

# Opening Symposium of QS<sup>2</sup>C Theory Forum

September 27- 30, 2010

At Suzuki Umetaro Hall of RIKEN, Wako, Saitama, Japan.

|       | Sept. 27th   |  | Sept. 28th   |   | Sept. 29th  |   | Sept. 30th                                 |                             |                                   |             |                 |  |
|-------|--|--|--|---|---|---|--|-----------------------------|-----------------------------------|-------------|-----------------|--|
| 9:20  | Opening ( N. Nagaosa )   |  |  |   |   |   |  |                             |                                   |             |                 |  |
| 9:30  | Highlights in strong correlation physics<br>Chair : N. Nagaosa | G. A. Sawatsky                                     | Topological phenomena<br>Chair : L. Balents          | S. C. Zhang                                       | Strong correlation and superconductivity<br>Chair : M. Norman | Z. X. Shen                                    | Emergent Properties<br>Chair : M. Kawasaki | 9:30-10:00                  | Y. Tokura<br>< Overview >         |             |                 |  |
| 10:00 |  | T. Giamarchi                                       |  | A. V. Balatsky                                    |   | Y. Maeno                                      |  | 10:00-10:15                 | Y. Taguchi                        |             |                 |  |
| 10:30 |  | Break (20 min.)                                    |  | Break (20 min.)                                   |   | Break (20 min.)                               |  | 10:15-10:30                 | Y. Tokunaga                       |             |                 |  |
| 10:50 |  | H. Fukuyama  |  | X. F. Jin   |   | K. Miyake                                     |  | 10:30-10:45                 | S. Ishiwata                       |             |                 |  |
| 11:20 |  | Y. Tokura  |  | Y. B. Kim   |   | Y. Kitaoka                                    |  | 10:45-11:05 Break (20 min.) |                                   |             |                 |  |
| 11:50 |  | M. Kawasaki  |  | M. Oshikawa                                       |   | R. Arita                                      |  | 11:05-11:20                 | S. Shin                           |             |                 |  |
| 12:20 |  | Lunch (12:20 - 14:00)                              |  | Lunch (12:20 - 14:00)                             |   | Lunch (12:20 - 14:00)                         |  | Lunch (12:20-13:20)         |                                   |             |                 |  |
| 14:00 |  | Theory of quantum physics<br>Chair : G.A. Sawatsky |  | J. Zaanen   |   | Poster Session<br>15:20-15:30 Break (10 min.) |  | W. E. Pickett               | Motttronics<br>Chair : N. Nagaosa | 13:20-13:35 | K. S. Takahashi |  |
| 14:30 | M. R. Norman   |  | K. Terakura  | 13:35-13:50                                       | K. Shibuya  |   |  |                             |                                   |             |                 |  |
| 15:00 | D. Loss  |  | L. Balents   | 13:50-14:05                                       | J. S. Lee   |   |  |                             |                                   |             |                 |  |
| 15:30 | F. Nori  |  | M. Ogata   | 14:05-14:20                                       | A. Tsukazaki  |   |  |                             |                                   |             |                 |  |
| 16:00 | Break (30 min.)  |  | Y. Kuramoto  | 14:20-14:40                                       | Break (20 min.)   |   |  |                             |                                   |             |                 |  |
| 16:30 | Theory of electron correlation I<br>Chair : A.V. Balatsky      | K. Ueda  | Theory of electron correlation II<br>Chair : D. Loss | M. Imada  | Dissipationless Electronics<br>Chair : Y. Tokura              | 15:10-15:25                                   | S. Ono                                     |                             |                                   |             |                 |  |
| 17:00 |  | N. Kawakami  |  | H. Kawamura                                       |   | 15:25-15:40                                   | T. Hasegawa                                |                             |                                   |             |                 |  |
| 17:30 |  | T. K. Ng   |  | A. Furusaki                                       |   | 15:40-16:00                                   | Break (20 min.)                            |                             |                                   |             |                 |  |
| 18:00 |  | S. Yunoki  |  | 18:00-20:00<br>Banquet<br>@Hirosawa Club<br>RIKEN |   | 16:00-16:15                                   | N. Nagaosa                                 |                             |                                   |             |                 |  |
| 18:30 |  |  |  |   |   |   | 16:15-16:30                                | K. Nomura                   |                                   |             |                 |  |
|       |  |  |  |   |   |   | 16:30-16:45                                | F. Kagawa                   |                                   |             |                 |  |
|       |  |  |  |   |   |   | 16:45-17:00                                | T. Arima                    |                                   |             |                 |  |
|       |  |  |  |   |   |   | 17:00-17:20 Break (20 min.)                |                             |                                   |             |                 |  |
|       |  |  |  |   |   |   | 17:20-17:35                                | K. Ishizaka                 |                                   |             |                 |  |
|       |  |  |  |   |   |   | 17:35-17:50                                | M. S. Bahrmy                |                                   |             |                 |  |
|       |  |  |  |   |   |   | 17:50-18:05                                | Y. Onose                    |                                   |             |                 |  |
|       |  |  |  |   |   |   | 18:05-18:20                                | H. Murakawa                 |                                   |             |                 |  |

## Day 1 : Monday, Sept. 27

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**09:20 - 09:30**      **Opening : N. Nagaosa**

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**09:30 - 12:20**      **Highlights in strong correlation physics**

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Chair : N.Nagaosa

Ma01    **G.A. Sawatsky**    ( The University of British Columbia )  
Electronic polarons in narrow band correlated electron systems:  
The explicit role of anions in transition metal compounds

Ma02    **T. Giamarchi**      ( University of Geneva )  
Statics and dynamics of spin ladders

**10:30 - 10:50**      *Break ( 20 min. )*

Ma03    **H. Fukuyama**      ( Tokyo University of Science )  
Exotic electronic states in molecular solids

Ma04    **Y. Tokura**            ( University of Tokyo & CERG and CMRG, RIKEN )  
Skyrmion lattice formation and topological Hall effect induced by spin chirality

Ma05    **M. Kawasaki**      ( Tohoku University & CERG and CMRG, RIKEN )  
Interface Issues of Correlated Electron Oxides

**12:20 - 14:00**      **Lunch break**

**14:00 - 16:00**      **Theory of quantum physics**

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Chair : G.A. Sawatsky

Mp01    **J. Zaanen**            ( Leiden University )  
Quantum criticality, high Tc superconductivity and the AdS/CFT correspondence  
of string theory

Mp02    **M. R. Norman**      ( Argonne National Lab )  
AdS/CFT - Playing the Devil's Advocate

Mp03    **D. Loss**              ( University of Basel )  
Nuclear Magnetism and Peierls-like transition in Nanotubes and Quantum Wires  
with Spin-Orbit Interactions

Mp04    **F. Nori**              ( RIKEN, University of Michigan )  
An overview on atomic physics and quantum optics using circuits with  
superconducting qubits

16:00-16:30 Break ( 30 min. )

**16:30-18:30 Theory of electron correlation I**

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Chair : A. V. Balatsky

- Mp05 **K. Ueda** ( University of Tokyo )  
Theory of Dielectric Breakdown of the One-Dimensional Hubbard Model
- Mp06 **N. Kawakami** ( Kyoto University )  
Cluster-DMFT Study of Mott Transition with Spin/Orbital Frustration
- Mp07 **T. K. Ng** ( The Hong Kong University of Science and Technology )  
Fermionic theory for quantum antiferromagnets with spin  $S > 1/2$
- Mp08 **S. Yunoki** ( RIKEN )  
Microscopic study of spin-orbit-induced Mott insulator in Ir oxides

## Day 2 : Tuesday, Sept. 28

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### 09:30 - 12:20 Topological phenomena

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Chair : L. Balents

Ta01 **S.C. Zhang** ( Stanford University )  
Topological insulators and topological superconductors

Ta02 **A. V. Balatsky** ( Los Alamos National Laboratory )  
Dirac materials

10:30 - 10:50 *Break ( 20 min. )*

Ta03 **X. F. Jin** ( Fudan University )  
Unveiling the Intrinsic origin of the Anomalous Hall Effect

Ta04 **Y. B. Kim** ( University of Toronto )  
Spin Liquid and Topological Insulator in Weak Mott Regime

Ta05 **M. Oshikawa** ( University of Tokyo )  
Symmetry protection of topological order and entanglement

12:20 - 14:00 **Lunch break**

14:00 - 15:20 **Poster Session**

15:20 - 15:30 *Break ( 10 min. )*

### 15:30 - 17:30 Theory of electron correlation II

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Chair : D. Loss

Tp01 **Y. Kuramoto** ( Tohoku University )  
A new type of electronic order involving Kondo singlets

Tp02 **M. Imada** ( University of Tokyo )  
Emergent Mott Physics

Tp03 **H. Kawamura** ( Osaka University )  
Spin liquid and novel order in two-dimensional frustrated Heisenberg antiferromagnets

Tp04 **A. Furusaki** ( RIKEN )  
Kondo effect on the edge of topological insulators and superconductors

18:00-20:00 Banquet at Hirosawa Club, RIKEN.

# RIKEN MAP



## Day 3 : Wednesday, Sept. 29

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### 09:30 - 12:20 Strong correlation and superconductivity

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Chair : M. Norman

Wa01 **Z. X. Shen** ( Stanford University )  
Energy Gaps and Symmetry Breaking in High-Temperature Superconductors

Wa02 **Y. Maeno** ( Kyoto University )  
Topological Competition of Superconductivity in  $\text{Sr}_2\text{RuO}_4$  Junctions

10:30 - 10:50 Break ( 20 min. )

Wa03 **K. Miyake** ( Osaka University )  
Spin fluctuations vs valence fluctuations in heavy electron superconductors

Wa04 **Y. Kitaoka** ( Osaka University )  
The attractive interaction for high- $T_c$  cuprate superconductors

Wa05 **R. Arita** ( University of Tokyo )  
Alkali-metal loaded zeolites: Relativistic and correlated  $s$  electron systems

12:20 - 14:00 Lunch break

### 14:00 - 17:30 Perspectives in strong correlation physics

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Chair : N. Kawakami

Wp01 **W. E. Pickett** ( University of California, Davis )  
Creating New Electronic Phases in Oxide Nanostructures

Wp02 **K. Terakura** ( JAIST )  
Phase diagram of tetragonal  $\text{LaVO}_3$  and its implication in polar discontinuity systems  $\text{LaVO}_3/\text{SrTiO}_3$  and  $\text{LaVO}_3/\text{LaAlO}_3$

Wp03 **L. Balents** ( University of California, Santa Barbara )  
Strong spin orbit physics in the Mott regime

Wp04 **M. Ogata** ( University of Tokyo )  
Order parameters and impurity effects in iron-pnictide superconductors

16:00 - 16:30 Break ( 30 min. )

Wp05 **H. Takagi** ( University of Tokyo, RIKEN )  
Novel electronic phases produced by strong spin-orbit coupling in 5d Ir Oxides

Wp06 **S. Maekawa** ( Japan Atomic Energy Agency )  
Seebeck Effect, Spin Seebeck Effect and Spin-Electronics

## Day 4 : Thursday, Sept. 30

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**09:30 - 10:00**      **Overview : Y. Tokura**

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**10:00 - 12:20**      **Emergent Properties**

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Chair : M. Kawasaki

- 10:00 - 10:15      Qa01    **Y. Taguchi**                      ( CERG and CMRG, RIKEN )  
Exploration of magnetocaloric and thermoelectric materials
- 10:15 - 10:30      Qa02    **Y. Tokunaga**                      ( ERATO-MF, JST )  
Magnetic control of spin helicity and electric polalization in  
multiferroic M-type hexaferrites with room-temperature  
conical state
- 10:30 - 10:45      Qa03    **S. Ishiwata**                      ( QPEC, University of Tokyo )  
Anomalous Hall effect in the helimagnetic cubic perovskite  
SrFeO<sub>3</sub>
- 10:45 - 11:05*      *Break ( 20 min. )*
- 11:05 - 11:20      Qa04    **S. Shin**                              ( University of Tokyo )  
Time-resolved photoemission on Bi2212
- 11:20 - 11:35      Qa05    **A. Chainani**                      ( RIKEN SPring-8 Center )  
Soft X-ray angle-resolved photoemission of Fe/Cu(001) and  
Fe/Au(111)
- 11:35 - 11:50      Qa06    **Y. Murakami**                      ( KEK )  
Ordering States of Electronic Degrees of Freedom Studied  
by Resonant Hard/Soft X-ray Scattering
- 11:50 - 12:05      Qa07    **H. Nakao**                              ( KEK )  
Charge and Magnetic Order in LaMnO<sub>3</sub>/SrMnO<sub>3</sub> Superlattice
- 12:05 - 12:20      Qa08    **H. Wadati**                              ( QPEC, University of Tokyo )  
Resonant soft x-ray scattering studies of Pr<sub>0.5</sub>Ca<sub>0.5</sub>MnO<sub>3</sub> thin films
- 12:20 - 13:20*      *Lunch*

**13:20 - 15:40**      **Mottronics**

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Chair : N. Nagaosa

- 13:20 - 13:35      Qp01    **K. S. Takahashi**                      ( CMRG, RIKEN )  
4d and 5d single-layered perovskite films as prepared by  
pulsed laser deposition
- 13:35 - 13:50      Qp02    **K. Shibuya**                              ( CMRG, RIKEN )  
Metal-insulator transition in electron-doped VO<sub>2</sub> thin films  
and TiO<sub>2</sub>/VO<sub>2</sub> superlattices
- 13:50 - 14:05      Qp03    **J. S. Lee**                              ( QPEC, University of Tokyo )  
Optical study of correlated matters



## Day 4 : Thursday, Sept. 30

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14:05 - 14:20 Qp04 **A. Tsukazaki** ( QPEC, University of Tokyo )  
Quantum transport in MgZnO/ZnO heterostructures with extremely high mobility 2DEG

14:20 - 14:40 *Break ( 20 min. )*

14:40 - 14:55 Qp05 **Y. Iwasa** ( CERG, RIKEN & University of Tokyo )  
Basic aspects of electric double layer transistor

14:55 - 15:10 Qp06 **A. Sawa** ( AIST )  
Control of Metal-Insulator Transition in NdNiO<sub>3</sub> by Electrolyte Gating

15:10 - 15:25 Qp07 **S. Ono** ( CERG, RIKEN )  
High performance organic single crystal transistors

15:25 - 15:40 Qp08 **T. Hasegawa** ( AIST )  
Photovoltaics in Organic Mottronics Materials

15:40 - 16:00 *Break ( 20 min. )*

### 16:00 - 18:20 **Dissipationless Electronics**

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Chair : Y.Tokura

16:00 - 16:15 Qp09 **N. Nagaosa** ( CERG, and CMRG, RIKEN & University of Tokyo )  
Emergent electromagnetism

16:15 - 16:30 Qp12 **K. Nomura** ( CERG, RIKEN )  
Spin textures on a topological insulator

16:30 - 16:45 Qp11 **F. Kagawa** ( QPEC, University of Tokyo )  
Dynamical response of domain walls

16:45 - 17:00 Qp10 **T. Arima** ( Tohoku University )  
Spin-induced polarization in triangular lattice

17:00 - 17:20 *Break ( 20 min. )*

17:20 - 17:35 Qp13 **K. Ishizaka** ( University of Tokyo )  
Bulk Rashba splitting in a layered polar Bi compound

17:35 - 17:50 Qp14 **M. S. Bahramy** ( CERG, RIKEN )  
Giant Rashba splitting in bulk BiTeI

17:50 - 18:05 Qp15 **Y. Onose** ( University of Tokyo )  
Observation of magnon Hall effect

18:05 - 18:20 Qp16 **H. Murakawa** ( ERATO-MF, JST )  
Magnetoelectric Properties of the Noncentrosymmetric Crystal Magnet

## Poster Session

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- P01 **S. Sakai** (Vienna University of Technology)  
Pseudogap state in high- $T_c$  cuprates in the light of zeros of Green's function
- P02 **T. Momoi** (RIKEN)  
Spin nematic order and magnetization plateau in the triangular lattice multiple-spin exchange model: Magnetism of solid  $^3\text{He}$  films
- P03 **W. Koshibae** (CMRG, RIKEN)  
Real-time quantum dynamics of a spin-electron coupled system
- P04 **S. Ashhab** (RIKEN)  
Cavity QED in the ultrastrong-coupling regime
- P05 **S. Ashhab** (RIKEN)  
Landau-Zener-Stueckelberg interferometry
- P06 **N. Lambert** (RIKEN)  
Distinguishing quantum and classical transport through nanostructures
- P07 **P. D. Nation** (RIKEN)  
Landauer Transport Model for Black Hole Entropy Production
- P08 **J. Kishine** (Kyushu Institute of Technology)  
Sliding conductivity of magnetic phase-kink crystal in a chiral helimagnet: Gauge field, accidental Kramers and magnetic-current diode effect
- P09 **H. Wang** (RIKEN)  
Robust and scalable optical one-way quantum computation
- P10 **M. Ezawa** (University of Tokyo)  
Giant Skyrmion in Thin Ferromagnetic Film:  
The importance of Magnetic Dipole-Dipole interaction
- P11 **P. K. Ghosh** (RIKEN)  
Solar energy conversion mimicking natural photosynthesis:  
Modeling the light-energy conversion in a molecular triad  
(inserted between two proton reservoirs or two electrodes)
- P12 **T. Sakai** (JAEA)  
Exotic Quantum Phenomena of the Spin Nanotubes
- P13 **J. R. Johansson** (RIKEN)  
The dynamical Casimir effect in a superconducting microwave circuits
- P14 **M. Mori** (JAEA)  
Enhanced Pairing Correlations near Oxygen Dopants in Cuprate Superconductors
- P15 **A. Koga** (Tokyo Institute of Technology)  
Superfluid state in strongly correlated systems with attractive interactions
- P16 **A. Shitade** (University of Tokyo)  
Purely Electric Manipulation of Two Spin Qubits in a Double Quantum Dot
- P17 **T. Kita** (Kyoto University)  
Orbital fluctuations around Mott transition in multiorbital Hubbard model
- P18 **J. H. Han** (Sungkyunkwan University)  
Skyrmion Lattice in Two-Dimensional Chiral Magnet

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- P19 **S. C. Furuya** ( Institute for Solid State Physics )  
Electron Spin Resonance Shift in Haldane Chains with Uniaxial Anisotropy
- P20 **G. Giavaras** ( RIKEN )  
Graphene quantum dots due to spatial modulation of the Dirac gap
- P21 **Y. W. Long** ( ERATO-MF, JST )  
Synthesis, magnetic and transport properties of SrCoO<sub>3</sub> single crystal
- P22 **T. Eggel** ( University of Tokyo )  
4DXY Quantum Criticality of <sup>4</sup>He in Nanoporous Gelsil Glass
- P23 **H. Sakai** ( CMRG, RIKEN )  
Self-organization and metallic conduction of Jahn-Teller polarons in electron-doped cubic SrMnO<sub>3</sub> crystal
- P24 **D. C. Peets** ( Kyoto University )  
Noncentrosymmetric Superconductors
- P25 **H. M. Yamamoto** ( RIKEN )  
Band-Filling-Controlled Mott-transition in an organic FET
- P26 **J. Fujioka** ( ERATO-MF, JST )  
Optical Investigation on Collective Dynamics of Charge-Orbital Density Wave in Layered Manganites
- P27 **E. Iyoda** ( University of Tokyo )  
Abelian statistics in FQH states and shot noise at finite temperatures
- P28 **M. Mochizuki** ( University of Tokyo )  
Electromagnons and Optical Spin-Chirality Switching in the Multiferroic Mn Perovskites
- P29 **T. Suzuki** ( CMRG, RIKEN )  
Doping effect on thermoelectric properties in layered RZnSbO (*R* = La, Ce) with low lattice thermal conductivity
- P30 **F. Kagawa** ( QPEC, University of Tokyo )  
Magnetic Mott criticality in a  $\kappa$ -type organic salt
- P31 **M. Kohno** ( NIMS )  
Spectral function near the Mott transition in the one-dimensional Hubbard model
- P32 **M. Tezuka** ( Kyoto University )  
Effect of disorder on 1D ultracold fermionic superfluids
- P33 **Y. Takahashi** ( ERATO-MF, JST )  
Terahertz optical study of electromagnons in the multiferroic perovskite manganites
- P34 **N. Kida** ( University of Tokyo )  
Gigantic terahertz magnetochromism and non-reciprocal dichroism via electromagnons
- P35 **T. Misawa** ( University of Tokyo )  
Magnetic Properties of *Ab initio* Model for Iron-Based Superconductors LaFeAsO
- P36 **H. Murakawa** ( ERATO-MF, JST )  
Ferroelectricity induced by spin-dependent metal-ligand hybridization in Ba<sub>2</sub>CoGe<sub>2</sub>O<sub>7</sub>

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- P37 **S. Ishiwata** ( QPEC, University of Tokyo )  
Anomalous Hall effect in the helimagnetic cubic perovskite SrFeO<sub>3</sub>
- P38 **A. Smirnov** ( RIKEN )  
Electron-driven proton pumps in biological systems
- P39 **M. Nakamura** ( CMRG, RIKEN )  
Multiferroicity in an orthorhombic YMnO<sub>3</sub> thin film
- P40 **J. G. Checkelsky** ( ERATO-MF, JST )  
Experimental probes of Ferromagnetism and the Rashba effect in heavily spin-orbit coupled materials
- P41 **Y. Onose** ( University of Tokyo )  
Observation of magnon Hall effect
- P42 **S. Miyahara** ( ERATO-MF, JST )  
Magnetoelectric Effects Induced by Spin-Dependent Metal-Ligand Hybridization in Ba<sub>2</sub>CoGe<sub>2</sub>O<sub>7</sub>
- P43 **T. Nomura** ( JAEA )  
Effect of Electron Correlation on Resonant Inelastic X-Ray Scattering in Iron-Arsenide Superconductors
- P44 **D. Okuyama** ( CMRG, RIKEN )  
Single-crystal Structural analysis of multiferroic perovskite YMnO<sub>3</sub>
- P45 **A. Chainani** ( RIKEN SPring-8 Center )  
Fermi surface nesting driven Spin-spiral in ultrathin Fe/Cu(001) films
- P46 **S. Furukawa** ( University of Toronto )  
Phase diagram of a spin-1/2 frustrated ferromagnetic chain with easy-plane anisotropy
- P47 **A. Miranowicz** ( Adam Mickiewicz University )  
Qubit-induced phonon blockade as a signature of quantum behavior in nanomechanical resonators
- P48 **K. Ishizaka** ( University of Tokyo )  
Observation of bulk Rashba-splitting in BiTeI
- P49 **H. Wadati** ( QPEC, University of Tokyo )  
Resonant soft x-ray scattering studies of Pr<sub>0.5</sub>Ca<sub>0.5</sub>MnO<sub>3</sub> thin films