11:50 - 12:30

**Natalia Perkins** "Bond disordered spin liquid and the honeycomb iridate  $H_3LiIr_2O_6$ "

*Lunch (2 hrs)*

### **Afternoon Session: Chair Natalia Perkins**

14:30 - 15:10

**Mike Zhitomirsky** "Noncoplanar multi-k states in frustrated magnets"

15:10 - 15:50

**Adolfo Avella** "Defects, Disorder, and Strong Electron Correlations in Orbital Degenerate, Doped Mott Insulators"

15:50 - 16:30

**Alaska Subedi** "Intertwined structural and magnetic transitions in rare-earth nickelates"

*Coffee break (30 min)*

17:00 - 17:40

**Zurab Guguchia** "Tunable Berry curvature through magnetic phase competition in a topological Kagome Magnet"

18:00 - 20:00

### **Welcome Dinner**

Restaurant 'Rachis Ubani', Kustba Road no. 1

(17:50 Transport departs from Workshop venue)

# Workshop

## 3 June, Monday

Georgian National Academy of Sciences, Rustaveli ave. 52  
(about 10min downhill walk from Hotels)

(Talks are 30min+10min discussion)

### Morning Session: Chair Reinhold Egger

9:30 - 10:10

**Alexander Altland** "Many body quantum chaos of the Sachdev-Ye-Kitaev Model"

10:10 - 10:50

**Masaki Oshikawa** "Universal gap scaling in finite quantum Ising chains"

*Coffee break (20 min)*

11:10 - 11:50

**Daniel I. Khomskii** "Electric activity of different magnetic textures"

11:50 - 12:30

**Henrik Johannesson** "Robustness of symmetry-protected topological states against time-periodic perturbations"

*Lunch (2 hrs)*

### Afternoon Session: Chair Alexander Altland

14:30 - 15:10

**Pilar López-Sancho** "Topological Solitons in doped Zigzag Graphene Nanoribbons"

15:10 - 15:50

**Alessandro De Martino** "Graphene p-n junctions"

15:50 - 16:30

**Michael Sekania** "Braiding errors in interacting Majorana wires"

*Coffee break (30 min)*

17:00 - 17:40

**Pierre Fromholz** "A criterion for topological phases : cases of the Kitaev wire and the AKLT chain"

18:00 – 18:40

**Day summary discussion for students led by a senior scientist**

**Free evening**

# Workshop

## 4 June Tuesday

Georgian National Academy of Sciences, Rustaveli ave. 52  
(about 10min downhill walk from Hotels)

(Talks are 30min+10min discussion)

### Morning Session: Chair Mike Zhitomirsky

9:30 - 10:10

**Leon Balents** "Exciting excitations in quantum antiferromagnets"

10:10 - 10:50

**Oleg Starykh** "Collective modes of magnetized spin liquids"

*Coffee break (20 min)*

11:10 - 11:50

**Alexander Chernyshev** "Anisotropic-Exchange Magnets on a Triangular Lattice: Spin Waves, Accidental Degeneracies, and Dual Spin Liquids"

11:50 - 12:30

**B.J. Kim** "High-velocity spin waves in the Sr<sub>2</sub>IrO<sub>4</sub>/Sr<sub>3</sub>Ir<sub>2</sub>O<sub>7</sub> heterostructure"

*Lunch (2 hrs)*

### Afternoon Session: Chair Masaki Oshikawa

14:30 - 15:10

**Achim Rosch** "Magnetotransport in Dirac materials: Theory and experiment"

15:10 - 15:50

**Yuval Gefen** "Multidimensional non-equilibrium steady states from topological degeneracy"

15:50 - 16:30

**Oleksiy Kolezhuk** "Topological excitations in low-dimensional magnets with competing interactions"

*Coffee break (30 min)*

17:00 - 17:40

**Constantin Schrade** "Spin-valley density waves in moiré materials"

18:00 – 18:40

**Day summary discussion for students led by a senior scientist**

19:00 – 21:00

### **Dinner**

Academy Lounge Restaurant, Rustaveli ave. 27/2

(about 15 min downhill walk from Hotels)

# Workshop

**5 June**

**Excursion Day**

**(8:30** Bus departs from Betsy's Hotel, Makashvili str. 32-34 --- return about 20:30)

**Whole Day Excursion to**

**Kakheti Region**

(further details will be provided during the Workshop)

# Workshop

## 6 June Thursday

Georgian National Academy of Sciences, Rustaveli ave. 52  
(about 10min downhill walk from Hotels)

(Talks are 30min+10min discussion)

### Morning Session: Chair Dieter Vollhardt

9:30 - 10:10

**Bernhard Keimer** "Resonant x-ray scattering from quantum materials"

10:10 - 10:50

**Walter Metzner** "Competition between magnetism and superconductivity in the Hubbard model and in the cuprates"

*Coffee break (20 min)*

11:10 - 11:50

**Alexander Shengelaya** "Surprisingly similar response of superconductivity and stripe order to in-plane impurities in cuprates"

11:50 - 12:30

**Alex Zazunov** "Fermi-liquid theory for superconducting Kondo problem"

*Lunch (2 hrs)*

### Afternoon Session: Chair Alexander Nersesyan

14:30 - 15:10

**Paul Wiegmann** "Hydrodynamics of the edge modes"

15:10 - 15:50

**Giuseppe Mussardo** "Lieb-Liniger tales"

15:50 - 16:30

**Maria Vozmediano** "New anomaly induced transport in 3D Dirac matter"

*Coffee break (30 min)*

17:00 - 17:40

**Bilal Tanatar** "Ground-state properties and strong correlation effects in Rydberg-dressed Bose gases"

18:00 - 18:40

**Day summary discussion for students led by a senior scientist**

**Free evening**

# Workshop

## 7 June Friday

Georgian National Academy of Sciences, Rustaveli ave. 52  
(about 10min downhill walk from Hotels)

(Talks are 30min+10min discussion)

### Morning Session: Chair Leon Balents

9:30 - 10:10

**Thors Hans Hansson** "Geometry and topology in two-dimensional chiral liquids"

10:10 -10:50

**Eva Andrei** "Strategies for transforming the band structure of 2D materials"

*Coffee break (20 min)*

11:10 -11:50

**Mikhail Kiselev** "Thermoelectric transport through SU(n) quantum impurity"

11:50 -12:30

**Marcello Dalmonte** "Lattice gauge theories and Schwinger pair production in synthetic quantum magnets"

*Lunch (2 hrs)*

### Afternoon Session: Chair Alexander Chernyshev

14:30 -15:10

**Lucile Savary** "The SU(4) spins"

15:10 - 15:50

**Rodrigo Pereira** "Chiral spin liquids from junctions of spin chains"

15:50 – 16:30

**Andrey Zheludev** "Spin nematics on a square lattice: experiment"

*Coffee break (30 min)*

17:00 - 17:40

**Masahiko G. Yamada** "SU(4) quantum spin-orbital liquids and beyond"

19:00 - 22:00

### **Conference Dinner**

Restaurant 'Tabla', Ilia Chavchavadze ave. 33

(18:30 Transport departs from Betsy's Hotel, Makashvili Str. 32-34)

# Workshop

## 8 June Saturday

Ilia state University, Building G, Giorgi Tsereteli str. 1

(9:00 Transport departs from Betsy's Hotel, Makashvili str. 32-34)

(Talks are 30min+10min discussion)

### Morning Session: Chair Oleg Starykh

9:30 - 10:10

**Roderich Moessner** "Dephasing in spin liquids"

10:10 - 10:50

**Felix von Oppen** "Topological quantum computation with Majorana fermions"

*Coffee break (20 min)*

11:10 - 11:50

**Natan Andrei** "Non-equilibrium dynamics of quantum many-body systems"

11:50 - 12:30

**Alvaro Ferraz** "Fermi Surface Reconstruction in Underdoped Cuprates"

*Lunch (2 hrs)*

### Afternoon Session: Chair Achim Rosch

14:30-15:10

**Cristiane Morais Smith** "There is a plenty of room at the bottom ...but even more in a fractal"

15:10 - 15:50

**Dionys Baeriswyl** "Superconductivity from repulsion: Variational results in the limit of weak interactions"

15:50 – 16:30

**Revaz Ramazashvili** "Zeeman spin-orbit coupling and magnetic quantum oscillations in antiferromagnetic conductors"

*Coffee break (30 min)*

17:00 - 17:40

**Sergey Streltsov** "Spin-orbit entanglement resulting in anisotropic compass model and absence of Jahn-Teller distortions in  $\text{CuAl}_2\text{O}_4$ "

18:00 – 18:40

**Day summary discussion for students led by a senior scientist**

**Free evening**



## Workshop

### 9 June Sunday

Ilia state University, Building G, Giorgi Tsereteli str. 1

(9:00 Transport departs from Betsy's Hotel, Makashvili str. 32-34)

(Talks are 30min+10min discussion)

#### Morning Session: Chair Adolfo Avella

9:30 - 10:10

**Vladimir Kravtsov** "Between one and infinite dimensions: surprises of Anderson localization"

10:10 - 10:50

**Davron Matrasulov** "Supercritical phenomena in graphene with charged impurities"

*Coffee break (20 min)*

11:10 - 11: 50

**Hrachya Babujian** "Correlation Functions of Classical and Quantum Artin System defined on Lobachevsky Plane and Scrambling Time"

11:50 - 12:30

**Yasir Iqbal** "Functional renormalization group for three-dimensional quantum magnetism"

*Lunch (2 hrs)*

#### Afternoon Session: Chair Michael Sekania

14:30 - 15:10

**Francesco Buccheri** "Superconductivity from piezoelectric interactions in Weyl semimetals"

15:10 - 15:30 **Workshop Closing Remarks**

**(Please see the next page for 10 June Monday Lecture Schedule for Students)**

# Workshop

## 10 June Monday

### Lectures for Students

Lecture Hall, Andronikashvili Institute of Physics, Tamarashvili str. 6  
(9:30 Transport departs from Betsy's Hotel, Makashvili str. 32-34)

10:00 - 11:40

**Vladimir Kravtsov** "Non-ergodic extended states in Random matrix theory and Anderson localization "

12:00 - 13:00

**Dionys Baeriswyl** "Variational studies of the Hubbard model"

*Lunch (1.5 hr)*

14:30 - 16:30

**Michael Sekania** "Introduction to Matrix Product States, Density-Matrix Renormalization Group Perspective"

## Posters

### June 8-10.

(Ilia state University, Building G, Giorgi Tsereteli str. 1)

**Neda Ahmadi** "Classification of Quantum Phases of Alternate Spin Ladders."

**Vicente Arjona** "Fingerprints of the conformal anomaly on the thermoelectric transport in Dirac and Weyl semimetals"

**Bachana Beradze** "Magnetic phase diagram of a spin-1/2 two-leg ladder with modulated Dzyaloshinskii-Moriya interaction"

**Schelto Crone** "Detecting a  $Z_2$  topologically ordered phase using iPEPS".

**Shora Garuchava** "Asymmetric ionic Hubbard model with next nearest neighbor hopping"

**Serena Fazzini** "Interaction-Induced Fractionalization and Topological Superconductivity in the Polar Molecules Anisotropic t-J Model".

**Luka Jibuti.** "Quantum Phases of Water Molecules in Nano-Cavities."

**Jonas Sonnenschein** " Spinon hopping model for  $\text{Ca}_{10}\text{Cr}_7\text{O}_{28}$  "

**Mikheil Tsitsishvili** "Gapped phases and quantum criticalities of a dimerized two-chain ladder model"

**Bart van Voorden** "A topological quantum pump of strongly interacting fermions".

**End of the Scientific Program**

# Workshop

## List of participants

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## Workshop

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