YITP Annual Report

Yukawa Institute For
Theoretical Physics
Kyoto University

2015

Foreword

We present here an annual report of the scientific activities of Yukawa Institute for Theoretical Physics during the academic year 2015.

From the year 2007 we started our new project of "Yukawa International program of Quark-Hadron Sciences (YIPQS)" funded by Japan Ministry of Education, Culture, Sports, Science and Technology. In this project we select a few research topics each year for long-term workshops and invite leading experts from abroad to stimulate discussion and to foster collaborations among workshop participants. In the year 2015 we held two long-term workshops "New Frontiers in Non-equilibrium Physics 2015" and "Computational Advances in Nuclear and Hadron Physics", and extensive discussions have been made. Our report contains some of the results obtained during these workshops.

Not only has our institute pushed forward the research in contemporary theoretical physics, but also we encourage activities in creating new interdisciplinary fields of research involving the forefront of modern physics. Since July 2015, we have operated "International Research Unit of Advanced Future Studies" in collaboration with 12 research organizations in Kyoto University. Under this unit, six workshops and symposiums were held in the year 2015, which stimulate discussion on various topics in science and culture.

Since its foundation in 1953, our institute has played a role of international hub for the researchers in theoretical physics. We hope that this report makes our activities more accessible to researchers in the world, and helps them to visit us in the future.

Director
Misao Sasaki

Contents

Chapter 1

Members

1.1 Regular Staff, Visiting Professors and Advanced Future Studies Researchers (2015 April – 2016 March)

Regular Staff

Misao Sasaki
Professor (A)

Masaru Shibata
Professor (A)

Hisao Hayakawa
Professor (C)

Akira Ohnishi
Professor (N)

Sinya Aoki
Professor (E)

Tadashi Takayanagi
Professor (E)

Shigeki Sugimoto
Professor (E)

Shinji Mukohyama
Professor (A)

Masatoshi Sato
Professor (C) [2015.6.1 –]

Kunihito Ioka
Professor (A) [2016.2.1 –]

Takahiro Tanaka
Concurrent Post Professor (A) [2015.4.17 –2015.5.31]

Masatoshi Murase
Associate Professor (C)

Hiroshi Kunitomo
Associate Professor (E)

Naoki Sasakura
Associate Professor (E)

Keisuke Totsuka
Associate Professor (C)

Naoyuki Itagaki
Associate Professor (N)

Fumihiro Takayama
Associate Professor (E)

Yoshitaka Hatta
Associate Professor (N)

Atsushi Taruya
Associate Professor (A)

Antonio De Felice
Associate Professor (A)

Yudai Suwa
Associate Professor (A)

Seiji Terashima
Assistant Professor (E)

Yu Watanabe
Assistant Professor (C)

Ippei Danshita
Assistant Professor (C)

Tetsuo Hyodo
Assistant Professor (N)

Yuko Fujita
Assistant Professor (Project Manager)

In this list, the symbols A, C, E and N in the parenthesis are the following abbreviations of research fields:

A: Astrophysics and Cosmology
C: Condensed Matter and Statistical Physics
E: Elementary Particle Theory
N: Nuclear Physics Theory

Visiting Professors

Prof. Stephan COLOMBI
(Institut d'Astrophysique de Paris)
2015.4.1 — 2015.6.30
Numerical modelling of Vlasov-Poisson equations

Prof. Jean-Paul BLAIZOT
(CEA Saclay)
2015.7.4 — 2015.10.3
Understanding the initial stage of relativistic heavy-ion collisions

Prof. Rainer SOMMER
(NIC DESY)
2015.7.5 — 2015.10.4
Evaluation of the strong coupling constant and the determination of V_{ub} from B-meson decays in lattice QCD

Prof. Frederic VAN WIJLAND
(University Paris Diderot)
2015.12.18 — 2016.3.17
Biased dynamics and soft-modes

Advanced Future Studies

Hector Palomo Bombin
Program-Specific Senior Lecturer
2016.1.1 — 2020.3.31

Alexander Vikman
Visiting Fellows
(Institute of Physics (FZU) of the Czech Academy of Sciences, Czech Republic)
2015.12.1 — 2016.2.28

Pan Zhang
Visiting Fellows
(Institute of Theoretical Physics, Chinese Academy of Sciences, China)
2016.3.3 — 2016.3.31

1.2 Hakubi Researchers, Research Fellows and Graduate Students (2015 April – 2016 March)

Hakubi Researchers

Masaki Shigemori
Hakubi Project Associate Professor (E)

Masanori Hanada
Hakubi Project Associate Professor (E)

Werner, Marcus Christian
Hakubi Project Assistant Professor (A) [2015.4.1 –]

Research Fellows

Takatoshi Ichikawa (N) [2009.4.1 – 2016.3.31]

Kenta Kiuchi (A) [2010.2.1 –]

Takashi Hiramatsu (A) [2010.4.1 –]

Hiroki Nagakura (A) [2011.4.1 – 2016.2.28]

Takashi Yoshida (A) [2013.4.1 – 2015.9.30]

Wakana Iwakuni (A) [2013.4.1 –]

Noburo Shiba (E) [2013.9.26 –]

Daisuke Nomura (E) [2013.10.16 – 2016.3.31]

Song He (E) [2013.11.1 – 2015.10.31]

Shunsuke Yabunaka (C) [2014.4.1 –]

Kouji Kashiwa (N) [2014.4.1 –]

Mitsutoshi Fujita (E) [2014.4.1 – 2015.8.31]

Masahiro Nozaki (E) [2014.4.1 – 2015.9.15]

Hirotada Okawa (A) [2014.7.1 –]

Takumi Iritani (E) [2014.7.1 – 2015.8.31]

Kenji Morita (N) [2014.8.1 –]

Chunshan Lin (A) [2014.8.16 –]

Yusuke Kimura (E) [2014.10.1 –]

Shinya Gongyo (E) [2015.4.1 – 2016.2.29]

Yasuhiro Yamaguchi (N) [2015.4.1 – 2015.9.30]

Shunji Matsuura (E) [2015.4.1 – 2015.9.30]

Yu Maezawa (N) [2015.4.1 –]

Giacomo Marmorini (C) [2015.4.1 –]

Hiroaki Matsunaga (E) [2015.5.1 – 2016.3.31]

Atsuo Shitade (C) [2015.6.1 – 2016.3.31]

Takahiro Nishinaka (E) [2015.9.1 –]

Lau, Pak Hung Chris (E) [2015.9.10 –]

Graduate Students

Naofumi Hama (E) [2010.4.1 – 2016.3]

Terukazu Ichihara (N) [2012.4.1 – 2016.3]

Tomoki Nosaka (E) [2011.4.1 – 2016.3]

Tomohiko Sano (C) [2011.4.1 – 2016.3]

Kazuya Shinjo (C) [2011.4.1 – 2016.3]

Satoshi Takada (C) [2011.4.1 – 2016.3]

Kyohei Kawaguchi (A) [2012.4.1 –]

Tokiro Numasawa (E) [2012.4.1 –]

Kazuhiko Tanimoto (C) [2012.4.1 –]

Kota Watanabe (C) [2012.4.1 –]

Yasuho Yamashita (A) [2012.4.1 –]

Yuta Yoshida (N) [2012.4.1 –]

Jaewang Choi (E) [2013.4.1 –]

Guillem Domenech Fuertes (A) [2014.10.1 –]

Joseph Mathew Fedrow (A) [2015.4.1 –]

Takaya Miyamoto (E) [2015.4.1 –]

Ryosuke Hara (C) [2013.4.1 –]

Ichihiko Hashimoto (A) [2013.4.1 –]

Takumi Ohta (C) [2013.4.1 –]

Minkyu Park (E) [2013.4.1 –]

Hidekazu Tsukiji (N) [2013.4.1 –]

Kento Watanabe (E) [2013.4.1 –]

Chen Hua (E) [2015.10.1 –]

Yukihisa Imamura (C) [2014.4.1 –]

Yuki Kamiya (N) [2014.4.1 –]

Masamichi Miyaji (E) [2014.4.1 –]

Kazuma Nagao (C) [2014.4.1 –]

Naoya Oishi (A) [2014.4.1 – 2016.3]

Kazuma Shimizu (E) [2014.4.1 –]

Yu Takaoka (C) [2014.4.1 – 2016.3]

Haruki Uchida (A) [2014.4.1 –]

Kazuhito Kuramoto (C) [2015.4.1 –]

Kohei Matsumoto (N) [2015.4.1 –]

Yuya Nakagawa (N) [2015.4.1 –]

Yushi Nakatani (A) [2015.4.1 –]

Aiki Ueno (E) [2015.4.1 –]

Hisashi Yamamoto (A) [2015.4.1 –]

Ph.D Awarded

Naofumi Hama
The localization calculation on supersymmetric gauge theories and its application (E)
(Hiroshi Kunitomo)

Terukazu Ichihara
Fluctuations in QCD phase diagram in the strong coupling limit of lattice QCD (N)
(Akira Ohnishi)

Tomoki Nosaka
M2-branes in M-theory and exact large N expansion (E)
(Naoki Sasakura)

Tomohiko Sano
Studies on non-equilibrium fluctuating motion as a rectifier (C)
(Hisao Hayakawa)

Kazuya Shinjo
Density-matrix renormalization group study of quantum spin systems with Kitaev-type anisotropic interaction (C)
(Keisuke Totsuka)

Satoshi Takada
Studies on transport phenomena of cohesive granular particles (C)
(Hisao Hayakawa)

Chapter 2

Research Activities

2.1 Research Summary

Astrophysics and Cosmology Group

Inflation and Early Universe

G. Domenech and M. Sasaki showed that if we consider various conformally related frames of the metric, the resulting spectrum of the curvature perturbation depends crucially on which frame of the metric matter minimally couples to.

C. Lin and M. Sasaki proposed a mechanism to enhance the tensor perturbation from inflation, thus evading the Lyth bound, by a minimal extension of general relativity to a theory with massive gravitons.

G. Domenech and M. Sasaki, together with A. Naruko, considered disformal transformations in cosmology, and showed that a pure disformal transformation without any conformal factor is equivalent to rescaling the time coordinate, thus explicitly proving the invariance of physical observables under cosmological disformal transformations.

S. Mukohyama, along with A. E. Gumrukcuoglu, L. Heisenberg and N. Tanahashi, studied cosmological solutions of bimetric theory with a composite matter coupling and analyzed its stability.

S. Mukohyama, along with R. Namba, R. Saitou and Y. Watanabe, studied the nature of constraints and count the number of degrees of freedom in the nonprojectable version of the $U(1)$ extension of Hořava-Lifshitz gravity, using the standard method of Hamiltonian analysis in the classical field theory, and showed that the theory in general contains the scalar graviton.

A. De Felice and S. Mukohyama proposed a new theory of massive gravity (the minimal theory of massive gravity) with only two propagating degrees of freedom and showed that it provides a stable nonlinear completion of the self-accelerating cosmological solution that was originally found in the dRGT theory.

G. Domenech and S. Mukohyama, along with R. Namba, A. Naruko, R. Saitou and Y. Watanabe, studied metric transformations which depend on a scalar field and its first derivatives and confirmed that the number of physical degrees of freedom does not change under such transformations, as long as they are not singular.

A. De Felice and S. Mukohyama, along with A. E. Gumrukçuoglu and L. Heisenberg, proposed a consistent linear effective vielbein matter coupling without introducing the Boulware-Deser ghost in ghost-free massive gravity, based on the partially constrained vielbein formulation.

A. De Felice and S. Mukohyama investigated the phenomenology of the minimal theory of massive gravity, that they recently proposed, in the presence of a dust fluid.

S. Mukohyama, along with A. Naruko and D. Yoshida, considered a new form of gravity theories in which the action is written in terms of the Ricci scalar and its first and second derivatives and showed that the theory is ghost-free under an appropriate choice of the functional form of the Lagrangian.

S. Mukohyama, along with C. Deffayet and V. Sivanesan, proposed a general method to classify field theories of a single p-form with equations of motions of order strictly equal to 2 and gauge invariance, and built a non-trivial Galileon-like theory for a 3-form with gauge invariance and an action which is polynomial into the derivatives of the form.

Observational Cosmology

M. Sasaki, together with K. Yamamoto, V. Marra and V. Mukhanov, studied the validity of the Newtonian description of cosmological perturbations for a fluid with non-zero pressure. It is found that even when the density contrast is nonlinear, the Newtonian description is valid as long as we consider sub-horizon inhomogeneities. However on scales smaller than the sound horizon, the nonlinear effect from the fluid motion always becomes important, giving rise to non-negligible anisotropic stress.

Y-S. Song, A. Taruya, E. Linder et al. have presented a first consistent modified gravity analysis using the anisotropic galaxy clustering of Baryon Oscillation Spectroscopic Survey (BOSS) DR11. In contrast to the cosmological test of general relativity frequently discussed in the literature, they consider the $f(R)$ gravity as a prototypical example of modified gravity, and constructed a theoretical template of galaxy correlation function, taking account of the nonlinear clustering and redshift-space distortions effects. Applying it to the latest observational data, they find no evidence of deviation from general relativity, and get a robust and stringent constraint on $f(R)$ gravity at cosmological scales.

T. Okumura et al. including A. Taruya have measured the redshift-space correlation function from a spectroscopic sample of $2,783$ emission line galaxies from the FastSound survey. The survey, which uses the Subaru Telescope and covers the redshift ranges of $1.19 < z < 1.55$, is the first cosmological study at such high redshifts. They detected a clear anisotropy due to redshift-space distortions, from which they obtain the first constraint on the growth rate at the redshift, $f(z)\sigma_8(z) = 0.482 \pm 0.116$ at $z \sim 1.4$. The derived constraint is consistent with the prediction of general relativity within the 1-σ confidence level.

I. Hashimoto, A. Taruya, T. Matsubara, T. Namikawa, and S. Yokoyama investigated the statistical power of

higher-order statistics and cross-correlation statistics to constrain the primordial non-Gaussianity from imaging surveys. Making use of a strong scale-dependent galaxy/halo clustering in the presence of primordial non-Gaussianity, they find that the bispectra can break the degeneracy between non-Gaussian parameters ($f_{\rm NL}$, $g_{\rm NL}$ and $\tau_{\rm NL}$), leading to a simultaneous constraint on those three parameters. The combination of cross-correlation statistics further improves the constraints by factor of 2.

Gravitational Waves

The final phase of coalescing compact binary systems composed of neutron star (NS) and/or black hole (BH) is among the most promising sources for kilo-meter-size laserinterferometric gravitational-wave detectors such as advanced LIGO and KAGRA. Gravitational waves from their late inspiral to merger phases can be accurately derived only by numerical-relativity (NR) simulations. Kawaguchi, Kyutoku, and Shibata with their collaborators performed simulations for the merger of precessing black hole-neutron star binaries and explored the unique gravitational waveforms. Kyutoku, Sekiguchi, and Shibata with their collaborators also performed a long-term accurate simulation for coalescing binary neutron stars and estimated the measurability of the tidal deformability of the neutron stars that is the key quantity for constraining the nuclear equation of state from the observation of gravitational waves.

If a NS is tidally disrupted by the companion BH in BH-NS binaries, a substantial amount of the neutron-rich matter can be ejected from the system. Kyutoku, Ioka, and Shibata with their collaborators thoroughly explored this mass ejection process.

Because NSs are strongly magnetized, magnetohydrodynamics effects should play a key role in the merger process of NS-NS binaries. Kiuchi, Kyutoku, Sekigychi, and Shibata preformed the highest-resolution (with grid spacing 17.5 m) general-relativistic magnetohydrodynamics simulations for NS-NS binaries on the "K" computer. They found that the magnetic fields are steeply amplified by the Kelvin-Helmholtz instability in a few millisecond after the onset of the merger until the magnetic-field energy reaches about 1% of the internal energy of the merger remnant. They also performed simulations for BH-NS binaries and found the following: If a NS is tidally disrupted at the merger, NS matter forms an accretion torus surrounding the remnant BH. In the accretion torus, magnetic fields are amplified by the magneto-rotational instability and eventually a strong outflow is driven by the amplified magnetic pressure. The final remnant after the outflow is composed of a BH surrounded by a poloidal magnetic field profile, which is well-suited for launching a gamma-ray burst.

T. Namikawa, A. Nishizawa, and A. Taruya propose a novel method to probe cosmology from the so-called gravitational-wave (GW) standard sirens without redshift identification. A key observable is the anisotropies in the number distribution and luminosity distances to each GW source, arising from the clustering and lensing effects of large-scale structure. With a network of Einstein telescopes, they pointed out that (i) the anisotropies can be measured even at very high redshifts ($z \geq 2$), (ii) the expected constraints on the primordial non-Gaussianity would be comparable to or even better than the other large-scale structure probes, and (iii) the cross-correlation with other cosmological observations is found to have high-statistical significance.

As an implication to the GW event GW150914 that is most probably the coalescence of BH binaries of 30-30 $M_\odot$, T. Namikawa, A. Nishizawa, and A. Taruya estimate how well the second-generation gravitational-wave detectors can statistically confirm BH binaries like GW150914 to be a tracer of the large-scale structure by looking at the auto- and cross-correlation of BH binaries with photometric galaxies and weak-lensing measurements. They find that, with a three-year observation, the $> 3\sigma$ detection of non-zero signal is possible if the BH merger rate today is $\dot{n}_0 \gtrsim 100\,{\rm Gpc}^{-3}\,{\rm yr}^{-1}$ and the clustering bias of BH binaries is $b_{\rm BH,0} \gtrsim 1.5$.

Y. Suwa along with T. Yokozawa, M. Asano, T. Kayano, N. Kanda, Y. Koshio, and M. R. Vagins proposed a new method constraining central information of core-collapse supernovae by combining observations for gravitational waves and neutrinos. For this, they employed realistic noise level and analysis method for both gravitational wave detector (KAGRA) and water Cherenkov detectors (EGADS and GADZOOKS!).

High-Energy Astrophysics

Supermassive stars in nuclear burning phases are among the possible candidates for the progenitor of supermassive black holes, which are likely to be formed in an early universe. Shibata, Uchida, and Sekiguchi explored the stability of rotating supermassive stars against general relativistic gravitational collapse and showed that the rotation significantly modifies the stability condition.

Y. Suwa and H. Nagakura, together with D. Nakauchi, K. Kashiyama, and T. Nakamura, examine the bright radio synchrotron counterparts of low-luminosity gamma-ray bursts and relativistic supernovae (SNe) and found that they can be powered by spherical hypernova (HN) explosions. They also considered the optical synchrotron counterparts of radio-bright HNe and show that they can be observed as precursors several days before the SN peak.

Y. Suwa along with N. Tominaga evaluated the amount of ^{56}Ni generated by a strongly-magnetized NS, which is a strong candidate of the central engine for HNe. They found that in order to make a consistent model for a HN associated with gamma-ray burst, a very rapidly rotating ($\sim$ 1 ms for rotation period) and very strong magnetic field ($\sim 10^{16}$ G for surface magnetic fields) are required.

Y. Suwa, T. Yoshida and M. Shibata, together with H. Umeda and K. Takahashi, performed stellar evolutionary calculation and explosion simulation for carbon-oxygen core, which is supposed to experience close binary interactions, e.g. common envelope phase. This kind of system is expected to form binary NSs, which are important candidates of strong gravitational wave emitters. They found that these systems result in rapidly evolving dim SNe and are compatible with optical observations of SN

2005ek and PSR J0737–3039.

Y. Suwa with S. Yamada, T. Takiwaki, and K. Kotake performed systematic simulations for core-collapse supernova explosions with various progenitor models from 12 to 100 solar masses. Using these detailed simulation data, they constructed a phenomenological model that is calibrated by numerical simulations.

Condensed Matter and Statistical Dynamics Group

Condensed-Matter Physics

The subjects of condensed-matter physics are the states of matter that emerge at low-temperatures as a consequence of non-trivial many-body effects. The main goal in this field is to understand how interplay among such low-energy degrees of freedom as charge, spin and (electron) orbital, when combined with a few simple fundamental principles (e.g. Fermi statistics, electromagnetic force), leads to a variety of phenomena. The area of current research in our group includes physics of topological insulators and superconductors, and exotic phenomena in low-dimensional quantum magnetism and ultracold atomic/molecular gases.

Higgs bound states of superfluid Bose gases in optical lattices: When the lattice depth increases in a system of an ultracold Bose gas in an optical lattice, the quantum phase transition from superfluid to Mott insulator occurs. In the superfluid phase near the critical point, a particle-hole symmetry emerges in the system and the superfluid becomes relativistic. In such a relativistic superfluid, there are two types of low-energy collective mode, namely the gapless Nambu-Goldstone (NG) mode and the gapful Higgs mode. The former and latter modes corresponds to phase and amplitude fluctuations of the superfluid order parameter. The Higgs mode that has been studied thus far is a delocalized state in the entire system. Danshita and coworkers have studied effects of potential barriers on these collective modes and found bound states of Higgs mode in the presence of a potential barrier that does not break the particle-hole symmetry. These bound states are localized around the barrier and have lower energy than the energy gap of the delocalized Higgs mode. They also consider a tunneling problem of the NG mode when there is also a potential barrier that breaks the particle- hole symmetry and found Fano resonance of the NG modes mediated by the Higgs bound states.

Spin-liquid phases in high magnetic fields: There are a variety of states of matter called "topological", that defy the traditional Landau-type description. Among them, quantum spin liquids with long-range entanglement and topological order would be very interesting from both theoretical and experimental point of view. According to the Berry phase theory of quantum magnets in high magnetic fields, magnetization plateaus with genuine topological order (spin-liquid plateaus) are possible at (simple) rational values of $Q(S-m^z)$ (Q and m^z being the number of spins per unit cell and magnetization per site, respectively). To verify this scenario, Plat, Alet, Capponi, and Totsuka investigated an anisotropic spin-1/2 model on the Kagomé lattice using quantum Monte-Carlo simulations and strong-coupling expansions. In particular, they carefully analyzed the plateau with $Q(S-m^z)=1$ ($Q=3$, $S=1/2$), where the system can be mapped onto a quantum loop model. They established the phase diagram containing the $\mathbf{Z}_2$ spin liquid phase as well as more conventional spin-ordered phases.

Phases of SU(N) ultra-cold fermions in one dimension: The realization of quantum degeneracy in alkaline-earth and the related cold fermions (e.g., ^{87}Sr, ^{171}Yb, and ^{173}Yb) opened the possibility of simulating SU(N) quantum systems that are hardly be realized in the usual condensed-matter settings. Capponi, Lecheminant, and Totsuka extended the previous study to other particle fillings, etc. and mapped out the $T=0$ phases of such SU(N) cold fermions loaded in a one-dimensional optical lattice. Totsuka and Tanimoto investigated the SPT phases from the quantum-entanglement point of view and numerically demonstrated that a set of non-local order parameters is quite useful in identifying the topological class of a given state.

Magnetism of a three-dimensional tetramer compound: Strong quantum fluctuations (induced by, e.g., low spins) and frustration often stabilize quantum disordered ground states even in three-dimensional systems. In collaboration with experimentalists, Totsuka tried to understand magnetism of newly found spin-1/2 tetramer compound Cu_2PO_4OH and explained the data of neutron-scattering experiments.

Magnetism of electron systems with strong spin-orbit interaction: Since the theoretical proposal that the interplay between the Mott physics and strong spin-orbit interaction may lead to the putative spin liquid introduced by Kitaev, magnetism of the 5*d* electron systems such as Na_2IrO_3 have been a subject of great interest. Motivated by the spin-liquid behavior observed in an Ir-compound $Ba_3IrTi_2O_9$, Shinjo, Sota, Yunoki, Totsuka, and Tohyama applied the two-dimensional densety-matrix renormalization group to establish the ground-state phase diagram of the spin-1/2 Heisenberg model with anisotropic Kitaev interactions on the triangular lattice. Using various order parameters calculated numerically, they determined the magnetic structure of each phase.

Phase diagram and dynamics of a one-dimensional fermion model with Majorana edge modes: As exemplified by the model of the spineless p-wave superconductor introduced by Kitaev, one-dimensional fermion models with pairing terms sometimes host emergent Majorana modes at the edges of the system. In the presence of several competing hoppings/pairings, we may expect a rich phase diagram and interesting dynamics. Ohta, Tanaka, Danshita, and Totsuka investigated the zero-temperature phase diagram and the sweep dynamics of a one-dimensional fermion model (the generalized cluster model). Also Ohta and Totsuka considered a similar model with a spatially modulating potential and found several interesting phenomena depending on the periodicity and the strength of the modulation.

Topological Superconductivity in Dirac Semimetals: Dirac semimetals host bulk band-touching Dirac points and a surface Fermi loop. Sato together with Kobayashi developed a theory of superconducting Dirac semimetals. Establishing a relation between the Dirac points and the surface Fermi loop, he clarified how the nontrivial topology of Dirac semimetals affects their superconducting state. It was noted that the unique orbital texture of Dirac points and a structural phase transition of the crystal favor symmetry-protected topological superconductivity with a quartet of surface Majorana fermions. He also suggested the possible application of our theory to recently discovered superconducting states in Cd_3As_2.

Surface electronic state of superconducting topological crystalline insulator: Sato and collaborators studied the surface state of a doped topological crystalline insulator in the superconducting state. Motivated by $Sn_{1-x}In_xTe$, they considered fully gapped pair potentials and calculated the surface spectral function. It was found that mirror-protected zero-energy surface Andreev bound states (SABSs) appear at the (001) surface. The gapless points of these SABSs appear on the mirror-symmetric line on the surface Brillouin zone while the positions of the gapless points depend on the chemical potential. In addition, due to the presence of the Dirac surface states in the normal state, the dispersion of the SABSs drastically changes with the chemical potential.

Fragile surface zero-energy flat bands in three-dimensional chiral superconductors: Sato and coworkers studied surface zero-energy flat bands in three-dimensional chiral superconductors with $p_z(p_x + ip_y)\nu$-wave pairing symmetry (ν is a nonzero integer), based on topological arguments and tunneling conductance. It was shown that the surface flat bands are fragile against (i) the surface misorientation and (ii) the surface Rashba spin-orbit interaction. The fragility of (i) is specific to chiral SCs, whereas that of (ii) happens for general odd-parity SCs. They demonstrated that these flat-band instabilities vanish or suppress a zero-bias conductance peak in a normal/insulator/superconductor junction, which behavior is clearly different from high-T_c cuprates and noncentrosymmetric superconductors. By calculating the angle-resolved conductance, they also discussed a topological surface state associated with the coexistence of line and point nodes.

Symmetry-Protected Topological Superfluids and Superconductors From the Basics to ^3He: Sato and collaborators gave a comprehensive review of recent progress in research on symmetry-protected topological superfluids and topological crystalline superconductors. The central part of this review is devoted to the superfluid ^{3}He, which serves as a rich repository of novel topological quantum phenomena originating from the intertwining of symmetries and topologies. Moreover, they shared the current status of our knowledge on the topological aspects of unconventional superconductors, such as the heavy-fermion superconductor UPt_3 and superconducting doped topological insulators, in connection with the superfluid ^{3}He.

Advanced Statistical Dynamics

The subjects of advanced statistical dynamics are nonequilibrium statistical mechanics, nonlinear sciences and biological physics. The main goal in this field is to understand how dynamical nonequilibrium structures are sustained in nature based on tools of statistical physics. Thus, the research areas are spread in variety of fields in social sciences, biology, chemistry, engineering, mathematics and physics. The current research activities of our group are granular physics, nonlinear rheology in glassy materials, mesoscopic transport quantum systems, the basis of quantum mechanics and system biology. In this academic year, Hayakawa has organized a long-term workshop "New Frontiers in Nonequlibrium Physics 2015"which was held from July 21st to August 22nd as the chairman. He, as the chairman, has also organized the YKIS symposium "New Frontiers in Non-equilibrium Statistical Physics 2015" held from August 17th to 19th and an international workshop "Avalanches, plasticity, and nonlinear response in nonequilibrium solids" held on March 7th-9th, 2016.

Non-equilibrium statistical mechanics for sheared granular liquids: K. Suzuki and H. Hayakawa have developed the new statistical theory of sheared dense granular flow. Starting from the Liouville equation, they have derived the effective Hamiltonian to characterize the nonequilibrium steady state. Their theory succeed to reproduce the behavior of the shear viscosity or the shear stress against the density quantitatively without introduction of any fitting parameters. One paper on this subject has been published in PRL and has attract much attention among physicists. Hayakawa has presented many invited talks on this subject.

Size distribution of particles in Saturn's rings from aggregation and fragmentation: H. Hayakawa and an international team including N. V. Brilliantov, P.L. Krapivsky, Anna Bodrova, Frank Spahn, Vladimir Stadnichuk, and Jürgen Schmidt have analyzed Smoluchowski's rate equation for aggregation and fragmentation, and succeed to explain the observed data for size distribution of grains in Saturn's ring. This study has been published in PNAS and attract much attention among SNS in abroad.

Non-Gaussian noise in physical systems: Kiyoshi Kanazawa and Hisao Hayakawa with Takahiro Sagawa and Tomihiko G. Sano have developed the theory of non-Gaussian noise appears in physical systems. They have developed a systematic theory to describe nonlinear friction systems under the influence of non-Gaussian noise, which has been published in J. Stat. Phys. Kiyoshi Kanazawa has received the Young Scientist Award of the Japanese Physical Society (region 11) on this subject. His PhD thesis has been selected one of Springer theses. This idea has been applied to explain realistic experimental setup of granular gases with a rotor, which has been submitted to PRE.

The project on non-Gaussian noise is now a part of international collaborations. E. Fedor- H. Hayakawa-P. Visco- F. van Wijland have submitted a paper entitled

"Active cage model of glassy dynamics" in which they succeed to explain the hopping distribution function observed in expleriments. This is a part of achievement of the long term stays by EF and FvW. Andera Cairoli in UK has also stayed at YITP a month and is developing the path integral formalism for non-Gaussian noise. Takafumi Suzuki of the University of Tokyo has also clarified the quantum correction to the theory of non-Gaussian noise during his two months' stay at YITP.

Theory of cohesive fine powders under shear: S. Takada, K. Saitoh and H. Hayakawa have developed the kinetic theory of dilute cohesive granular gases in which they obtained good agreement between the theory and the DSMC. The result has been submitted and has been used as a part of ST's PhD thesis. K. Saitoh, ST and HH have also published a continuum theory for cohesive granular flow under the plane shear, which has been selected as one of inside front covers.

Drag acting on a moving tracer in granular environment: S. Takada and H. Hayakawa have developed simulation on the drag force acting on a moving tracer in granular environment. They have found that the drag force can be explained by the theory of perfect fluid for non-dense two dimensional situations. They have also clarified the role of the friction between the bottom plate and the moving disks, and reproduced the counter experiment. They have published one paper on this subject. Now, they are developing simulation in three dimensional situations. Anki Reddy Katha has also joined this subject when he has stayed at YITP.

Study of Heat Engine partitioned by Fluctuating Piston: T. G. Sano and H. Hayakawa has developed a stochastic mean field model of heat engine partitioned by a finite-mass piston. The time evolution equations for the density and the temperature of the enclosed gas are proposed, taking into account the stochastic equation of motion of the piston, and the energy conservation for the gas. Their result has been used as a part of PhD thesis by TGS.

Geometric fluctuation theorem: K. Watanabe and H. Hayakawa have struggled to derive the fluctuation theorem in geometric pumping processes in which the conventional steady fluctuation theorem cannot be used. What they found is that the current distribution $P(J)$ satisfies $\ln P(J)/P(-J) \propto \Omega^{1/2}J$, where J and Ω are the current and the modulation frequency, respectively. This result is one of remarkable achievements in non-equilibrium statistical mechanics.

Relaxation Time Scale under Sparse Band Random Matrices: Y. Watanabe and his collaborator show that the physically-realistic relaxation time scale of isolated quantum systems is obtained by considering the sparse band random matrices. The sparseness and the band structure of the Hamiltonian reflect the Hamiltonian and the locality of the observable of interest, respectively. The result implies that the time scale is proportional to the volume of the system and, hence, realistic in considering the diffusion process for instance.

Generalization of quantum f-divergence and its geometrical properties: Y. Takaoka and Y. Watanabe define a class of generalized quantum f-divergences. They satisfy the non-negativity, CPTP monotonicity, and coincide with the classical f-divergences in the case that the two quantum states are commutable. Also, the maximum and minimum in the class are revealed. Furthermore, the expression for the induced metrics and connections from the generalized quantum f-divergences as their information-geometrical properties is shown. On the top of that, the condition that the induced connections become metric is derived.

Hydrodynamics in bridging and aggregation of two colloidal particles in a near-critical binary mixture: Yabunaka and collaborators investigated bridging and aggregation of two colloidal particles in a near-critical binary mixture when the fluid far from the particles is outside the coexistence (CX) curve and is rich in the component disfavored by the colloid surfaces. In such situations, the adsorption-induced interaction is enhanced, leading to bridging and aggregation of the particles. They considered bridging firstly by changing the temperature with a fixed interparticle separation and secondly by letting the two particles aggregate. Their findings are as follows: The interparticle attractive force dramatically increases upon bridging. The dynamics is governed by hydrodynamic flow around the colloid surfaces. In aggregation, the adsorption layers move with the particles and squeezing occurs at narrow separation. These results suggest relevance of bridging in the reversible colloid aggregation observed so far.

The essential problems in life phenomena: Murase studied the problems in life phenomena from the point of view of incompleteness. Indeed, completeness means that we can describe world phenoma completely without inconsistency. However, it is also true that incompleteness is very plausible feature in living phenomena. Due to such incompleteness, evolution can be possibly conducted by nature. Along this line, side effects of evolution can be also incorporated into the whole structure of life systems.

Nuclear Theory Group

The main focus of our research group is the basic investigation of nuclear physics covering all the physical phenomena governed by the strong interactions, such as the structure and the dynamics of nuclei and hadrons, and properties of hadron-quark many-body system in finite temperatures and densities. Here we briefly review our research activity in the academic year of 2015.

Nuclear structure and dynamics

Universal damping mechanism of quantum vibrations in deep sub-barrier fusion reactions: Ichikawa and Matsuyanagi investigated fusion hindrance mechanism observed in heavy-ion fusion reactions at extremely low incident energies. At extremely low incident energies, called the deep sub-barrier energies, steep falloffs of fusion cross sections have been observed in a wide range of nuclear reaction systems. These steep falloffs are often called the fusion hindrance. The physical origin of the fusion hindrance is still unclear. In their study, they demonstrated that quantum vibrations of the target and projectile nuclei are damped when they approach each other in a fusion reaction and this damping mechanism causes the strong suppression of quantum transitions between reaction channels. To show this, they, for the first time, applied the random phase approximation (RPA) method to di-nuclear systems. They found that the drastic change of single-particle wave functions constituting the low-energy collective excitations would commonly occur in all deep sub-barrier fusions. Thus, the damping of quantum vibrations seems to be a universal mechanism causing the fusion hindrance. Their finding requires a drastic modification to the widely-used standard coupled-channel model.

Systematic investigations of deep sub-barrier fusion reactions using an adiabatic model: Ichikawa systematically investigated fusion hindrance phenomena observed in deep sub-barrier fusion reactions using the coupled-channel (CC) method combined with an adiabatic approach. To describe the fusion hindrance, he proposed a novel extension of the standard CC model by introducing a damping factor that describes a smooth transition from sudden to adiabatic process, namely, the transition from the separated two-body to the united nuclear system. This modification was achieved by adopting a coordinate dependence in the coupling matrix elements. All calculated fusion cross sections using this model were consistent with the experimental data. Thus, he concluded that a coordinate-dependent coupling strength is responsible for the fusion hindrance.

General transformation of α cluster model wave function to jj-coupling shell model in various $4N$ nuclei: Itagaki and his collaborators systematically discussed the competition of shell and cluster structures. The antisymmetrized quasi-cluster model (AQCM) is a method to describe a transition from the α-cluster wave function to the jj-coupling shell model wave function. In this model, the cluster-shell transition is characterized by only two parameters; R representing the distance between α clusters and Λ describing the breaking of α clusters, and the contribution of the spin-orbit interaction, very important in the jj-coupling shell model, can be taken into account starting with the α cluster model wave function. In this year they discussed the generality of AQCM by extending the application to heavier region; various $4N$ nuclei from ^{4}He to ^{100}Sn. The characteristic magic numbers of the jj-coupling shell model, 28 and 50, are described starting with the α cluster model. The persistence of threefold symmetry is discussed in ^{12}C. The competition of two different configurations is discussed in ^{20}Ne (^{16}O+one quasi cluster and ^{12}C+two quasi clusters) and ^{28}Si (pentagon shape of five quasi clusters and ^{12}C+^{16}O). Also, we compare the energy curves for the α+^{40}Ca cluster configuration calculated with and without α breaking effect in ^{44}Ti.

Cluster-shell competition and its effect on the $E0$ transition probability in ^{20}Ne: Itagaki and his collaborator discussed ^{20}Ne, which has been known as a typical example of a nucleus with α cluster structure (^{16}O+α structure). However according to the spherical shell model, the spin-orbit interaction acts attractively for four nucleons outside of the ^{16}O core, and this spin-orbit effect cannot be taken into account in the simple α cluster models. They investigated how the α cluster structure competes with independent particle motions of these four nucleons. The antisymmetrized quasi-cluster model (AQCM) is a method to describe a transition from the α cluster wave function to the jj-coupling shell model wave function. In this model, the cluster-shell transition is characterized by only two parameters; R representing the distance between clusters and Λ describing the breaking of α clusters, and the contribution of the spin-orbit interaction, very important in the jj-coupling shell model, can be taken into account by changing α clusters to quasi clusters. In this study, based on AQCM, we apply ^{16}O plus one quasi cluster model for ^{20}Ne. Here they focused on the $E0$ transition matrix element, which has been known as the quantity characterizing the cluster structure. The $E0$ transition matrix elements are sensitive to the change of the wave functions from α cluster to jj-coupling shell model. Similar investigation has been carried out for ^{16}O (^{12}C+α), and breaking effect of α clusters in ^{12}C has been discussed.

Rod-shaped Nuclei at Extreme Spin and Isospin: Itagaki and his collaborators discussed the stability of rod shape in neutron-rich C isotopes. The anomalous rod shape in carbon isotopes has been investigated in the framework of the cranking covariant density functional theory, and two mechanisms to stabilize such a novel shape with respect to the bending motion, extreme spin, and isospin, are simultaneously discussed for the first time in a self-consistent and microscopic way. By adding valence neutrons and

rotating the system, we have found the mechanism stabilizing the rod shape; i.e., the σ orbitals (parallel to the symmetry axis) of the valence neutrons, important for the rod shape, are lowered by the rotation due to the Coriolis term. The spin and isospin effects enhance the stability of the rod-shaped configuration. This provides a strong hint that a rod shape could be realized in nuclei towards extreme spin and isospin. Similar analysis of the rod shape has been performed also for ^{24}Mg using cranking Skyrme Hartree-Fock Theory.

3α-cluster structure in ^{12}C and ^{14}C: Yoshida and a collaborator studied 3α-cluster structure in ^{12}C and ^{14}C with the 3α-cluster and the $^{10}\mathrm{Be}+\alpha$-cluster model. For description of the ^{10}Be in the $^{10}\mathrm{Be}+\alpha$-cluster model, they apply the $2\alpha+$nn wave function which can describe feature of the ground state and first and second excited states in ^{10}Be. In the generator coordinate method (GCM) calculation, the 3α linear-chain is obtained the 0^+_4 state in ^{14}C. It is found that two neutrons in ^{14}C play a role to stabilize the 3 α linear-chain structure. On the other hand, the 3α gas-like state is suppressed in ^{14}C by the ^{10}Be core which is more compact than the ^{8}Be.

Hadron structure and dynamics

Structure of $\Lambda(1405)$ and construction of $\bar{K}N$ local potential based on chiral SU(3) dynamics: Hyodo in collaboration with Miyahara develops the single-channel local potential for the $\bar{K}N$ system, which is applicable to quantitative studies of $\bar{K}$ bound states in nuclei. Because the high precision measurement of the kaonic hydrogen by SIDDHARTA reduces the uncertainty of the $\bar{K}N$ amplitude below the $\bar{K}N$ threshold, the local potential should be calibrated in a wide energy region. They establish a new method to construct the local potential focusing on the behavior of the scattering amplitude in the complex energy plane. Applying this method, they construct the $\bar{K}N$ potential based on the chiral coupled-channel approach with the SIDDHARTA constraint. The wave function from the new potential indicates the $\bar{K}N$ molecular structure of $\Lambda(1405)$.

Weak decay of Λ_c^+ for the study of $\Lambda(1405)$ and $\Lambda(1670)$: Hyodo in collaboration with Miyahara and Oset studies the Λ_c decay process to π^+ and the meson-baryon final state for the analysis of Λ resonances. Considering the Cabibbo-Kobayashi-Maskawa matrix, color suppression, diquark correlation and the kinematical condition, they show that the final meson-baryon state should be in a pure $I=0$ combination, when the meson-baryon invariant mass is small. Because the $I=1$ contamination usually makes it difficult to analyze Λ resonances directly from experiments, the Λ_c decay is an ideal process to study Λ resonances. Calculating the final state interaction by chiral unitary approaches, they find that the $\pi\Sigma$ invariant mass distributions have the same peak structure in the all charge combination of the $\pi\Sigma$ states related to the higher pole of the two poles of the $\Lambda(1405)$. Furthermore, they obtain a clear $\Lambda(1670)$ peak structure in the $\bar{K}N$ and $\eta\Lambda$ spectra.

Structure of the $\Lambda(1405)$ and the $K^-d\to\pi\Sigma n$ reaction: Hyodo in collaboration with Ohnishi, Ikeda, and Weise investigates the $\Lambda(1405)$ resonance production reaction within the framework of the coupled-channels Alt-Grassberger-Sandhas (AGS) equations. They perform full three-body calculations for the $\bar{K}NN$-πYN amplitudes on the physical real energy axis and investigate how the signature of the $\Lambda(1405)$ appears in the cross sections of the $K^-d\to\pi\Sigma n$ reactions, also in view of the planned E31 experiment at J-PARC. Two types of meson-baryon interaction models are considered: an energy-dependent interaction based on chiral $SU(3)$ effective field theory, and an energy-independent version that has been used repeatedly in phenomenological approaches. These two models have different off-shell properties that imply correspondingly different behavior in the three-body system. They investigate how these features show up in differential cross sections of $K^-d\to\pi\Sigma n$ reactions. Characteristic patterns distinguishing between the two models are found in the invariant mass spectrum of the final $\pi\Sigma$ state. The $K^-d\to\pi\Sigma n$ reaction, with different ($\pi^\pm\Sigma^\mp$ and $\pi^0\Sigma^0$) charge combinations in the final state, is thus demonstrated to be a useful tool for investigating the subthreshold behavior of the $\bar{K}N$ interaction.

Quark mass dependence of H-dibaryon in $\Lambda\Lambda$ scattering: Yamaguchi and Hyodo study the quark mass dependence of the H-dibaryon in the strangeness $S=-2$ baryon-baryon scattering. The low-energy effective field theory is used to describe the coupled-channel baryon-baryon scattering, in which the quark mass dependence is incorporated so as to reproduce the lattice QCD data in the SU(3) limit. We point out the existence of the Castillejo-Dalitz-Dyson (CDD) pole in the $\Lambda\Lambda$ scattering amplitude below the threshold in the SU(3) limit. At the physical point, the H-dibaryon is unbound, and the remnant of the CDD pole causes the Ramsauer-Townsend effect near the $N\Xi$ threshold. Through the extrapolation in quark masses, we show that the unitary limit of the $\Lambda\Lambda$ scattering is achieved between the physical point and the SU(3) limit.

Structure of near-threshold quasibound states: Kamiya and Hyodo study the compositeness of near-threshold quasi-bound states in the framework of effective field theory. From the viewpoint of the low-energy universality, They revisit the model-independent relations between the structure of the bound state and the observables in the weak binding limit. The effective field theory enables us to generalize the weak-binding relation of the stable bound states to unstable quasi-bound states with decay modes. They present the interpretation of the complex values of the compositeness for the unstable states. Combining the model-independent relation and the threshold observables extracted from the experimental data, we show that $\Lambda(1405)$ is dominated by the $\bar{K}N$ molecular structure and that $a_0(980)$ is dominated by the non-$\bar{K}K$ component.

High-Energy QCD, QCD matter, and phase diagram

Flow harmonics v_n at finite density: Hatta, in collaboration with Monnai and Xiao, analytically computed the flow harmonics v_n (Fourier coefficients of the azimuthal angle distribution of particles in heavy-ion collisions) using the anisotropically deformed Gubser flow including the finite density effects. It is shown that the v_n difference between particles and antiparticles is proportional to the shear viscosity and the chemical potential.

Elliptic flow difference of charged pions in heavy-ion collisions: Hatta and collaborators computed the difference in v_2 (elliptic flow) between π^+ and π^- as a function of charge asymmetry. This observable has been proposed as a signal of the so-called chiral magnetic wave (CMW). It is shown that the experimental data from the STAR collaboration can be explained in ordinary hydrodynamics without invoking CMW effects.

Hemisphere jet mass distribution at finite Nc: Hatta, in collaboration with Hagiwara and Ueda, performed the resummation of nonglobal logarithms in hemisphere jet mass distribution in e^+e^- annihilation including the finite-N_c effects. Previously, the resummation has been done only in the large-N_c approximation or to finite orders of perturbation theory. It is shown that the finite-N_c effects are large when the invariant mass in a single hemisphere becomes small.

Non-boost-invariant solution of relativistic hydrodynamics in 1+3 dimensions: Hatta, Xiao and Yang constructed a new analytical solution of relativistic viscous hydrodynamics. At early times, the solution expands nearly one-dimensionally, while at late times it expands spherically. It is thus an attractive model of the evolution of the fireball in heavy-ion collisions.

Probing the small-x gluon tomography in correlated hard diffractive dijet production in DIS: Hatta, Xiao and Yuan established a relation between the gluon Wigner distribution in QCD and the color dipole amplitude at small-x. Based on this relation, they pointed out that the Wigner distribution can be experimentally measured in dijet production in diffractive deep inelastic scattering.

Entropy production in isolated quantum systems: Tsukiji and Ohnishi, in collaboration with Iida, Kunihiro, and Takahashi, explored the thermalization process in isolated quantum mechanical systems by using the Husimi-Wehrl (HW) entropy evaluated in the semiclassical treatment. They proposed two numerical methods to calculate the semi-classical time evolution of the HW entropy, and demonstrated the characteristics and usefulness of these methods in describing entropy production of a couple of quantum mechanical systems whose classical counter systems are chaotic: The HW entropy at a given time can be obtained in a reliable way by simultaneous application of the two methods. These methods are expected to be useful in systems with many degrees of freedom such as quantum field theory.

Parametric Instability of Classical Yang-Mills Fields under Color Magnetic Background: Ohnishi in collaboration with Tsutsui, Iida and Kunihiro, has investigatedi instabilities of classical Yang-Mills fields in a temporally preiodic and spatially homogeneous longitudinal color magnetic background field in a nonexpanding geometry for elucidating the earliest stage dynamics of ultrarelativistic heavy-ion collisions. The instabilities are caused by parametric resonance despite the fact that the momentum dependence of the growth rate for small momenta is similar to that of the Nielsen-Olesen instability. Some of the instability bands are found to emerge not only in the low-momentum but also in the high-momentum region, typically of the order of the saturation momentum.

Net-baryon number fluctuations across the chiral phase transition at finite density in strong coupling lattice QCD: Ichihara, Morita and Ohnishi have investigated the net-baryon number fluctuations across the chiral phase transition at finite density in the strong-coupling and chiral limits of lattice QCD. The cumulant ratios of the net-baryon number are expected to signal the QCD critical point. At finite volume, the higher-order cumulant ratios are found to show oscillatory behavior around the phase boundary, and there exists a region where the fourth-order cumulants are negative. This negative region may be relevant to the observed suppression of the cumulant ratio, while it shrinks with increasing lattice size as expected from the scaling analysis.

Evading the sign problem in the mean-field approximation through Lefschetz-thimble path integral: Kashiwa in collaboration with Tanizaki and Nishimura investigated the sign problem appearing in the mean-field approximation based on the Lefschetz-thimble method. They found that the Lefschetz-thimble method respects the reflection symmetry which makes physical quantities manifestly real at any order of approximations using complex saddle points. This was demonstrated by the Airy integral and the Polyakov-loop effective model of dense QCD as an example.

Topological feature and phase structure of QCD at complex chemical potential: Kashiwa and Ohnishi gave a new definition of the confinement-deconfinement transition at finite temperature by using the imaginary chemical potential. The imaginary chemical potential can be interpreted as the Aharonov-Borm phase and then an analogy of the topological order at zero temperature suggests that the Roberge-Weiss endpoint would define the deconfinement transition temperature. The QCD phase diagram at complex chemical potential was also investigated by using the perturbative calculation towards understanding the deconfinement transition temperature at finite real chemical potential.

Phase structure of two-color QCD at real and imaginary chemical potentials; lattice simulations and model analyses: Kashiwa in collaboration with Makiyama, Sakai, Saito, Ishii, Takahashi, Kouno, Nakamura, Yahiro investigated the phase diagram of two color QCD at both real and imaginary chemical potentials by using the lattice simulation and the Polyakov-loop extended Nambu-Jona-Lasinio model. They found that the model is good in the

deconfinement region, but less accurate in the transition and confinement regions. The baryon degree of freedom improve the model. They also found that the vector-type four-quark interaction is necessary to reproduce the lattice QCD data.

Understanding of QCD at high density from $\mathbb{Z}_3$-symmetric QCD-like theory: Kashiwa in collaboration with Kouno, Takahashi, Misumi, Yahiro investigated the phase structure of the $\mathbb{Z}_3$-symmetric SU(3) gauge theory. In the $\mathbb{Z}_3$-symmetric SU(3) gauge theory, the Polyakov-loop becomes zero in the confined phase and never coexists with the color-superconducting phase. They found that the basic phase structure of the $\mathbb{Z}_3$-symmetric QCD-like theory remains in the phase diagram of QCD. The possibility to obtain realistic QCD from the $\mathbb{Z}_3$-symmetric QCD-like theory was discussed by using the heavy quark theory.

Effects of kinematical cuts on electric-charge fluctuations: Morita, in collaboration with Karsch and Redlich, investigated effects of kinematical cuts on the cumulants of net electric-charge fluctuations in heavy ion collisions. They pointed out that there is substantical effect on the value of the cumulants when Bose statistics is important. They found that part of the observed difference between STAR and PHENIX data can be attributed to the different low transverse momentum acceptances. They also discussed similarity between the low momentum cut and the finite volume effects.

QCD sum rules for J/ψ with dimension six condensates: Morita, in collaboration with Kim and Lee, extended QCD sum rules for J/ψ at finite temperature to include contribution from dimension six gluonic operators. They utilized expressions of those operators in terms of chromo-electric and magnetic fields, whose temperature dependence has been extracted in lattice QCD simulations, to obtain a complete expression for the operator product expansion of the current-current correlation function up to dimension six. They found that the contribution of the dimension six operators gives a slighly improved stability in the sum rule.

Test for a universal behavior of Dirac eigenvalues in the complex Langevin method: Ichihara and Kashiwa in collaboration with Nagata have investigated the nearest neighbor spacing (NNS) distribution of Dirac eigenvalues at finite density, applying the complex Langevin (CL) method to chiral random matrix models. In the CL method, field variables are complexified due to the complex action at finite density. Then it is a highly non-trivial problem whether an original universal behavior of a non-holomorphic quantity, the NNS distribution, is preserved. We found that the NNS distribution follows the expected universal behavior as in the original theory when the CL method reproduces correct results. This behavior indicates that universal quantities can be benchmarks to distinguish the correct convergence case from the wrong convergence case in the CL method.

Particle Physics Group

Particle physics is a branch of physics studying the origin of matter and space-time as well as their interactions, the most fundamental problems in Nature. Its final goal is to reveal the underlying physical laws and components of the nature. A lot of important mysteries are remaining unanswered, and this group has research activities in various directions to reach this goal.

In particle phenomenology, the current experimental results are considered to be very accurately described by the Standard Model (SM) with $SU(3) \times SU(2) \times U(1)$ gauge group. However, this model cannot be the final theory for the following reasons; it contains too many tunable parameters which can only be determined by experiments, it suffers from the hierarchy problem, and it does not contain the dark matter and the neutrino masses. Thus particle physics beyond the SM is actively investigated by many members of this group. The study of the Higgs sector is now one of the hot topics thanks to the LHC experiments at CERN. The Higgs sector explains the origin of the particle masses through the mechanism of the spontaneous symmetry breaking. Another important topic is the mechanism of the supersymmetry breaking. The supersymmetry is a highly attractive idea, since it solves the hierarchy problem of the SM and unifies naturally the gauge couplings of the SM at a high energy scale, suggesting a Grand Unified Theory (GUT) of gauge fields and matters. However, no experimental evidence of the supersymmetry has been observed yet. Reconciliation of the present experimental situation with theoretical requirements is highly wanted. Supergravity, a local gauge theory of supersymmetry, is also investigated by some members of the group.

Quantum Chromodynamics (QCD) is a non-Abelian gauge theory coupled with matter fields. This theory describes the hadronic systems, and has various applications in particle phenomenology as well as in astrophysics. Because of its strong interactions, understanding its properties requires non-perturbative approaches to quantum field theories. Lattice QCD gives a practical and powerful numerical method to analyze the non-perturbative aspects of QCD. Recently, a new method based on the duality between gravity and gauge theory has emerged from the study of string theory. This new method analyzes QCD in terms of gravity or string theory, and can relatively easily derive some results which are difficult to obtain directly from gauge theory per se.

It is yet not known how to incorporate the principle of quantum mechanics into the gravity or the general relativity. Application of the standard quantization procedure to the general relativity is met with many serious problems, including uncontrollable UV divergence. A consistent theory of quantum gravity seems to require a new notion of space-time, which replaces the classical space-time notion that is a continuous smooth manifold. Noncommutative space-time (or fuzzy space, more generally) is one candidate, which actually has been noted to appear in quantum gravity and string theory under certain conditions. Based on this quantum space-time notion, quantum gravity is investigated by some of the group members.

String theory is a theory of one-dimensionally extended objects like string, trying to give a consistent unified theory of all the interactions and matters. To relate the string theory to the real nature, compactification is a vital step, since the consistency of the string theory requires the space-time dimension to be ten, and the extra six-dimensions must be compactified to small sizes. The mode of compactification determines the possible contents of gauge theory and matters in low energy, and finding realistic compactifications is an important topic. This is studied by the group members. However, at present infinite possibilities of compactifications are known, and non-perturbative formulation of the string theory seems to be required for it to have predictable powers to the real nature. As study in this direction, the string field theory and the M-theory are investigated by the group members, too. Black hole physics based on string theory and mathematical aspects of string theory are also actively researched by the group members.

Historically the development of particle physics came hand in hand with that of field theory, which is not only a common language of particle physics but also a central tool in modern theoretical physics, including cosmology, condensed matter, and statistical physics. Thinking of this powerful generality of field theory, some of the group members study related topics in condensed matter physics and integrable systems.

Here is a summary of main works of the members of the particle physics group in the academic year 2015.

Particle Phenomenology

The observed masses and mixings of quarks and leptons may imply the existence of flavor symmetry behind. Such a flavor symmetry could play important roles not only for masses and mixings of elementary particles but also for the existence and the stability of dark matter. Along with this line, in a model explaining both neutrino masses and dark matter from non-Abelian discrete flavor symmetry, Takayama discussed the signatures of flavor symmetry in dark matter direct detection experiments, rare Lepton Flavor Violating(LFV) processes, and EW precision measurements. He with Kobayashi (Hokkaido), Omura (Nagoya), Yasuhara (Kyoto) published a paper studying the generic prediction for LFV processes in leptopihilic multi-higgs doublet models in case that the flavor symmetry breaking leaves a remnant symmetry in the charged lepton sector. He chaired an international workshop held in YITP on the topics for the dark side of the universe.

Lau together with Nick Manton and Mareike Haberichter calculated reduced B(E2) electromag-

netic transition strengths for light nuclei of mass numbers B=8,12,16,20,24, and 32 within the Skyrme model. They found that the predicted transition strengths are of the correct order of magnitude and the computed intrinsic quadrupole moments match the experimentally observed effective nuclear shapes. For the Hoyle state, they predicted a large B(E2) value. For oxygen-16, they obtained a quantitative understanding of the ground state rotational band and the rotational excitations of the second spin-0 state.

Lattice Gauge Theories

– Hadron-Hadron Interactions –

Aoki with Murano, Ishii(Osaka), Nemura, Sasaki (Tsukuba), Doi, Hatsuda, Ikeda (Riken) and Inoue (Nihon) reported their research on strangeness S=-2 baryon-baryon interaction using the coupled channel approach in lattice QCD. They found the strong attraction in this channel.

Aoki, Gongyo, Iritani and Miyamoto with Murano, Ishii(Osaka), Nemura, Sasaki (Tsukuba), Doi, Hatsuda, Ikeda (Riken) and Inoue (Nihon) reported their first result on baryon interactions in lattice QCD with physical pion masses.

– Hadron mass and matrix elements –

Aoki with Fukaya (Osaka), Cossu, Hashimoto, T. Kaneko, and Noaki (KEK) published their research on eta-prime meson mass using topological charge density correlation in QCD. They found that new method improves signal of the eta meson propagator without extra numerical costs.

Aoki with Onogi (Osaka), Cossu, Hashimoto, T. Kaneko, Noaki (KEK) and Feng (Columbia) published their research on light meson electromagnetic form factors in 2+1 flavor QCD using overlap quarks. They found that their results on the charge radii and the low energy constants of the chiral perturbation theory agree with experimental and phenomenological ones.

– Finite density QCD –

Aoki and Hanada with Nakamura (Hiroshima) reported their research on the pion condensation problem at finite density using the chiral random matrix model. They found that the method they proposed works well in this model and gives the correct result analytically known.

–Entanglement Entropy–

Aoki, Iritani, Nozaki, Numasawa and Shiba with Tasaki (Gakushuin) published their research on the definition of entanglement entropy in lattice gauge theories. They proposed a definition of the entanglement entropy in lattice gauge theories and showed that the definition they proposed satisfies all the standard properties of the entanglement entropy.

–Field theories and Gravity–

Aoki and Hanada with Iizuka (Osaka) published their research on black hole formation in the BFSS matrix model using the classical time evolution of the theory. They found quantitative evidence for the formation of a single state of D0-branes at late time, which is dual to the formation of a large black hole.

Aoki and Kikuchi with Onogi(Osaka) published their research on geometries form field theory using the gradient flow. They found that 3-dimensional Euclidean AdS geometry emerges from the 2-dimensional O(N) nonlinear sigma model in the large N limit.

Quantum Gravity

Quantization of gravity is a long-standing fundamental issue in physics. General relativity has difficulties in quantization due to the ultraviolet divergences of quantum fluctuations. Among various possibilities, this fact suggests that the classical notion of continuous spacetime with infinitely short distances should somehow be replaced with a new notion suited for quantization, and the classical spacetime and general relativity should emerge as infrared effective phenomena of a dynamical theory of such a new notion. As such a dynamical theory, Sasakura has been working on Canonical Tensor Model (CTM), in which spaces are described by a rank-three tensor, for several years to achieve the end. This year, in collaborations with Chen and two researchers abroad, Sasakura has obtained two major advances: the constraint algebra of the ADM formalism of general relativity can be obtained from a formal continuum limit of CTM, and classical spaces with metrics in any dimensions emerge on boundaries of randomly connected tensor networks, the dynamics of which has previously been shown to be in tight connection with CTM.

String Theory and SUSY Gauge Theory

–Supersymmetric Quantum Field Theory–

Recently, it has been developed significantly that a technique to compute some correlation functions in supersymmetric quantum field theory exactly without approximation, which is called the localization technique. Using this, Terashima gave a nonperturbative proof of Dijkgraaf-Vafa conjecture. Terashima with Honda (Weizmann Inst.), Iizuka (Osaka) and Tanaka (Riken) comupted the exact partition function of the three dimensional quantum gravity by using the Chern-Simons theory reformulation and the localization technique. Nosaka, Shimizu and Terashima comupted the free energy of the mass deformed ABJM theory in the large N limit and found a quantum phase transition.

Nishinaka mainly studied non-perturbative phenomena in supersymmetric quantum field theories. In particular, he studied the moduli space of 4d N=3 superconformal field theories and 2d chiral algebras associated with them, the latter of which describes the OPE among certain 1/4 BPS operators of the 4d theories. he also studied an interesting RG flow from the simplest Argyres-Douglas N=2 superconformal field theory which leads to an interacting N=1 IR fixed point with very small central charges.

Kimura studied F-theory compactifications on products of K3 surfaces without a section. He determined gauge groups and matter spectra. For some models, he showed that anomaly can be cancelled.

–String Field Theory–

Re-examining the symmetries of the pseudo-action, Kunitomo proposed a prescription for new Feynman rules of the WZW-like heterotic string field theory. The new rules

are an analog of those recently proposed by himself for the open superstring field theory. It was shown that they reproduce the well-known on-shell tree-level amplitudes for four and five external strings including fermions without ambiguity.

He with Yuji Okawa (Komaba, U. Tokyo) also constructed a complete action for the open superstring field theory that includes both the Neveu-Schwarz (NS) sector and the Ramond sector. They used the WZW-like action for the NS sector, and couple it to the superstring field for the Ramond sector restricted by suitable constraints. This is the first construction of a complete gauge invariant action for open superstring field theory in a covariant form.

–Black Hale Microstate–

Shigemori continued the study of the black hole microstate geometries called superstrata. He explicitly constructed perturbative superstrata solutions with three quantum numbers, generalizing the ones with two quantum numbers that he constructed previously. Some preliminary analysis for non-linear completion of these solutions was also carried out. As another direction, he studied superstrata obtained by perturbation around quotients of $AdS_3 \times S^3$ spaces, generalizing the one around $AdS_3 \times S^3$. As an approach complementary to the explicit construction in supergravity, using AdS/CFT, he started quantum field theory analysis of superstrata, by studying the vacuum structure of the D1-D5 quantum field theory. In addition, he organized an international workshop on the microstructure of black holes, inviting experts from Japan and overseas, and discussing the latest developments in the relevant areas. Taking advantage of the occasion, he organized YITP public lectures, in which one of the workshop participants and some (including himself) of the YITP members explained to general public about what general relativity is and about the frontiers of the research in black hole physics.

AdS/CFT and Entanglement Entropy

Takayanagi introduced with Bhattacharya, Hubeny and Rangamani, a new quantity called entanglement density by taking derivatives of entanglement entropy in null directions. This quantity has a remarkable property that it is vanishing for any excited states in two dimensional CFTs dual to pure Einstein gravity. When we add matter contributions, it no longer vanishes and we found that the entanglement density is given by an integral of null component of bulk energy stress tensor.

He, Numasawa, Takayanagi and Watanabe studied the entanglement entropy in string theory. Even though direct computations are difficult due to a double summation which appears in the replica method, they employed a modified background called Melvin geometry, which enables them to calculate the entanglement entropy as a particular limit. Owing to this trick, they showed that the entanglement entropy in string theory is finite.

Miyaji and Takayanagi found with Ryu and Wen that the boundary states in CFTs provide a nice example of quantum states with no real space entanglement entropy. They are expected to be dual to a point-like universe via gauge/gravity correspondence. They used this observation to formulate the continuum limit of entanglement renormalization for general CFTs.

Miyaji and Takayanagi proposed a new framework which generalizes the idea of holography so that it is applicable to spacetime without boundaries. This new framework is based on the conjectured relationship between holographic and tensor networks. They found several important properties of the surface/state correspondence.

Caputa, Takayanagi and Watanabe studied the time evolution of localized excitation in an eternal AdS black hole with Simon and Stikonas. They computed the time evolution of entanglement entropy in both gravity and CFT side and confirmed so called scrambling phenomena as conjectured by several authors. Moreover they computed the scrambling time in detail.

Miyaji, Numasawa, Shiba, Takayanagi and Watanabe investigated a continuum limit of entanglement renormalization for two dimensional CFTs in the light of surface/state correspondence. They clarified the role of conformal symmetry in the language of tensor networks. Moreover motivated by this picture, they identified CFT states dual to localized excited states in the bulk AdS and confirmed that they reproduce expected two point functions in AdS.

Miyaji, Numasawa, Shiba, Takayanagi and Watanabe applied the quantity called information metric to studies of quantum field theory. Especially they found that the information metric for marginal perturbation is approximately given by a maximal volume in an AdS spacetime if we apply AdS/CFT. They checked this new conjecture by analyzing an eternal AdS black hole geometry.

Shiba and Takayanagi computed holographic entanglement entropy in the presence of double trace deformations with Miyagawa. The leading contribution appears at one loop level of quantum gravity. They found that the result agrees with known result in two dimensional CFTs. In higher dimensional CFTs, their results give holographic predictions.

Sugimoto with Mitsutoshi Fujita (Kentucky Univ.), Charles M. Melby-Thompson (Fudan Univ.) and Rene Meyer (SUNY, Stony Brook) continued their research on holographic description of 2+1 dimensional Yang-Mills-Chern-Simons theory with defects. They analyzed the behavior of the Wilson loops and chiral condensate, and pointed out an interesting correspondence between fractional quantum Hall states with two boundaries and 2 dimensional QCD.

Yukawa International Program for Quark-Hadron Sciences

From the beginning of the academic year of 2007, Yukawa Institute for Theoretical Physics launched a new five-year project, "Yukawa International Program for Quark-Hadron Sciences (YIPQS)", sponsored by "Ministry of Education, Culture, Sports, Science and Technology, JAPAN (MEXT)". At the end of the academic year of 2010, the government approved to convert the YIPQS project budget into a more stable normal budget, and now we can run the program from a longer term point of view.

Aim of the program

By the end of 1970's, the final understanding was reached that Quantum Chromodynamics (QCD) is the fundamental theory of the strong interaction which was originally discovered by Hideki Yukawa. Still, nevertheless, only little has been established from QCD on various possible forms of hadrons or quarks. For example, while scaling behaviors of the lepton-nucleon cross section in the deep-inelastic scattering region and some properties of ground state hadrons have been precisely understood in perturbative and lattice QCD calculations, respectively, the study of bare nuclear force just started very recently. We have not yet reached the stage to understand properties of excited hadrons above the threshold including the exotic hadrons, binding mechanism of nuclei with more than two nucleons, nuclear matter equation of state, and the vacuum structures at extremely high temperature in the Early Universe and at extremely high density in compact stars, from the fundamentaly theory, namely QCD. In other words, there is still a vast area of research interest which is to be explored. To advance our exploration, it is necessary not only to make full use of existing theoretical techniques but also to develop new theories and to establish new frameworks. The expected achievement would cast a strong impact on our understanding of various forms of matter at various levels in nature. One may face a situation that one should restructure the current understanding about possible forms of matter.

The primary purpose of the YIPQS is to establish a new area of research fields; the quark-hadron sciences. For this purpose, with cooperating with present and near-future experimental activities, Yukawa Institute for Theoretical Physics will advance theoretical research not only in quark-hadron physics but also in related areas, as listed below, which constitute indispensable building blocks for the quark-hadron sciences.

Examples of related areas include; quark-gluon plasma, hadron physics, lattice QCD, dark energy, dark matter, baryogenesis, CP violation, strongly-correlated systems, phase transition of internal degrees of freedom of matter, physics of the Early Universe, matter at extreme conditions, structure of unstable nuclei and nucleosynthesis, compact star physics, optical lattice, (super)string theory, AdS/CFT correspondence, non-perturbative and/or non-equilibrium dynamics, etc.

International collaboration program

As a core activity of the YIPQS, long-stay programs are organized on research topics ranging over quark-hadron physics and related fields of theoretical physics. The proposal of the program is open for the community, with a requirement that the organizing committee should include a member of Yukawa Institute. Yukawa Institute calls for the proposals of the long-stay programs annually. The theme of the long-stay program is selected and endorsed by the YIPQS executive committee with taking account of comments and opinions from the international advisory committee. The program is to be endorsed by the steering/advisory committee of the Yukawa Institute. The proposed program plan is also to be examined by the user's committee of the Yukawa Institute.

Two to three long-stay programs will be held annually; the duration of each program is one to three months. World-leading scientists are invited for each theme, and the Yukawa Institute provides participants with relaxed and at-home atmosphere so that there may be active discussions and fruitful collaborations, which we hope that will ultimately lead to Nobel-prize class results. To publicize the aim of creating and advancing the field of quark-hadron sciences, the activities and outcomes of the YIPQS will be announced regularly on the website.

Long-stay programs

In this academic year the following two long-stay programs were held;

1. July. 21 – Aug. 23, 2015:
   "New Frontiers in Non-equilibrium Physics 2015"
   http://www2.yukawa.kyoto-u.ac.jp/~new-noneq2015.ws/
   Chairman: Hisao Hayakawa

2. Sep. 21 – Oct. 30, 2015:
   "Computational Advances in Nuclear and Hadron Physics"
   http://www2.yukawa.kyoto-u.ac.jp/~canhp2015/
   Chairman: Naoyuki Itagaki

The detailed information of each program can be seen at the website written above.

International molecule-type workshops

Smaller-size international collaboration programs are also organized to cope with the rapid development of the research in this field. The program is named a "molecule-type" international program. It is expected that the group discussion in this small program will evolve to form a research collaboration. The proposal has been received anytime within the budget limit. This program should involve at least one core participant from abroad, and should be long for two weeks or more. The selection of this program is also made by the executive committee, and the

selected program is examined by the user's committee of the Yukawa Institute.

In this academic year there were five international programs of this molecule-type as listed below;

1. May 18 – May 29, 2015:
   "Black Hole Information Loss Paradox"
   Core members: Pisin Chen and Misao Sasaki

2. June 1 – June 14, 2015:
   "Vlasov-Poisson : towards numerical methods without particles"
   Core members: Stephane Colombi and Atsushi Taruya

3. June 22 – July 10, 2015:
   "Radiation Reaction in General Relativity"
   Core Members: Leor Barack, Steven Detweiler and Takahiro Tanaka

4. Sep. 7 – Sep. 26, 2015:
   "Selected topics in the physics of the Quark-Gluon Plasma and Ultrarelativistic Heavy Ion Collisions"
   Core Members: Jean-Paul Blaizot, Yacine Mehtar-Tani and Yoshitaka Hatta

5. Mar. 23 – Apr. 6, 2016:
   "Exotic hadrons from high energy collisions"
   Core Members: Su Houng Lee and Tetsuo Hyodo

Organization

The executive committee was organized in the Yukawa Institute to run the whole program. The committee members are:
Akira Ohnishi (chair), Sinya Aoki, Yoshitaka Hatta, Hisao Hayakawa, Kunihito Ioka, Naoyuki Itagaki, Teiji Kunihiro, Hiroshi Kunitomo, Sinji Mukohyama, Misao Sasaki, Masatoshi Sato, Masaru Shibata, Shigeki Sugimoto, Yudai Suwa, Tadashi Takayanagi, Takahiro Tanaka.

One associate professor was hired to enhance the research activities at the Yukawa Institute.

The website of the program is;
http://www2.yukawa.kyoto-u.ac.jp/˜yipqs/index-e.html.

International Research Unit of Advanced Future Studies

The International Research Unit of Advanced Future Studies was established on July 28, 2015 in collaboration of 12 Kyoto University research organizations based on the New Integrated Creative Sciences Project (NICS Project; Project Leader: Masatoshi Murase) research activities (FY 2013-2014), and is operated by the Yukawa Institute for Theoretical Physics (YITP). Its vision is to drive intellectual adventures of multi-discipline integration for paradigm shifts in exploration of universal laws and emerging principles governing the living organisms, materials, mind, human societies, education and economy and to guide our future through intellectual adventures of multi-disciplinary integration. IRU-AFS leverages its international research networks with many global guest faculties to promote its original research in collaboration with the International Research Unit of Integrated Complex System Science (IRU-ICSS) and the Unit of Synergetic Studies for Space (USSS).

Overview

IRU-AFS aims at paradigm shifts that explore universal laws and emergent principles governing the living organisms, materials, mind, human societies, education and economy and guides our future through interdisciplinary studies. The first step is to challenge the fundamental assumption "The description of the world has to be objective," which is in a one-directional descriptive format, and to stand on a view, "humans create sciences and cultures that impact humans." This type of bi-directional "creative disruptions" exist widely in issues of macro-worlds, such as economy, human society, and psychology, as well as of a micro-world like quantum physics, and confuse scientists and attract them at the same time. IRU-AFS challenges the questions in these unprecedented areas and science frontiers leveraging its academic, global, and personal networks.

Purposes

Living organisms, materials, mind, human societies, education, and economy are all systems in a different hierarchical layer. In our research projects, these entities are viewed as dynamic processes. Regardless of the layer in the hierarchy, when a result of a process affects the process itself, a large-scale pattern, which is substantially larger than the scale of elements that construct the system, suddenly emerges. "Creative Disruption" includes the origin of life, evolution of mind, the inception of a new theory, self-organization of a social structure, collapse of a pandemic or a bubble economy, super conductivity, or quantum information theory. IRU-AFS explores creative phenomena observed in systems in different hierarchical layers with intelligence and insight of humanities, social and natural sciences to seek the universal principles behind the systems as well as specific principles and laws unique to each system. These processes will lead to creation of new disciplines; that is the value of the Advanced Future Studies.

Workshops and Symposiums

1. Interdisciplinary Symposium on Advanced Future Studies
   Chairman: Masatoshi Murase
   Date: 2015/08/06
   Place: CO-OP INN Kyoto
   http://www2.yukawa.kyoto-u.ac.jp/~future/events_en/the-symposium-was-held-by-yitp.html

2. International Workshop on Itinerant-Electron Magnetism
   Chairman: Kazuyoshi Yoshimura
   Date: 2015 September 25-27
   Place: Science Seminar House, North Campus of Yoshida Campus, Kyoto University
   http://www2.yukawa.kyoto-u.ac.jp/~future/events_en/international-workshop-on-itinerant-electron-magnetism.html

3. Symposium on GSEE/Kyoto 2016
   Chairman: Kazuo Nishimura
   Date: 2016 February 11
   Place: Panasonic Auditorium, Yukawa Memorial Hall, Kyoto University
   http://www2.yukawa.kyoto-u.ac.jp/~future/news_en/20160211-2.html

4. International Symposium on Advanced Future Studies
   Chairman: Masatoshi Murase
   Date: 2016 February 12
   Place: Panasonic Auditorium, Yukawa Memorial Hall, Kyoto University
   http://www2.yukawa.kyoto-u.ac.jp/~future/IS20160212/index.html

5. Superflares on Solar-type Stars and Solar Flares, and Their Impacts on Exoplanets and the Earth
   Chairman: Kazunari Shibata
   Date: 2016 March 1-4
   Place: Room 207, Building 6, Graduate School of Science, Kyoto University
   http://www2.yukawa.kyoto-u.ac.jp/~future/news_en/20160301-2.html

6. International Workshop on Advanced Future Studies
   Chairman: Masatoshi Murase
   Date: 2016 March 14-16
   Place: CO-OP INN Kyoto
   http://www2.yukawa.kyoto-u.ac.jp/~future/IS20160314/index.html

2.2 Publications

2.2.1 YITP preprints (January – December 2015)

15-1 A. Emir Gumrukcuoglu, Lavinia Heisenberg, Shinji Mukohyama, Norihiro Tanahashi, *Cosmology in bimetric theory with an effective composite coupling to matter*,arXiv:1501.02790 J. of Cosmology and Astroparticlel Physics, Vol. April [hep-th] (January).

15-2 Daniele Bertacca, Nicola Bartolo, Marco Bruni, Kazuya Koyama, Roy Maartens, Sabino Matarrese, Misao Sasaki, David Wands, *Galaxy bias and gauges at second order in General Relativity*,arXiv:1501.03163 Class.Quant.Grav. 32 (2015) 17, 175019 [astro-ph.CO] (January).

15-3 Naoki Sasakura, Yuki Sato, *Renormalization procedure for random tensor networks and the canonical tensor model*,arXiv:1501.05078 PTEP 043B09 [hep-th] (January).

15-4 Thomas DeGrand, Yuzhi Liu, Ethan T. Neil, Yigal Shamir, Benjamin Svetitsky, *Spectroscopy of SU(4) gauge theory with two flavors of sextet fermions*,arXiv:1501.05665 Phys. Rev. D 91, 114502 (2015) [hep-lat] (January).

15-5 Chunshan Lin, Lance Z. Labun, *Effective Field Theory of Broken Spatial Diffeomorphisms*,arXiv:1501.07160 JHEP03(2016)128 [hep-th] (January).

15-6 Guillem Domènech, Misao Sasaki, *Conformal Frame Dependence of Inflation*,arXiv:1501.07699 JCAP 1504 (2015) 022 [gr-qc] (January).

15-7 Yong-Seon Song, Atsushi Taruya, Akira Oka, *Cosmology with anisotropic galaxy clustering from the combination of power spectrum and bispectrum*,arXiv:1502.03099 JCAP 1508 (2015) 08, 007 [astro-ph.CO] (February).

15-8 Sinya Aoki, Takumi Iritani, Masahiro Nozaki, Tokiro Numasawa, Noburo Shiba, Hal Tasaki, *On the definition of entanglement entropy in lattice gauge theories*,arXiv:1502.04267 [hep-th] (February).

15-9 Takumi Iritani, Guido Cossu, Shoji Hashimoto, *Partial restoration of chiral symmetry in the color flux tube*,arXiv:1502.04845 Phys. Rev. D 91, 094501 (2015) [hep-lat] (February).

15-10 Jinn-Ouk Gong, Misao Sasaki, *A new parameter in attractor single-field inflation*,arXiv:1502.04167 [astro-ph.CO] (February).

15-11 Yoshitaka Hatta, Mauricio Martinez, Bo-Wen Xiao, *Analytic solutions of the relativistic Boltzmann equation*,arXiv:1502.05894 Phys. Rev. D 91, 085024 (2015) [hep-th] (February).

15-12 Iosif Bena, Stefano Giusto, Rodolfo Russo, Masaki Shigemori, Nicholas P. Warner, *Habemus Superstratum! A constructive proof of the existence of superstrata*,arXiv:1503.01463 JHEP 1505 (2015) 110 [hep-th] (February).

15-13 Masanori Yamada, Kenji Sasaki, Sinya Aoki, Takumi Doi, Tetsuo Hatsuda, Yoichi Ikeda, Takashi Inoue, Noriyoshi Ishii, Keiko Murano, Hidekatsu Nemura (HAL QCD Collaboration), *$\Omega\Omega$ interaction from 2+1 flavor lattice QCD*,arXiv:1503.03189 PTEP 071B01(2015) [hep-lat] (February).

15-14 Takumi Ohta, Shu Tanaka, Ippei Danshita, Keisuke Totsuka, *Phase diagram and sweep dynamics of a one-dimensional generalized cluster model*,arXiv:1503.03204 J. Phys. Soc. Jpn. 84, 063001 (2015) [cond-mat.stat-mech] (March).

15-15 Takeru Nakayama, Ippei Danshita, Tetsuro Nikuni, Shunji Tsuchiya, *Fano resonance through Higgs bound states in tunneling of Nambu-Goldstone modes*,arXiv:1503.01516 Phys. Rev. A 92, 043610 (2015) [cond-mat.quant-gas] (March).

15-16 Masamichi Miyaji, Tadashi Takayanagi, *Surface/State Correspondence as a Generalized Holography*,arXiv:1503.03542 PTEP 073B03(2015) [hep-th] (March).

15-17 Sinya Aoki, Masanori Hanada, Norihiro Iizuka, *Quantum Black Hole Formation in the BFSS Matrix Model*,arXiv:1503.05562 [hep-th] (March).

15-18 Sanefumi Moriyama, Tomoki Nosaka, *Superconformal Chern-Simons Partition Functions of Affine D-type Quiver from Fermi Gas*,arXiv:1504.07710 JHEP09(2015)054 [hep-th] (March).

15-19 Masayuki Asakawa, Tetsuo Hatsuda, Takumi Iritani, Etsuko Itou, Masakiyo Kitazawa, Hiroshi Suzuki, *Accurate Determination of Reference Scales for Wilson Gauge Action from Yang–Mills Gradient Flow*,arXiv:1503.06516 [hep-lat] (March).

15-20 unused

15-21 Pawe Caputa, Joan Simón, Andrius tikonas, Tadashi Takayanagi, Kento Watanabe, *Scrambling time from local perturbations of the eternal BTZ black hole*,arXiv:1503.08161 JHEP08(2015)011 [hep-th] (March).

15-22 Guillem Domènech, Atsushi Naruko, Misao Sasaki, *Cosmological disformal invariance*,arXiv:1505.00174 Journal of Cosmology and Astroparticle Physics, Vol 2015 October (2015) [gr-qc] (March).

15-23 Yuki Watanabe, Atsushi Naruko, Misao Sasaki, *Multi-disformal invariance of nonlinear primordial perturbations*,arXiv:1504.00672 EPL (Europhysics Letters), Volume 111, Number 3 [gr-qc] (March).

15-24 Shinji Hirano, Masazumi Honda, Kazumi Okuyama, Masaki Shigemori, *ABJ Theory in the Higher Spin Limit*,arXiv:1504.00365 [hep-th] (March).

15-25 Chunshan Lin, Misao Sasaki, *Resonant Primordial Gravitational Waves Amplification*,arXiv:1504.01373 Phys.Lett. B752 84(2016) [astro-ph.CO] (April).

15-26 Yuya Tanizaki, Hiromichi Nishimura, Kouji Kashiwa, *Evading the sign problem in the mean-field approximation through Lefschetz-thimble path integral*,arXiv:1504.02979 Phys. Rev. D 91, 101701 (2015) [hep-th] (April).

15-27 Sinya Aoki, Michael Creutz, *Pion masses in 2-flavor QCD with η condensation*,arXiv:1504.01454 PoS(LATTICE2014)316 [hep-lat] (April).

15-28 Chuan-Tsung Chan, Hirotaka Irie, Benjamin Niedner, Chi-Hsien Yeh, *Wronskians, dualities and FZZT-Cardy branes*,arXiv:1601.04934 [hep-th] (April).

15-29 Remya Nair, Sanjay Jhingan, Takahiro Tanaka, *Synergy between ground and space based gravitational wave detectors for estimation of binary coalescence parameters*,arXiv:1504.04108 [gr-qc] (April).

15-30 Shinji Mukohyama, Ryo Namba, Rio Saitou, Yota Watanabe, *Hamiltonian analysis of non-projectable Hořava-Lifshitz gravity with $U(1)$ symmetry*,arXiv:1504.07357 Phys. Rev. D 92, 024005 (2015) [hep-th] (April).

15-31 Norihiro Iizuka, Akinori Tanaka, Seiji Terashima, *Exact Path Integral for 3D Quantum Gravity*,arXiv:1504.05991 Phys. Rev. Lett. 115, 161304 (2015) [hep-th] (April).

15-32 Sinya Aoki, Kengo Kikuchi, Tetsuya Onogi, *Encoding field theories into gravities*,arXiv:1505.00131 [hep-th] (April).

15-33 Roberto Emparan, Tetsuya Shiromizu, Ryotaku Suzuki, Kentaro Tanabe, Takahiro Tanaka, *Effective theory of Black Holes in the 1/D expansion*,arXiv:1504.06489 [hep-th] (April).

15-34 Tong-Gyu Lee, Eiji Nakano, Yasuhiko Tsue, Toshitaka Tatsumi, Bengt Friman, *Landau-Peierls instability in a Fulde-Ferrell type inhomogeneous chiral condensed phase*,arXiv:1504.03185 Phys. Rev. D 92, 034024 (2015) [hep-ph] (April).

15-35 Hiroaki Kouno, Kouji Kashiwa, Junichi Takahashi, Tatsuhiro Misumi, Masanobu Yahiro, *Understanding of QCD at high density from Z3-symmetric QCD-like theory*,arXiv:1504.07585 Phys. Rev. D 93, 056009 (2016) [hep-ph] (April).

15-36 Takeshi Fukuyama, Daisuke Nomura, *Anapole moment of a chiral molecule revisited*,arXiv:1505.03888 The European Physical Journal D, 69:264 [hep-ph] (May).

15-37 Yasuho Yamashita, Antonio De Felice, Takahiro Tanaka, *Appearance of Boulware-Deser ghost in bigravity with doubly coupled matter*,arXiv:1408.0487 Int.J.Mod.Phys. D23 (2014) 1443003 [hep-th] (May).

15-38 Keiyu Goto, Hiroaki Matsunaga, *On-shell equivalence of two formulations for superstring field theory*,arXiv:1506.06657 [hep-th] (May).

15-39 Yoshitaka Hatta, Akihiko Monnai, Bo-Wen Xiao, *Flow harmonics v_n at finite density*,arXiv:1505.04226 Phys. Rev. D 92, 114010 (2015) [hep-ph] (May).

15-40 Masanori Hanada, Yoshinori Matsuo, Takeshi Morita, *Instanton dynamics in finite temperature QCD via holography*,arXiv:1505.04498 Nucl.Phys.B Vol.899 631 October(2015) [hep-th] (May).

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15-42 Hidekazu Tsukiji, Hideaki Iida, Teiji Kunihiro, Akira Ohnishi, Toru T. Takahashi, *Entropy production in quantum Yang-Mills mechanics in semi-classical approximation*,arXiv:1505.04698 PTEP 2015 (2015) 083A01 [hep-ph] (May).

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15-47 Nicola Bartolo, Daniele Bertacca, Marco Bruni, Kazuya Koyama, Roy Maartens, Sabino Matarrese, Misao Sasaki, Licia Verde, David Wands, *A relativistic signature in large-scale structure*,arXiv:1506.00915 Phys. Of the Dark Universe Vol.13 30, 2016 [astro-ph.CO] (May).

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15-50 Yong-Seon Song, Atsushi Taruya, Eric Linder, Kazuya Koyama, Cristiano G. Sabiu, Gong-Bo Zhao, Francis Bernardeau, Takahiro Nishimichi, Teppei Okumura, *Consistent Modified Gravity Analysis of Anisotropic Galaxy Clustering Using BOSS DR11*,arXiv:1507.01592 Phys. Rev. D 92, 043522 (2015) [astro-ph.CO] (June).

15-51 H. Mei, K. Hagino, J. M. Yao, and T. Motoba, *Microscopic study of low-lying spectra of Λ hypernuclei based on a beyond-mean-field approach with a covariant energy density functional*,arXiv:1504.04924 Phys. Rev. C 91, 064305 (2015) [nucl-th] (June).

15-52 Naoki Sasakura, Yuki Sato, *Constraint algebra of general relativity from a formal continuum limit of canonical tensor model*,arXiv:1506.04872 [hep-th] (June).

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15-54 Masahiro Nozaki, Tokiro Numasawa, Shunji Matsuura, *Quantum Entanglement of Fermionic Local Operators*,arXiv:1507.04352 JHEP02(2016)150 [hep-th] (June).

15-55 Yudai Suwa, Takashi Yoshida, Masaru Shibata, Hideyuki Umeda, Koh Takahashi, *Neutrino-driven explosions of ultra-stripped type Ic supernovae generating binary neutron stars*,arXiv:1506.08827 [astro-ph.HE] (June).

15-56 Hiroshi Kunitomo, *Symmetries and Feynman Rules for Ramond Sector in Heterotic String Field Theory*,arXiv:1506.08926 PTEP 093B02(2015) [hep-th] (June).

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15-58 Terukazu Ichihara, Kenji Morita, Akira Ohnishi, *Net baryon number fluctuations across the chiral phase transition at finite density in the strong coupling lattice QCD*,arXiv:1507.04527 PTEP 2015 (2015) 113D01 [hep-lat] (July).

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15-63 Kouji Kashiwa, Tong-Gyu Lee, Kazuya Nishiyama, Ryo Yoshiike, *Inhomogeneous chiral condensates and non-analyticity under an external magnetic field*,arXiv:1507.08382 [hep-ph] (July).

15-64 Masazumi Honda, Norihiro Iizuka, Akinori Tanaka, Seiji Terashima, *Exact Path Integral for 3D Quantum Gravity II*,arXiv:1510.02142 Phys. Rev. D 93, 064014 (2016) [hep-th] (July).

15-65 Hiroshi Kunitomo, Yuji Okawa, *Complete action of open superstring field theory*,arXiv:1508.00366 Prog. Theor. Exp. Phys. (2016) 023B01 [hep-th] (August).

15-66 Tatsuki Hashimoto, Keiji Yada, Masatoshi Sato, Yukio Tanaka, *Surface electronic state of superconducting topological crystalline insulator*,arXiv:1507.03335 Phys. Rev. B 92, 174527 (2015) [cond-mat.supr-con] (August).

15-67 Takeshi Mizushima, Yasumasa Tsutsumi, Takuto Kawakami, Masatoshi Sato, Masanori Ichioka, Kazushige Machida, *Symmetry Protected Topological Superfluids and Superconductors — From the Basics to ^3He —*,arXiv:1508.00787 J. Phys. Soc. Jpn. 85, 022001 (2016) [cond-mat.supr-con] (August).

15-68 Ken Shiozaki, Masatoshi Sato, Kiyonori Gomi, *Topology of nonsymmorphic crystalline insulators and superconductors*,arXiv:1511.01463 [cond-mat.mes-hall] (August).

15-69 JLQCD collaboration: H. Fukaya, S. Aoki, G. Cossu, S. Hashimoto, T. Kaneko, J. Noaki, *η'meson mass from topological charge density correlator in QCD*,arXiv:1509.00944 Phys. Rev. D 92, 111501 (2015) [hep-lat] (August).

15-70 JLQCD Collaboration: S. Aoki, G. Cossu, X. Feng, S. Hashimoto, T. Kaneko, J. Noaki, T. Onogi, *Light meson electromagnetic form factors from three-flavor lattice QCD with exact chiral symmetry*,arXiv:1510.06470 Phys. Rev. D 93, 034504 (2016) [hep-lat] (August).

15-71 Kenta Miyahara, Tetsuo Hyodo, Eulogio Oset, *Weak decay of Lambda_cˆ+ for the study of Lambda(1405) and Lambda(1670)*,arXiv:1508.04882 Phys. Rev. C 92, 055204 (2015) [nucl-th] (August).

15-72 Antonio De Felice, Ryotaro Kase, Shinji Tsujikawa, *Existence and disappearance of conical singularities in GLPV theories*,arXiv:1508.06364 Phys. Rev. D 92, 124060 (2015) [gr-qc] (August).

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15-74 Takumi Iritani, Etsuko Itou, Tatsuhiro Misumi, *Lattice study on QCD-like theory with exact center symmetry*,arXiv:1508.07132 JHEP11(2015)159 [hep-lat] (August).

15-75 Gaurav Narain, Naoki Sasakura, *An OSp extension of Canonical Tensor Model*,arXiv:1509.01432 PTEP 123A05(2015) [hep-th] (September).

15-76 Yuki Kamiya, Tetsuo Hyodo, *Structure of near-threshold quasi-bound states*,arXiv:1509.00146 Phys. Rev. C 93, 035203 (2016) [hep-ph] (September).

15-77 Seiji Terashima, *A Nonperturbative Proof of Dijkgraaf-Vafa Conjecture*,arXiv:1509.02916 JHEP03(2016)136 [hep-th] (September).

15-78 Antonio De Felice, A. Emir Gürükçüoğlu, Lavinia Heisenberg, Shinji Mukohyama, *Matter coupling in partially constrained vielbein formulation of massive gravity*,arXiv:1509.05978 Journal of Cosmology and Astroparticle Physics, Volume 2016, January 2016 [hep-th] (September).

15-79 Yuta Yoshida, Yoshiko Kanada-En'yo, Fumiharu Kobayashi, *α-cluster excited states in ^{32}S*,arXiv:1602.00241 PTEP 043D01(2016) [nucl-th] (September).

15-80 Matthew Buican, Takahiro Nishinaka, *Argyres-Douglas Theories, the Macdonald Index, and an RG Inequality*,arXiv:1509.05402 JHEP02(2016)159 [hep-th] (September).

15-81 Toshiya Namikawa, Atsushi Nishizawa, Atsushi Taruya, *Anisotropies of gravitational-wave standard sirens as a new cosmological probe without redshift information*,arXiv:1511.04638 Phys. Rev. Lett. 116, 121302 (2016) [astro-ph.CO] (September).

15-82 HyungJoo Kim, Kenji Morita, Su Houng Lee, *Temperature dependence of dimension 6 gluon operators and their effects on Charmonium*,arXiv:1510.03563 Phys. Rev. D 93, 016001 (2016) [hep-ph] (September).

15-83 Shunji Matsuura, Hidetoshi Nishimori, Tameem Albash, Daniel A. Lidar, *Mean Field Analysis of Quantum Annealing Correction*,arXiv:1510.07709 [quant-ph] (September).

15-84 S. Alireza Mortazavi, Jennifer M. Lotz, Joshua E. Barnes, Gregory F. Snyder, *Modeling the Initial Conditions of Interacting Galaxy Pairs Using Identikit*,arXiv:1412.6227 [astro-ph.GA] (October).

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15-86 Hiroaki Matsunaga, *Comments on complete actions for open superstring field theory*,arXiv:1510.06023 [hep-th] (October).

15-87 Takahiro Tanaka, Yuko Urakawa, *Conservation of ζ with radiative corrections from heavy field*,arXiv:1510.05059 [hep-th] (October).

15-88 Ryotaro Kase, Shinji Tsujikawa, Antonio De Felice, *Cosmology with a successful Vainshtein screening in theories beyond Horndeski*,arXiv:1510.06853 Phys. Rev. D 93, 024007 (2016) [gr-qc] (October).

15-89 Giacomo Marmorini, Daisuke Yamamoto, Ippei Danshita, *On the umbrella-coplanar transition in the triangular XXZ model with arbitrary spin*,arXiv:1510.07969 [cond-mat.str-el] (October).

15-90 Masazumi Honda, Norihiro Iizuka, Akinori Tanaka, Seiji Terashima, *Exact Path Integral for 3D Higher Spin Gravity*,arXiv:1511.07546 [hep-th] (October).

15-91 Antonio De Felice, Shinji Mukohyama, *Phenomenology in minimal theory of massive gravity*,arXiv:1512.04008 JCAP04(2016)028 [hep-th] (November).

15-92 Terukazu Ichihara, Akira Ohnishi, Kenji Morita, *Higher order net baryon number cumulants in the strong coupling lattice QCD* , PoS(LATTICE 2015)203 (November).

15-93 Hidekazu Tsukiji, Hideaki Iida, Teiji Kunihiro, Akira Ohnishi, Toru T. Takahashi, *Study of entropy production in Yang-Mills theory with use of Husimi function*,arXiv:1511.03804 [hep-ph] (November).

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15-96 Akira Ohnishi, Terukazu Ichihara, *Preweighting method in Monte-Carlo sampling with complex action — Strong-Coupling Lattice QCD with 1/g 2 corrections, as an example —*,arXiv:1512.08458 [hep-lat] (November).

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15-99 Takumi Iritani, for HAL QCD Collaboration, *Lattice QCD studies on baryon interactions from Lüscher's finite volume method and HAL QCD method*,arXiv:1511.05246 [hep-lat] (November).

15-100 Kunihiko Terasaki, *Decays of Charmed Vector Mesons — $\eta\pi^0$ mixing as an origin of isospin non-conservation —*,arXiv:1511.05249 [hep-ph] (November).

15-101 Shoichiro Tsutsui, Teiji Kunihiro, Akira Ohnishi, *Parametric Instability of Classical Yang-Mills Fields in an Expanding Geometry*,arXiv:1512.00155 [hep-ph] (November).

15-102 Sinya Aoki, Kengo Kikuchi, Tetsuya Onogi, *Generalized Gradient Flow Equation and Its Applications*,arXiv:1511.06561 [hep-lat] (November).

15-103 Mitsutoshi Fujita, Charles M. Melby-Thompson, Rene Meyer, Shigeki Sugimoto, *Holographic Chern-Simons Defects*,arXiv:1601.00525 [hep-th] (November).

15-104 Yusuke Kimura, *Gauge Groups and Matter Fields on Some Models of F-theory without Section*,arXiv:1511.06912 JHEP 03(2016)042 [hep-th] (November).

15-105 Tomoki Nosaka, *Instanton effects in ABJM theory with general R-charge assignments*,arXiv:1512.02862 JHEP 03(2016) 059 [hep-th] (November).

15-106 Tomoki Nosaka, Kazuma Shimizu, Seiji Terashima, *Large N behavior of mass deformed ABJM theory*,arXiv:1512.00249 JHEP03(2016)063 [hep-th] (November).

15-107 Adam Rubin, Avishay Gal-Yam, Annalisa De Cia, Assaf Horesh, Danny Khazov, Eran O. Ofek, S. R. Kulkarni, Iair Arcavi, Ilan Manulis, Ofer Yaron, Paul Vreeswijk, Mansi M. Kasliwal, Sagi Ben-Ami, Daniel A. Perley, Yi Cao, S. Bradley Cenko, Umaa D. Rebbapragada, P. R. Woźniak, Alexei V. Filippenko, K. I. Clubb, Peter E. Nugent, Y.-C. Pan, C. Badenes, D. Andrew Howell, Stefano Valenti, David Sand, J. Sollerman, Joel Johansson, Douglas C. Leonard, J. Chuck Horst, Stephen F. Armen, Joseph M. Fedrow, Robert M. Quimby, Paulo Mazzali, Elena Pian, Assaf Sternberg, Thomas Matheson, M. Sullivan, K. Maguire, Sanja Lazarevic, *Type II supernova energetics and comparison of light curves to shock-cooling models*,arXiv:1512.00733 The Astrophysical Journal, Volume 820, Number 1 [astro-ph.HE] (November).

15-108 Keiyu Goto, Hiroaki Matsunaga, *A_∞/L_∞ structure and alternative action for WZW-like superstring field theory*,arXiv:1512.03379 [hep-th] (November).

15-109 Pisin Chen, Guillem Dom nech, Misao Sasaki, Dong-han Yeom, *Stationary bubbles and their tunneling channels toward trivial geometry*,arXiv:1512.00565 JCAP 04(2016)013 [hep-th] (December).

15-110 Takumi Doi, Sinya Aoki, Shinya Gongyo, Tetsuo Hatsuda, Yoichi Ikeda, Takashi Inoue, Takumi Iritani, Noriyoshi Ishii, Takaya Miyamoto, Keiko Murano, Hidekatsu Nemura, Kenji Sasaki, *First results of baryon interactions from lattice QCD with physical masses (1) – General overview and two-nucleon forces –*,arXiv:1512.01610 [hep-lat] (December).

15-111 Guillem Doménech, Chunshan Lin, Misao Sasaki, *Inflationary Magnetogenesis with Broken Local U(1) Symmetry*,arXiv:1512.01108 [astro-ph.CO] (December).

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15-113 Kazuhiro Yamamoto, Valerio Marra, Viatcheslav Mukhanov, Misao Sasaki, *Perturbed Newtonian description of the Lemaître model with non-negligible pressure*,arXiv:1512.04240 JCAP03(2016)030 [gr-qc] (December).

15-114 Yoshitaka Hatta, Bowen Xiao, Dilun Yang, *A non-boost-invariant solution of relativistic hydrodynamics in 1+3 dimensions*,arXiv:1512.04221 Phys. Rev. D 93, 016012 (2016) [hep-ph] (December).

15-115 Antonio Enea Romano, Sander Mooij, Misao Sasaki, *Adiabaticity and gravity theory independent conservation laws for cosmological perturbations*,arXiv:1512.05757 [gr-qc] (December).

15-116 Takumi Doi, Sinya Aoki, Shinya Gongyo, Tetsuo Hatsuda, Yoichi Ikeda, Takashi Inoue, Takumi Iritani, Noriyoshi Ishii, Takaya Miyamoto, Keiko Murano, Hidekatsu Nemura, Kenji Sasaki, *Towards Lattice QCD Baryon Forces at the Physical Point: First Results*,arXiv:1512.04199 [hep-lat] (December).

15-117 Atsushi Naruko, Daisuke Yoshida, Shinji Mukohyama, *Gravitational scalar-tensor theory*,arXiv:1512.06977 Classical and Quantum Gravity, Volume 33, Number 9 [gr-qc] (December).

15-118 Pawel Caputa, Masahiro Nozaki, Tokiro Numasawa, *Charged Entanglement Entropy of Local Operators*,arXiv:1512.08132 [hep-th] (December).

15-119 Yasushi Nara, Akira Ohnishi, *Does non-monotonic behavior of directed flow signal the onset of deconfinement?*,arXiv:1512.06299 [nucl-th] (December).

15-120 Yasushi Nara, Akira Ohnishi, Horst Stoecker, *Directed flow as a signature of the softest point of the equation of state in QCD matter*,arXiv:1601.07692 [hep-ph] (December).

15-121 Ichihiko Hashimoto, Atsushi Taruya, Takahiko Matsubara, Toshiya Namikawa, Shuichiro Yokoyama, *Constraining higher-order parameters for primordial non-Gaussianities from power spectra and bispectra of imaging survey*,arXiv:1512.08352 [astro-ph.CO] (December).

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15-123 Matthew Buican, Takahiro Nishinaka, *A Small Deformation of a Simple Theory*,arXiv:1602.05545 [hep-th] (December).

15-124 Antonio De Felice, A. Emir Gümrükçüoğlu, Lavinia Heisenberg, Shinji Mukohyama, Norihiro Tanahashi, *New Quasidilaton theory in Partially Constrained Vielbein Formalism*,arXiv:1603.02165 [hep-th] (December).

15-125 unused

15-126 Akira Ohnishi, Kenji Morita, Takenori Furumoto, *Lambda-Lambda interaction from two-particle intensity correlation in relativistic heavy-ion collisions*,arXiv:1512.08444 [nucl-th] (December).

15-127 Akira Ohnishi, *Approaches to QCD phase diagram; effective models, strong-coupling lattice QCD, and compact stars*,arXiv:1512.08468 J.Phys.Conf.Ser. 668 (2016), 012004 [nucl-th] (December).

15-128 Katrin Hammer, Alexander Vikman, *Many Faces of Mimetic Gravity*,arXiv:1512.09118 [gr-qc] (December).

15-129 Kenta Hotokezaka, Koutarou Kyutoku, Hirotada Okawa, Masaru Shibata, *Exploring tidal effects of coalescing binary neutron stars in numerical relativity II: Longterm simulations*,arXiv:1502.03457 Phys. Rev. D 91, 064060 (2015) [gr-qc] (December).

15-130 Kyohei Kawaguchi, Koutarou Kyutoku, Hiroyuki Nakano, Hirotada Okawa, Masaru Shibata, Keisuke Taniguchi, *Black hole-neutron star binary merger: Dependence on black hole spin orientation and equations of state*,arXiv:1506.05473 Phys. Rev. D 92, 024014 (2015) [astro-ph.HE] (December).

15-131 Koutarou Kyutoku, Kunihito Ioka, Hirotada Okawa, Masaru Shibata, Keisuke Taniguchi, *Dynamical mass ejection from black hole-neutron star binaries*,arXiv:1502.05402 Phys. Rev. D 92, 044028 (2015) [astro-ph.HE] (December).

15-132 Kenta Kiuchi, Yuichiro Sekiguchi, Koutarou Kyutoku, Masaru Shibata, Keisuke Taniguchi, Tomohide Wada, *High-resolution magnetohydrodynamics simulation of black hole-neutron star merger: Mass ejection and short gamma-ray burst*,arXiv:1506.06811 Phys. Rev. D 92, 064034 (2015) [astro-ph.HE] (December).

15-133 Francesco Pannarale, Emanuele Berti, Koutarou Kyutoku, Benjamin D. Lackey, Masaru Shibata, *Gravitational-wave cutoff frequencies of tidally disruptive neutron star-black hole binary mergers*,arXiv:1509.06209 Phys. Rev. D 92, 081504(2015) [gr-qc] (December).

15-134 Francesco Pannarale, Emanuele Berti, Koutarou Kyutoku, Benjamin D. Lackey, Masaru Shibata, *Aligned spin neutron star-black hole mergers: a gravitational waveform amplitude model*,arXiv:1509.00512 Phys. Rev. D 92, 084050 (2015) [gr-qc] (December).

15-135 Kenta Kiuchi, Pablo Cerdá-Durán, Koutarou Kyutoku, Yuichiro Sekiguchi, Masaru Shibata, *Efficient magnetic-field amplification due to the Kelvin-Helmholtz instability in binary neutron star mergers*,arXiv:1509.09205 Phys. Rev. D 92, 124034 (2015) [astro-ph.HE] (December).

15-136 Peter Möller, Arnold J. Sierk, Takatoshi Ichikawa, Akira Iwamoto, and Matthew Mumpower, *Fission barriers at the end of the chart of the nuclides*, Phys. Rev. C 91, 024310 (2015) (December).

15-137 Yoritaka Iwata, Takatoshi Ichikawa, Naoyuki Itagaki, Joachim A. Maruhn, Takaharu Otsuka, *Examination of the stability of a rod-shaped structure in 24 Mg*,arXiv:1409.8012 [nucl-th] (December).

15-138 Takatoshi Ichikawa, Kenichi Matsuyanagi, *A Universal Damping Mechanism of Quantum Vibrations in Deep Sub-Barrier Fusion Reactions*,arXiv:1506.07963 Phys. Rev. C 92, 021602(R) [nucl-th] (December).

15-139 Takatoshi Ichikawa, *Systematic investigations of deep sub-barrier fusion reactions using an adiabatic approach*,arXiv:1510.00806 Phys. Rev. C 92, 064604 [nucl-th] (December).

15-140 P. Moller, T. Ichikawa, *A Method to Calculate Fission-Fragment Yields Y(Z,N) versus Proton and Neutron Number in the Brownian Shape-Motion Model. Application to calculations of U and Pu charge yields*,arXiv:1508.05964 The European Physical Journal A December 2015, 51:173 [nucl-th] (December).

15-141 P. Moller, A. J. Sierk, T. Ichikawa, H. Sagawa, *Nuclear ground-state masses and deformations: FRDM(2012)*,arXiv:1508.06294 Atomic Data and Nuclear Data Tables Volumes 109 110, May July 2016, Pages 1 204 [nucl-th] (December).

15-142 Marcus C. Werner, *A geometrical approach to gravitational lensing magnification*,arXiv:1507.05099 [gr-qc] (December).

2.2.2 Publications and Talks by Regular Staff and Advanced Future Studies Researchers (April 2015 — March 2016)

Sinya Aoki

Journal Papers

1. Sinya Aoki, Masanori Hanada, Atsushi Nakamura,
"Taming the pion condensation in QCD at finite baryon density, "
JHEP 1505 (2015) 071, 0-23,
arXiv:1410.7421 [hep-th] .

2. Sinya Aoki, Takumi Iritani, Masahiro Nozaki, Tokiro Numasawa, Noburo Shiba, Hal Tasaki
"On the definition of entanglement entropy in lattice gauge theories "
JHEP 1506(2015) 187
(arXiv:1502. 04267[hep-th]), YITP-14-66.

3. Sinya Aoki, Masanori Hanada, Norihiro Iizuka
"Quantum Black Hole Formation in the BFSS Matrix Model"
JHEP 1505(2015)71
(arXiv:1503.05562 [hep-th]).

4. Masanori Yamada, Kenji Sasaki, Sinya Aoki, Takumi Doi, Tetsuo Hatsuda, Yoichi Ikeda, Takashi Inoue, Noriyoshi Ishii, Keiko Murano, Hidekatsu Nemura (HAL QCD Collaboration)
"$\Omega\Omega$ interaction from 2+1 flavor lattice QCD"
PTEP**2015 (7)** (2015): 017B01
(arXiv:1503.03189[hep-lat]).

5. Kenji Sasaki, Sinya Aoki, Takumi Doi, Tetsuo Hatsuda, Yoichi Ikeda, Takashi Inoue, Noriyoshi Ishii, Keiko Murano, (HAL QCD Collaboration)
"Coupled channel approach to strangeness $S = -2$ baryon-baryon interactions in Lattice QCD"
Progress of Theoretical and Experimental Physics (2015)11, 113B01
(arXiv:1504.01717[hep-lat]).

6. Sinya Aoki, Kengo Kikuchi, Tetsuya Onogi
"Geometries from field theories"
Progress of Theoretical and Experimental Physics (2015)10, 101B01
(arXiv:1505.00131[hep-th]).

7. H. Fukaya, S. Aoki, G. Cossu, S. Hashimoto, T. Kaneko, J. Noaki (JLQCD Collaboration),
"η' meson mass from topological charge density correlator in QCD,"
Phys. Rev. D **92** (2015) 11, 111501
(arXiv:1509.00944 [hep-lat]).

8. S. Aoki, G. Cossu, X. Feng, S. Hashimoto, T. Kaneko, J. Noaki, T. Onogi (JLQCD Collaboration),
"Light meson electromagnetic form factors from three-flavor lattice QCD with exact chiral symmetry",
Phys. Rev. D **93** (2016) 2, 034504
(arXiv:1510.06470 [hep-lat]).

Books and Proceedings

1. J. Noaki, S. Aoki, G. Cossu, H. Fukaya, S. Hashimoto, T. Kaneko for JLQCD Collaboration
"Fine lattice simulations with Ginsparg-Wilson fermions"
PoS LATTICE2014 (2015) 069, 1-7.

2. Sinya Aoki,
"Hadron Interactions from lattice QCD,"
EPJ Web Conf. 113 (2016) 01009,
arXiv:1603.00989[hep-lat], YITP-16-25.

3. S. Aoki
"Axial U(1) symmetry in the chiral symmetric phase of 2-flavor QCD at finite temperature"
PoS (CD15) 045,
arXiv:1603.00997[hep-lat].

Talks at International Conferences

1. "Hadron Interactions from lattice QCD, "
Invited, Plenary,
21th International Conference on Few-Body Problems in Physics, Chicago, USA,
May 18-22, 2015.

2. "Axial U(1) symmetry in the chiral symmetric phase of 2-flavor QCD at finite temperature, "
8th International Workshop on Chiral Dynamics, Pisa, Italy,
June 29- July 3, 2015.

3. "Nuclear forces from lattice QCD, " Invited, Plenary,

ECT* Workshop on "Lattice Nuclei Nuclear Physics and QCD - Bridging the gap," Trento, Italy,
July 6-10, 2015.

4. "Encoding field theories into gravities, "
The 33rd International Symposium on Lattice Field Theory (Lattice 2015), Kobe, Japan,
July 14-July 18, 2015.

5. "Chiral and U(1)$_A$ symmetries at finite temperature with overlap fermions, " Invited,
High-precision QCD at low energy, Benasque, Spain,
August 2-22, 2015.

6. "Comparative studies for baryon interactions with HAL QCD method and Lüscher's method, " Invited,
Long-term and Nishinomiya-Yukawa Memorial International Workshop on "Computational Advances in Nuclear and Hadron Physics, " YITP, Kyoto, Japan,
September 21-October 30, 2015.

7. "Opening Address" and "Summary of HPCI Strategic Program Field 5, " Invited,
Symposium "Quarks to Universe in Computational Science (QUCS2015), " Nara, Japan,
November 4-8, 2015.

8. "Recent developments and challenges in lattice QCD, " Invited,
International Symposium "RIKKYO Math-Phys 2016, " Rikkyo University, Tokyo, Japan,
January 9-11, 2016.

9. "New strategies with HAL QCD potential method, " Invited,
Joint HAL QCD-CalLat mini-workshop on lattice QCD for NP, LBL, Berkeley, USA,
January 27-29, 2016.

10. "Hadron interactions at heavier quark masses in lattice QCD –Are deuteron and di-neutron bound ? – , " Invited,
YITP and IOPP Joint workshop on Heavy Ion Physics, CCNU, Wuhan, China,
February 20, 2016.

Invited Seminars (in Japan)

1. "U(1) axial symmetry at high temperature," Physics at Finite Temperature and Density and Lattice QCD simulation, Tsukuba University, Tsukuba, Septembar 5, 2015.

2. "Chiral symmetry and U(1) axial anomaly in lattice QCD,"
The 71st JPS Annual Meeting Joint Symposium – Spontaneous Smmetry Breaking: Progress in Physics after Yoichiro Nambu – , Tohoku Gakuin University, Sendai, March 21, 2016.

Hector Bombin

Talks at International Conferences

1. "Time-correlated noise in quantum computation," Invited,
in "Advances in Quantum Algorithms and Computation," Aspen Center for Physics, Aspen, USA,
March 2016.

2. "Local Operations, Topological Order and Fault-tolerant Quantum Computation," Invited,
in "YITP Workshop on Quantum Information Physics," Yukawa Institute for Theoretical Physics, Kyoto, Japan,
January 2016.

Invited Seminars (Overseas)

1. 'Time-correlated noise in quantum computation,"
University of Southern California, Los Angeles, USA, March 2016.

2. 'Time-correlated noise in quantum computation,"
Caltech, Pasadena, USA, March 2016.

Ippei Danshita

Journal Papers

1. D. Yamamoto, G. Marmorini, and I. Danshita,
"Magnetization process of spin-1/2 Heisenberg antiferromagnets on a triangular lattice,"
J. Phys. Soc. Jpn. **85** (2016) 024706 (6 pages).

2. T. Nakayama, I. Danshita, T. Nikuni, and S. Tsuchiya,
"Fano resonance through Higgs bound states in tunneling of Nambu-Goldstone modes,"
Phys. Rev. A **92** (2015) 043601 (19 pages).

3. T. Ohta, S. Tanaka, I. Danshita, K. Totsuka,
"Phase diagram and sweep dynamics of a one-dimensional generalized cluster model,"
J. Phys. Soc. Jpn. **84** (2015) 063001 (4 pages), YITP-15-14, arXiv:1503.03204 [cond-mat].

Talks at International Conferences

1. "Fano resonance between Nambu-Goldstone modes and Higgs bound states in a superfluid," Invited,
in "Ugo Fano Gold Medal & Ugo Fano Symposium," CNR, Rome, Italy, December 2015.

2. "Bound states of Higgs modes in a relativistic superfluid," Invited,
in "12th US-Japan Seminar: Many body quantum systems from quantum gases to metrology and information processing," Monona Terrace, Madison, Wisconsin, USA, September 2015.

3. "Superfluid Bose-Bose mixtures obeying a nonlinear Schroedinger equation with cubic and quintic nonlinearities,"
in "24th Annual International Laser Physics Workshop," Courtyard by Marriott Hotel Shanghai Pudong, Shanghai, China, August 2015.

4. "Superfluid Bose-Bose mixtures obeying a nonlinear Schroedinger equation with cubic and quintic nonlinearities,"
in "24th Annual International Laser Physics Workshop," Courtyard by Marriott Hotel Shanghai Pudong, Shanghai, China, August 2015.

5. "Higgs bound states and heavy solitons of Bose gases in optical lattices,"
in "Frontiers in Quantum Simulation with Cold Atoms, Week 4," INT University of Washington, Seattle, Washington, USA, April 2015.

Invited Seminars (Overseas)

1. "Bound states of Higgs modes in a superfluid phase of lattice bosons,"
Department of Physics, Koç University, Sariyer, Istanbul, Turkey, December 2015.

2. "Higgs bound states and surface criticality of Bose gases in optical lattices,"
Institut für Laserphysik, Universität Hamburg, Hamburg, Germany, December 2015.

3. "Bound states of Higgs modes in a superfluid,"
Department of Physics, Boston University, Boston, Massachusetts, USA, September 2015.

Invited Seminars (in Japan)

1. "Strongly-correlated superfluid Bose gases in optical lattices: Higgs bound states and heavy solitary waves,"
Department of Physics, Osaka University, October 2015 (in Japanese).

2. "Quantum phase slips in one-dimensional superfluids,"
Advanced Institute for Computational Science, RIKEN, August 2015 (in Japanese).

3. "Strongly-interacting superfluid Bose gases in optical lattices: Higgs bound states and heavy solitary waves,"
Dept. of Electronic and Physical Systems, Waseda University, April 2015 (in Japanese).

Yoshitaka Hatta

Journal Papers

1. Y. Hatta, A. Monnai and B. Xiao,
"Flow harmonics v_n at finite density,"
Phys. Rev. D**92** (2015) 114010 (17 pages), arXiv:1505.04226 [hep-ph], YITP-15-39.

2. Y. Hatta, A. Monnai and B. Xiao,
"Elliptic flow difference of charged pions in heavy-ion collisions,"
Nucl. Phys. A**947** (2016) 155 (6 pages), arXiv:1507.04690 [hep-ph], YITP-15-57.

3. Y. Hagiwara, Y. Hatta and T. Ueda,
"Hemisphere jet mass distribution at finite N_c,"
Phys. Lett. B**756** (2016) 254 (5 pages), arXiv:1507.07641 [hep-ph], YITP-15-59.

4. Y. Hatta, B. Xiao and D. Yang,
"Non-boost-invariant solution of relativistic hydrodynamics in 1+3 dimensions,"
Phys. Rev. D**93** (2016) 016012 (8 pages), arXiv:1512.04221 [hep-ph], YITP-15-114.

5. Y. Hatta, B. Xiao and F. Yuan
"Probing the small-x gluon tomography in correlated hard diffractive dijet production in deep inelastic scattering"
Phys. Rev. Lett. 116 (2016) 202301 (5 pages), arXiv.1601.01585 [hep-ph], YITP-16-1.

Talks at International Conferences

1. "Nucleon spin and tomography," Invited,
in "International Workshop on Hadron Structure and Spectroscopy," Suzdal, Russia, May 2015.

2. "Computing flow harmonics v_n analytically," Invited,
in "Heavy Ion Collisions at the LHC; the first one fermi," Ben Gurion University, Israel, May 2015.

3. "Wigner and Husimi distributions in QCD," Invited,
in "Spinfest," JPARC, Tokai, Japan, July 2015.

4. “Husimi distribution for nucleon tomography,” Invited,
in “International conference on Physics Opportunities at Electron-Ion collider (POETIC VI),” Ecole Polytechnique, France, September 2015.

5. “Analytic approaches to relativistic hydrodynamics,” Invited,
in “Quark Matter 2015,” Kobe, Japan, October 2015.

6. “Husimi distribution for nucleon tomography,” Invited,
in “The 10th Circum-Pan-Pacific Symposium on High Energy Spin Physics,” Academia Sinica, Taiwan, October 2015.

7. “Charge dependence of elliptic flow in heavy-ion collisions,” Invited,
in “QCD chirality workshop,” UCLA, USA, February 2016.

Invited Seminars (in Japan)

1. “Basics of perturbative QCD,”
RIKEN, April 2015.

2. “Analytic approaches to relativistic hydrodynamics,”
Nagoya University, February 2015.

Hisao Hayakawa

Journal Papers

1. Satoshi Takada and Hisao Hayakawa, "Drag Law of Two Dimensional Granular Fluids", J. Eng. Mech. C4016004 (2016) [6pages].

2. Ryosuke Yoshii, Satoshi Takada, Shunji Tsuchiya, Hisao Hayakawa and Muneto Nitta, "Fulde-Ferrell-Larkin-Ovchinnikov states in a superconducting ring with magnetic fields: Phase diagram and the first-order phase transitions", Phys. Rev. B **92**, 224512 (2015) [7pages].

3. Koshiro Suzuki and Hisao Hayakawa, "Divergence of Viscosity in Jammed Granular Materials: A Theoretical Approach", Phys. Rev. Lett. **115**, 098001 (2015) [5pages]

4. Nikolai Brilliantov, P.L. Krapivsky, Anna Bodrova, Frank Spahn, Hisao Hayakawa, Vladimir Stadnichuk, and Jürgen Schmidt, "Size distribution of particles in Saturn's rings from aggregation and fragmentation", Proceedings of National Academy of Sciences of the United States of America, vol.**112**, 9536-9541 (2015) [6pages]

5. Kuniyasu Saitoh, Satoshi Takada and Hisao Hayakawa, "Hydrodynamic instabilities in shear flows of dry cohesive granular particles", Soft Matter **11**, 6371-6385 (2015).

6. Kiyoshi Kanazawa, Tomohiko G. Sano, Takahiro Sagawa, and Hisao Hayakawa, "Asymptotic derivation of Langevin-like equation with non-Gaussian noise and its analytical solution ", J. Stat. Phys. Vol. **160**, ,1294-1335 (2015).

Talks at International Conferences

1. Hisao Hayakawa, "Non-Gaussian noise and its applications (invited)" in Nonlinear Dynamics of Many Body Systems, Buffalo, NY, USA (2016, April 1-3) .

2. Hisao Hayakawa, "Divergence of viscosity in jammed granular materials: a theoretical approach (invited, plenary)” in Plasticity 2016, Hawaii, USA (2016 January 3-9) .

3. Hisao Hayakawa, "Divergence of viscosity in jammed granular materials: a theoretical approach (invited)” , in East Asia Joint Seminar on Statistical Physics 2015, KIAS in Seoul, Korea (2015, October 14-17).

4. Hisao Hayakawa, "Avalanches and their contribution for sheared granular flows (invited)", in Particles 2015 (Sep.28-30) at Barcelona, Spain

5. Hisao Hayakawa, "Theory of dense granular flows for divergence of the viscosity (invited)", in New Frontiers in Non-equilibrium Physics of Glassy Materials, Japan-France Joint Seminar at YITP, Kyoto Univ., Kyoto (2015, August 11-14)

6. Hisao Hayakawa, "Drag of a tracer disk in granular media(invited) ” in EMI2015 at Stanford University, CA, USA (2015, June 17-19).

Invited Seminars (Overseas)

1. Hisao Hayakawa, "Divergence of viscosity in jammed granular materials: a theoretical approach”, at University of Extremadura, Spain, September 25, 2015.

2. Lecture on “Granular Gases, Jamming Transition, and Jammed Solids (3 days lecture)" at Shanghai Jiao Tong University, March 30-April 2, 2015.

Invited Seminars (in Japan)

1. Hisao Hayakawa, “ The minimum model of a tracer particle activated by non-Gaussian

noise and its application: How can we understand non-Gaussianity?",
at Department of Physics, Kyushu University (June 26, 2015).

2. Hisao Hayakawa,"Divergence of viscosity in dense sheared granular materials: A description from non-equilibrium statistical mechanics",
at Department of Physics, University of Tokyo (June 11, 2015).

Tetsuo Hyodo

Journal Papers

1. T. Sekihara, T. Hyodo and D. Jido,
"Comprehensive analysis of the wave function of a hadronic resonance and its compositeness,"
Prog. Theor. Exp. Phys. **2015** (2015) 063D04 (32 pages), arXiv:1411.2308 [hep-ph], YITP-14-88.

2. K. Miyahara and T. Hyodo,
"Structure of $\Lambda(1405)$ and construction of $\bar{K}N$ local potential based on chiral SU(3) dynamics,"
Phys. Rev. **C93** (2016) 015201 (14 pages), arXiv:1506.05724 [nucl-th], YITP-15-53.

3. K. Miyahara, T. Hyodo and E. Oset,
"Weak decay of Λ_c^+ for the study of $\Lambda(1405)$ and $\Lambda(1670)$,"
Phys. Rev. **C92** (2015) 055204 (8 pages), arXiv:1508.04882 [nucl-th], YITP-15-71.

4. Y. Kamiya and T. Hyodo,
"Structure of near-threshold quasi-bound states,"
Phys. Rev. **C93** (2016) 035203 (6 pages), arXiv:1509.00146 [hep-ph], YITP-15-76.

5. S. Ohnishi, Y. Ikeda, T. Hyodo and W. Weise,
"Structure of the $\Lambda(1405)$ and the $K^- d \to \pi\Sigma n$ reaction,"
Phys. Rev. **C93** (2016) 025207 (12 pages), arXiv:1512.00123 [nucl-th], YITP-15-112.

6. E. Oset, W.-H. Liang, M. Bayar, J.-J. Xie, L.R. Dai, M. Albaladejo, M. Nielsen, T. Sekihara, F. Navarra, L. Roca, M. Mai, J. Nieves, J.M. Dias, A. Feijoo, V.K. Magas, A. Ramos, K. Miyahara, T. Hyodo, D. Jido, M. Doering, R. Molina, H.-X. Chen, E. Wang, L. Geng, N. Ikeno, P. Fernandez-Soler, Z. F. Sun,
"Weak decays of heavy hadrons into dynamically generated resonances,"
Int. J. Mod. Phys. **E25** (2016) 1630001 (105 pages), arXiv:1601.03972 [hep-ph], YITP-16-7.

Books and Proceedings

1. E. Oset, M. Bayar, A. Dote, T. Hyodo, P.K. Khemchandani, W.-H. Liang, P.K. Khemchandani, A. Martinez Torres, M. Oka, L. Roca, T. Uchino, C.W. Xiao,
"Two, three, many body systems involving mesons. Multimeson condensates,"
Acta Phys. Polon. **B47** (2016) 357 (9 pages), arXiv:1510.05547 [hep-ph].

Talks at International Conferences

1. "What we know about the $\Lambda(1405)$," Invited, Plenary,
in "XVI International Conference on Hadron Spectroscopy (Hadron 2015)," Newport News, Virginia, USA,
September 2015.

2. "Recent studies of $\Lambda(1405)$," Invited,
in "Frontiers in hadron and nuclear physics with strangeness and charm," ECT*, Trento, Italy,
October 2015.

3. "Compositeness of hadrons from effective field theory," Invited,
in "critical stability in Few-body system," RIKEN, Wako, Japan,
October 2015.

Invited Seminars (Overseas)

1. "Current status of $\Lambda(1405)$ and its structure,"
Technische Universität München, Germany, October 2015.

Naoyuki Itagaki

Journal Papers

1. Y. Iwata, T. Ichikawa, N. Itagaki, J.A. Maruhn, and T. Otsuka, "Examination of the stability of a rod-shaped structure in ^{24}Mg, "
Phys. Rev. C **92**, (2015) 011303(R) (5 pages).

2. P.W. Zhao, N. Itagaki, and J. Meng, "Rod-shaped carbon isotopes at extreme spin and isopin "
Phys. Rev. Lett. **115**, (2015) 022501 (6 pages).

Talks at International Conferences

1. "Exotic cluster structure in light nuclei," Invited,
   in "Nuclear structure and dynamics III," Portoroz, Slovenia,
   June 2015.

2. "Cluster structure of nuclei," Invited (lecturer),
   in "14th CNS international summer school", Center for Nuclear Study, University of Tokyo, Wako, Japan,
   August 2015.

Hiroshi Kunitomo

Journal Papers

1. H. Kunitomo,
   "Symmetries and Feynman rules for the Ramond sector in heterotic string field theory,"
   Prog. Theor. Exp. Phys. **2015** (2015) 093B02, YITP-15-56, arXiv:1506.08926 [hep-th].

2. H. Kunitomo and Y. Okawa,
   "Complete action for open superstring field theory,"
   Prog. Theor. Exp. Phys. **2016** (2016) 023B01, YITP-15-65, arXiv:1508.00366 [hep-th].

Talks at International Conferences

1. "Symmetries and Feynman rules for Ramond sector in WZW-type superstring field theory",
   in "String Field Theory and related Aspects VII," Sichuan U., Cheng-Du, China, May 2015.

Talks at Domestic Conferences

1. "Recent developments in construction of superstring field thoery II,"
   in " String Field Theory '16," Tokyo, Japan, February 2016 (in Japanese).

Invited Seminars (in Japan)

1. "Complete action of open superstring field theory"
   Dept. of Phys., The University of Tokyo, November 2015 (in Japanese).

2. "Complete action of open superstring field theory"
   Dept. of Phys., Ibaraki University, December 2015 (in Japanese).

Shinji Mukohyama

Journal Papers

1. A. De Felice, A. E. Gumrukcuoglu, L. Heisenberg and S. Mukohyama, "Matter coupling in partially constrained vielbein formulation of massive gravity," JCAP **1601**, 003 (2016) doi:10.1088/1475-7516/2016/01/003

2. G. Domenech, S. Mukohyama, R. Namba, A. Naruko, R. Saitou and Y. Watanabe, "Derivative-dependent metric transformation and physical degrees of freedom," Phys. Rev. D **92**, no. 8, 084027 (2015) doi:10.1103/PhysRevD.92.084027

3. A. De Felice and S. Mukohyama, "Minimal theory of massive gravity," Phys. Lett. B **752**, 302 (2016) doi:10.1016/j.physletb.2015.11.050

4. S. Mukohyama, R. Namba, R. Saitou and Y. Watanabe, "Hamiltonian analysis of nonprojectable Hořava-Lifshitz gravity with $U(1)$ symmetry," Phys. Rev. D **92**, no. 2, 024005 (2015) doi:10.1103/PhysRevD.92.024005

5. A. E. Gumrukcuoglu, L. Heisenberg, S. Mukohyama and N. Tanahashi, "Cosmology in bimetric theory with an effective composite coupling to matter," JCAP **1504**, no. 04, 008 (2015) doi:10.1088/1475-7516/2015/04/008

Talks at International Conferences

1. "Ghost Condensation and Horizon Entropy", Invited,
   in "Hot topics in Modern Cosmology", Cargese, France
   May 2016.

2. "Minimal Theory of Massive gravity", Invited,
   in "Hot topics in Modern Cosmology", Cargese, France
   May 2016.

3. “Massive gravity and cosmology”, Invited, in KICP workshop “Exploring theories of modified gravity”, University of Chicago October 2015.

4. “Massive gravity and cosmology”, Invited, in workshop “Gravity at all scales”, University of Nottingham
August 2015.

5. “Massive gravity and cosmology”, Invited, in “2nd APCTP-TUS workshop”, Tokyo University of Science
August 2015.

6. “Massive gravity and cosmology”, Invited, in Chinese Annual Meeting of Gravitation and Relativistic Astrophysics Society, Hangzhou, China
June 2015.

7. “Ghost Condensation and generalized second law”, Invited,
in YITP workshop “Black Hole Information Loss Paradox”, Yukawa Institute for Theoretical Physics,
May 2015.

Invited Seminars (Overseas)

1. “Massive gravity and cosmology,”
LPT, Orsay, France, December 2015.

2. “Massive gravity and cosmology,”
KIT, Karlsruhe, Germany, November 2015.

3. “Massive gravity and cosmology,”
SNS, Pisa, Italy, November 2015.

4. “Massive gravity and cosmology,”
SISSA, Trieste, Italy, November 2015.

5. “Massive gravity and cosmology,”
University of Tours, France, October 2015.

6. “Massive gravity and cosmology,”
University of Oslo, Norway, September 2015.

7. “Massive gravity and cosmology,”
University of the Basque Country, Bilbao, Spain, September 2015.

Invited Seminars (in Japan)

1. “Status of Ghost Condensation”
Keio University, March 2016 (QCD club).

2. “Massive gravity and cosmology”
Osaka City University, June 2015.

Supervisor of Translation

1. “Dark Matter and the Dinosaurs”, Lisa Randall (Author), S. Mukohyama (Supervisor of translation), M. Shiobara (Translator), NHK publication (2016/3/25), ISBN-10:4140816953.

Masatoshi Murase

Journal Papers

1. M. Murase,
“Introduction to New Integrated Creative Studies” (DOI: 10.14989/ 199810) 2015-001-a, Journal of Integrated Creative Studies (ISSN: 2424-0370).

2. M. Murase,
“Life and Totality” Kazetabi, 113-116(2015).

3. M. Murase and T. Murase,
“Synchronization of Arts and Sciences: The Essence of Mind and Problem of Education”
Journal of Quality Education Vol.7, 1-28, 2015.

4. M. Murase,
“Complesity and Evolution of Sciences" Kura Report http://research.kyoto-u.ac.jp/service/topic/spirits/lists/h25list_j/prits_h25ja_65_murase/.

5. M. Murase,
“Complesity and Future Studies" Kyoto University, Spirits Report 08-14, 2015.

Talks at International Conferences

1. M. Murase,
"Astonishingly Interesting World of Science and Education –Knowing How We Know–" International Symposium on Gsee/Kyoto 2016 at Yukawa Institute for Theoretical Physics, Kyoto University on February 11, 2016

2. M. Murase,
"Introduction to Advanced Future Studies" International Symposium on Advanced Future Studies held at Yukawa Institute for

Theoretical Physics, Kyoto University on February 12, 2016

3. M. Murase,
"Perspectives of Advanced Future Studies" International Symposium on Advanced Future Studies held at Coop-Inn Kyoto on March 14, 2016

Organizer of International Conferences

1. M. Murase,
IInternational Workshop on"Life and Matter and Society: Emergent Behavior Beyond Expectations" at Kyoto University Seminar House on May 26, 2015

2. M. Murase, with K. Nishimura and S. Ohno,
International Symposium on Gsee/Kyoto 2016 at Yukawa Institute for Theoretical Physics, Kyoto University on February 11, 2016

3. M. Murase,
International Symposium on Gsee/Kyoto 2016 at Yukawa Institute for Theoretical Physics, Kyoto University on February 11, 2016

4. M. Murase,
International Symposium Advanced Future Studies on February 11, 2016 held at Coop-Inn Kyoto on March 14, 2016

Organizer of Interdisciplinary Conferences

1. M. Murase,
The interdisciplinary workshops on Advanced Future Studies at Coop-Inn Kyoto on August 6, 2015.

2. M. Murase,
The interdisciplinary workshops on Complex Systems Sciencews at Coop-Inn Kyoto on August 7, 2015.

3. M. Murase, with K. Yoshimura, T. Yagi,
The Kyoto Forum on "Science and Future Studies" at Imamiya on February 27, 2015.

Invited and Public Lectures (in Japan)

1. M. Murase, "Integrated Life Science and Medicine,"
Mie University, Graduate School of Medicine, July 4, 2015.

2. M. Murase, "Life Science and Biolgocal Physics"
Kyoto University Lectures, Kyoto University, April-July, 2015.

3. M. Murase, "Structuralism and Living Systems,"
Yukawa Institute for Theoretical Physics, Kyoto University, April-July, 2015.

4. M. Murase, "Future Studies on the basis of Systemic View Points,"
Hotel Kyoto, June 4, 2015.

5. M. Murase, "Resilience and Future Studies"
Kitazato University, June 7, 2015.

6. M. Murase, "Astonishing World of Education"
Doshisha University, August 8, 2015.

7. M. Murase, "Physics on Complexity and Living Systems"
Rtsumeikan University, Sep.8-10, 2015.

8. M. Murase, "Structuralism and biophysics"
Yukawa Institute for Theoretical Physics, Kyoto University, October. 2, 2015.

9. M. Murase, "Biophysics and Applications"
Yukawa Institute for Theoretical Physics, Kyoto University, October 15, 2015.

10. M. Murase, "Emvoronment and Life, No.1"
Uji Research Center, Uji City, October 1, 2015.

11. M. Murase, "Emvoronment and Life, No.2"
Uji Research Center, Uji City, October 8, 2015.

12. M. Murase, "Emvoronment and Life, No.3"
Uji Research Center, Uji City, October 15, 2015.

13. M. Murase, "Introduction to Advanced Future Studies"
Graduate School of Shishu-kan, Kyoto University, November 21, 2015.

14. M. Murase, "Introduction to Advanced Education Studies"
Yukawa Institute for Theoretical Physics, Kyoto University, December. 2, 2015.

Akira Ohnishi

Journal Papers

1. Shoichiro Tsutsui, Hideaki Iida, Teiji Kunihiro, Akira Ohnishi, "Parametric Instability of Classical Yang-Mills Fields under Color Magnetic Background", Phys. Rev. D **91** (2015), 076003 [14 pages], YITP-14-89, arXiv:1411.3809 [hep-ph].

2. Hidekazu Tsukiji, Hideaki Iida, Teiji Kunihiro, Akira Ohnishi, Toru T. Takahashi, "Entropy production in quantum Yang-Mills mechanics in semi-classical approximation", Prog. Theor. Exp. Phys. **2015** (2015), 083A01 [16 pages], YITP-15-42, arXiv:1505.04698 [hep-ph].

3. Kouji Kashiwa, Akira Ohnishi, "Topological feature and phase structure of QCD at complex chemical potential", Phys. Lett. B **750** (2015), pp 282-286, YITP-15-45, arXiv:1505.06799 [hep-ph].

4. Terukazu Ichihara, Kenji Morita, Akira Ohnishi, "Net-baryon number fluctuations across the chiral phase transition at finite density in strong coupling lattice QCD", Prog. Theor. Exp. Phys. **2015** (2015), 113D01 [16 pages], YITP-15-58, arXiv:1507.04527 [hep-lat].

Books and Proceedings

1. Kenji Morita, Takenori Furumoto, Akira Ohnishi, "Lambda-Lambda Correlation in Relativistic Heavy Ion Collisions", EPJ Web Conf. **97** (2015), 00020 [8 pages].

2. Akira Ohnishi, "Approaches to QCD phase diagram; effective models, strong coupling lattice QCD, and compact stars (Lecture note)", J. Phys: Conf. Ser. **668** (2016), 012004 [12 pages], YITP-15-127, arXiv:1512.08468 [nucl-th].

Talks at International Conferences

1. "Approaches to QCD phase diagram; effective models, strong coupling lattice QCD, and compact stars", Invited, in Dense Matter 2015 & Strangeness in Quark Matter, Dubna, Russia, June-July 2015.

2. "Preweighting method in Monte-Carlo sampling with complex action — Strong-Coupling Lattice QCD with $1/g^2$ correction, as an examle —, in Lattice 2015 (The 33rd International Symposium on Lattice Field Theory), Kobe, Japan, July 2015.

3. A. Ohnishi, K. Morita, T. Furumoto "Lambda-Lambda interaction from two-particle intensity correlation in relativistic heavy-ion collisions", Invited, in HYP2015 (The 12th International Conference on Hypernuclear and Strange Particle Physics), Sendai, Japan, September 2015.

4. "Lambda-Lambda interaction from two-particle intensity correlation in relativistic heavy-ion collisions", in Molecule-type workshop on "Selected topics in the physics of the Quark-Gluon Plasma and Ultra-relativistic Heavy Ion Collisions", Kyoto, Japan, September 2015.

5. "Theoretical Overview — Nuclear and Hadron Physics ", Invited, in HINT2015 (International Workshop on future potential of high intensity proton accelerator for particle and nuclear physics), Tokai, Japan, October 2015.

6. "Strong-Coupling Lattice QCD with fluctuation and plaquette effects", QUCS2015 (Symposium on "Quarks to Universe in Computational Science"), Nara, Japan, November 2015.

7. "Collapse of directed flow as a signal of the softest point of QCD matter", in YITP and IOPP Joint workshop on Heavy Ion Physics, Wuhan, China, February 2016.

8. "Hadron-Hadron Correlation and Interaction from Heavy-Ion Collisions (and Summary)", in ExHIC2016 (Molecule-type workshop on "Exotic hadrons from high energy collisions") Kyoto, Japan, March 2016.

Invited Seminars (in Japan)

1. "Neutron Stars and Hypernuclei", JAEA-ASRC-TPI Theory Lecture Series, Tokai, Japan, June 2015.

2. "Introduction to Neutron Star Physics", YONUPA Summer School, Gamagori, Japan, August 2015.

Misao Sasaki

Journal Papers

1. Y. l. Zhang, K. Koyama, M. Sasaki and G. B. Zhao, "Acausality in Nonlocal Gravity Theory," JHEP **1603**, 039 (2016) doi:10.1007/JHEP03(2016)039 [arXiv:1601.03808 [hep-th]].

2. K. Yamamoto, V. Marra, V. Mukhanov and M. Sasaki, "Perturbed Newtonian description of the Lemaître model with non-negligible pressure," JCAP **1603**, no. 03, 030 (2016) doi:10.1088/1475-7516/2016/03/030 [arXiv:1512.04240 [gr-qc]].

3. G. Domenech, A. Naruko and M. Sasaki, "Cosmological disformal invariance," JCAP **1510**, no. 10, 067 (2015) doi:10.1088/1475-7516/2015/10/067 [arXiv:1505.00174 [gr-qc]].

4. C. Lin and M. Sasaki, "Resonant Primordial Gravitational Waves Amplification," Phys. Lett. B **752**, 84 (2016) doi:10.1016/j.physletb.2015.11.021 [arXiv:1504.01373 [astro-ph.CO]].

5. Y. Watanabe, A. Naruko and M. Sasaki, "Multi-disformal invariance of non-linear primordial perturbations," Europhys. Lett. **111**, 39002 (2015) doi:10.1209/0295-5075/111/39002 [arXiv:1504.00672 [gr-qc]].

6. J. O. Gong and M. Sasaki, "A new parameter in attractor single-field inflation," Phys. Lett. B **747**, 390 (2015) doi:10.1016/j.physletb.2015.06.023 [arXiv:1502.04167 [astro-ph.CO]].

7. G. Domenech and M. Sasaki, "Conformal Frame Dependence of Inflation," JCAP **1504**, no. 04, 022 (2015) doi:10.1088/1475-7516/2015/04/022 [arXiv:1501.07699 [gr-qc]].

8. D. Bertacca, N. Bartolo, M. Bruni, K. Koyama, R. Maartens, S. Matarrese, M. Sasaki and D. Wands, "Galaxy bias and gauges at second order in General Relativity," Class. Quant. Grav. **32**, no. 17, 175019 (2015) doi:10.1088/0264-9381/32/17/175019 [arXiv:1501.03163 [astro-ph.CO]].

Talks at International Conferences

1. "Reviving open inflation," Invited, in "The International Conference on Gravitation and Cosmology/The Fourth Galileo-Xu Guangqi Meeting", 4 May, 2015, KITCP, Beijing, China

2. "General Relativity and Cosmology (I)(II)", Invited Lectures, in "11th Particle Physics Phenomenology Workshop (PPP11) ", 13-14 May, 2015, Taipei, Taiwan

3. "Inflation and Alternatives," Discussion Leader, in "Gordon Research Conference: String Theory & Cosmology", 1 June, 2015, HKUST, Hongkong

4. "Conformal frames in gravity: frame dependence vs observational equivalence", Plenary, in "2015 Annual Meeting of the Chinese Physical Society, Division of Gravitation and Relativistic Astrophysics," 24 June, 2015, Hangzhou, China

5. "Conformal frames in gravity: frame dependence vs observational equivalence", Invited, in "Windows on Quantum Gravity: Season 2," 30 October, 2015, Instituto de Fsica Teorica UAM-CSIC, Madrid, Spain

6. "Conformal Frames in Cosmology: - frame dependence vs observational equivalence - ", Plenary, in "Second LeCosPA International Symposium: Everything About Gravity," 16 December, 2015, LeCosPA, Taipei, Taiwan

7. "General relativity in Japan - a historical perspective -", Invited, in "International Conference on General Relativity: Centennial Overviews and Future Perspectives," 23 December, 2015, Ewha Womans University, Seoul, Korea

8. "Gravitational Wave Astronomy -The Dawn has Arrived!-", Invited, in "APCTP Symposium on Current Trends in Physics," 25 March, 2016, POSTECH, Pohang, Korea

Invited Seminars (Overseas)

1. “Conformal Frames in Cosmology,” 23 October, 2015, University of Basque Country, Bilbao, Spain

2. “Cosmic inflation and its predictions,” [APCTP Colloquium] 7 January, 2016, APCTP, Pohang, Korea

3. “Inflationary Universe and Beyond,” 29 January, 2016, Hanoi National University of Education, Hanoi, Vietnam

4. “Inflationary Magnetogenesis with Broken Local U(1) Symmetry,” 29 February, 2016, ASCTP, Munich, Germany

Naoki Sasakura

Journal Papers

1. N. Sasakura and Y. Sato,
“Renormalization procedure for random tensor networks and the canonical tensor model,”
PTEP **2015**, no. 4, 043B09 (2015), YITP-15-3, arXiv:1501.05078 [hep-th].

2. N. Sasakura and Y. Sato,
“Constraint algebra of general relativity from a formal continuum limit of canonical tensor model,”
JHEP **1510**, 109 (2015), YITP-15-52, arXiv:1506.04872 [hep-th].

3. G. Narain and N. Sasakura,
“An OSp extension of the canonical tensor model,”
PTEP **2015**, no. 12, 123A05 (2015), YITP-15-75, arXiv:1509.01432 [hep-th].

4. H. Chen, N. Sasakura and Y. Sato,
“Emergent classical geometries on boundaries of randomly connected tensor networks,”
Phys. Rev. D **93**, no. 6, 064071 (2016), YITP-16-2, arXiv:1601.04232 [hep-th].

Talks at International Conferences

1. “Continuum limit of canonical tensor model and general relativity,”
in “Loops’15,” Erlangen, Germany,
July 2015.

Invited Seminars (Overseas)

1. “Tensor model in canonical formalism, and its relation to general relativity and randomly connected tensor network,"
AEI, Max-Planck Institute, Potsdam, Germany, July 2015.

2. “Emergent classical geometries on boundaries of randomly connected tensor networks,”
Chulalongkorn Univ., Bangkok, Thailand, February 2016.

Invited Seminars (in Japan)

1. “Formal continuum limits in canonical tensor model and general relativity,”
in “Dynamics of fields and spacetime with discrete methods,"
Okayama, September 2015 (in Japanese).

Masatoshi Sato

Journal Papers

1. Y. Tsutsumi, T. Kawakami, K. Shiozaki, M. Sato, and K. Machida,
“Symmetry-protected vortex bound state in superfluid ^{3}He-B phase,”
Phys. Rev. B **91**, (2015) 144504 (12 pages).

2. K. Shiozaki, M. Sato, and K. Gomi,
“Z_2 topology in nonsymmorphic crystalline insulators: Möbius twist in surface states”,
Phys. Rev. B **91**, (2015) 155120 (9 pages).

3. C. S. Amorim, K. Ebihara, A. Yamakage, Y. Tanaka, and M. Sato,
“Majorana braiding dynamics in nanowires”,
Phys. Rev. B **91**, (2015) 174305 (8 pages).

4. S. Kobayashi, and M. Sato,
“Topological Superconductivity in Dirac Semimetals”,
Phys. Rev. Lett. **115**, (2015) 187001 (5 pages).

5. T. Hashimoto, K. Yada, M. Sato, and Y. Tanaka, “Surface electronic state of superconducting topological crystalline insulator”,
Phys. Rev. B **92**, (2015) 174527 (8 pages).

6. S. Kobayashi, Y. Tanaka, and M. Sato,
"Fragile surface zero-energy flat bands in three-dimensional chiral superconductors",
Phys. Rev. B **92**, (2015) 214514 (10 pages).

7. T. Mizushima, Y. Tsutsumi, T. Kawakami, M. Sato, M. Ichioka, and K. Machida,
"Symmetry-Protected Topological Superfluids and Superconductors –From the Basics to 3He–",
J. Phys. Soc. Jpn. 85, (2016) 022001 (74 pages).

Talks at International Conferences

1. "Z_2 Topology in Nonsymmorphic Crystalline Insulators: Mobius Twist in Surface State", Invited,
in "EMN Qingdao Meeitng 2015", Qingdao, China,
June 2015.

2. "Topological Superconductivity in Topological Materials", Invited,
in "Summer Workshop on Semiconductor Quauntum Effects and Quantum Information", Nasu, Japan,
September 2015.

3. "Topology of Crystalline Insulators and Superconductors", Invited,
in "IAS Program and Croucher Conference on Topological Phases in Condensed Matter and Cold Atomic Systems", HKUST, Hong-Kong, China,
December 2015.

4. "Exotic Surface States in Topological Crystalline Materials", Invited,
in "Topological Phenomena in Novel Quantum Matter: Laboratory Realization of Relativisitic Fermions and Spin Liquid", MPI, Dresden, Germany,
March 2016.

5. "Topology of Crystalline Insulators and Superconductors", Invited,
in "Nathan Seiberg Symposium", IPMU, Kashiwa, Chiba, Japan,
March 2016.

Invited Seminars (in Japan)

1. "Topological Quantum Phenomena and Gauge Theories",
Dept. of Phys., Osaka Univ., June 2015.

2. "Topological Insulators and Superconductors",
KMI, Nagoya Univ., December 2015 (in Japanese).

3. "Symmetry and Topology in Insulators and Superconductors",
Dept. of Phys., Kindai Univ., February 2016 (in Japanese).

Masaru Shibata

Journal Papers

1. K. Kawaguchi, K. Kyutoku, H. Nakano, H. Okawa, M. Shibata, and K. Taniguchi,
"Black hole-neutron star binary merger: dependence on black hole spin orientation and equation of state",
Phys. Rev. D **92** (2015) 024014.

2. K. Kyutoku, K. Ioka, H. Okawa, M. Shibata, and K. Taniguchi,
"Dynamical mass ejection from black hole-neutron star binaries",
Phys. Rev. D **92** (2015) 044028.

3. K. Kiuchi, Y. Sekiguchi, K. Kyutoku, M. Shibata, K. Taniguchi, and T. Wada,
"High-resolution magnetohydrodynamics simulations for black hole-neutron star merger: Mass ejction and short gamma-ray burst",
Phys. Rev. D **92** (2015) 064034.

4. F. Pannarale, E. Berti, K. Kyutoku, B. Lackey and M. Shibata,
"Gravitational-wave cutoff frequencies of tidally disruptive neutron star-black hole binary mergers",
Phys. Rev. D **92** (2015) 081504(R).

5. F. Pannarale, E. Berti, K. Kyutoku, B. Lackey and M. Shibata,
"Aligned spin neutron star-black hole mergers: a gravitational waveform amplitude model",
Phys. Rev. D **92** (2015) 084050.

6. K. Kiuchi, P. Cerda-Duran, K. Kyutoku, Y. Sekiguchi, and M. Shibata,

"Efficient magnetic-field amplification due to the Kelvin-Helmholtz instability in binary neutron star mergers",
Phys. Rev. D **92** (2015) 124034.

7. M. Shibata, H. Uchida, and Y. Sekiguchi,
"Stability of rigidly rotating supermassive stars against gravitational collapse",
Astrophys. J. **818** (2016) 157.

8. K. Hotokezaka, K. Kyutoku, Y. Sekiguchi, and M. Shibata,
"Measurability of the tidal deformability by gravitational waves from coalescing binary neutron stars",
Phys. Rev. D **93** (2016) 064082.

Books

1. M. Shibata, "Numerical Relativity" (World Scientific, January 2016, 844 pages)

Talks at International Conferences

1. "Gravitational waves and dynamical mass ejection from binary neutron star merger" in "Workshop on binary neutron star mergers", Thessaloniki, Greece, May 28, 2015. (invited)

2. "Perspective of numerical relativity in Frontiers of Relativistic Astrophysics" in "General Relativity and Gravitation: A Centennial Perspective", Penn State, USA, June 11, 2015. (invited)

3. "Merger of neutron-star binaries: gravitational waves and electromagnetic counterparts" in "11th Amaldi conference on gravitational waves", Gwangju, Korea, June 26, 2015. (invited plenary)

4. "Mass ejection from binary neutron star mergers", in a parallel session of MG14, Roma, Italy July 16, 2015.

5. "Setting the stage: Status and issues of neutron-star binary merger in numerical relativity" in "MICRA2015", Stockholm, Sweden, August 20, 2015. (invited)

6. "Neutron star mergers, high density EoS, and gravitational waves" in "Quark Matter 2015", Kobe, Japan, Oct. 3, 2015. (invited plenary)

7. "Merger of binary neutron stars: mass ejection" in a parallel session of 28th Texas Symposium, Geneva, Switzerland, Dec. 16, 2015.

Invited Seminars (Overseas)

1. "Binary Neutron Star Merger and Numerical Relativity",
at Nordita, Stockholm, Sweden Aug. 20 (2015).

Invited Seminars (in Japan)

1. "Binary neutron star mergers",
in Nambu Seminar of Osaka University, Apr. 30 (2015).

2. "Binary neutron star merger and gravitational waves",
at Maskawa Jyuku, Kyoto Sangyo University, Nov. 30 (2015).

Shigeki Sugimoto

Talks at International Conferences

1. "Holographic study of 3d YM-CS theory with defects," Invited,
in "eNLarge Horizons," IFT, Madrid, Spain, June 2015.

2. "Holographic study of 3d YM-CS theory with defects," Invited,
KIAS-YITP joint workshop 2015 "Geometry in Gauge Theories and String Theory," KIAS, Seoul, Korea,
September 2015.

3. "On meson spectrum and equation of state in holographic QCD," Invited,
"Application of AdS/CFT to QCD and condensed matter physics," CRM, Montreal, Canada,
October 2015.

4. "Holographic QCD," Invited,
Collouium talk at the workshop "Application of AdS/CFT to QCD and condensed matter physics," CRM, Montreal, Canada,
October 2015.

5. "Holographic study of 3d YM-CS theory with defects," Invited,
"Tuscan Meeting on Theoretical Physics," Pisa University, Pisa, Italy,
February 2016.

Invited Seminars (in Japan)

1. "Holographic QCD," talk at Kansai seminar 2015, YITP, Kyoto Univ., July 2015 (in Japanese).

2. "Strings and elementary particles," Collouium talk at Dept. of Phys., Tohoku Univ., November 2015 (in Japanese).

3. "Miracles of string theory," public talk at "Physics and Universe," Kyoto Univ., November 2015 (in Japanese).

4. "On supersymmetry breaking in string theory," talk at string theory meeting, KEK, March 2016 (in Japanese).

5. "Introduction to holographic QCD," intensive lecture series at Dept. of Phys., Kyoto Univ., March 2016 (in Japanese).

Yudai Suwa

Journal Papers

1. D. Nakauchi, K. Kashiyama, H. Nagakura, Y. Suwa, and T. Nakamura, "Optical Synchrotron Precursors of Radio Hypernovae", ApJ 805 (2015) 164, arXiv:1411.1603 [astro-ph.HE]

2. Y. Suwa and N. Tominaga, "How much can ^{56}Ni be synthesized by the magnetar model for long gamma-ray bursts and hypernovae?",
MNRAS 451 (2015) 282, arXiv:1408.3116 [astro-ph.HE], YITP-14-65

3. T. Yokozawa, M. Asano, T. Kayano, Y. Suwa, N. Kanda, Y. Koshio, and M. R. Vagins, "Probing the Rotation of Core-collapse Supernova with a Concurrent Analysis of Gravitational Waves and Neutrinos",
ApJ 811 (2015) 86, arXiv:1410.2050 [astro-ph.HE], YITP-14-80

4. Y. Suwa, T. Yoshida, M. Shibata, H. Umeda, and K. Takahashi, "Neutrino-driven explosions of ultra-stripped Type Ic supernovae generating binary neutron stars",
MNRAS 454 (2015) 3073, arXiv:1506.08827 [astro-ph.HE], YITP-15-55

5. Y. Suwa, S. Yamada, T. Takiwaki, and K. Kotake, "The Criterion of Supernova Explosion Revisited: The Mass Accretion History",
ApJ 816 (2016) 43, arXiv:1406.6414 [astro-ph.HE], YITP-14-51

Talks at International Conferences

1. "Progenitors, Supernovae, and Neutron Stars,"
in "F.O.E. Fifty-One Erg," North Carolina State University, Raleigh, USA,
June 2015.

2. "Neutrino-driven explosions of ultra-stripped type Ic supernovae generating binary neutron stars,"
in "Fourteenth Marcel Grossmann Meeting," University of Rome "La Sapienza", Rome, Italy,
July 2015.

3. "On ^{56}Ni synthesis by the magnetar model for long gamma-ray bursts and hypernovae,"
in "Fourteenth Marcel Grossmann Meeting," University of Rome "La Sapienza", Rome, Italy,
July 2015.

4. "Neutrino acceleration: analogy with Fermi acceleration and Comptonization,"
in "MICRA 2015," Stockholm University, Stockholm, Sweden,
August 2015.

5. "From supernovae through protoneutron stars to neutron stars,"
in "The many faces of neutron stars," MIAPP, Gerching, Germany,
August 2015.

6. "From supernovae to neutron stars," invited,
in "Fifth International Conference on Nuclear Fragmentation," Kemer, Antalya, Turkey
October 2015.

7. "Neutrino-driven Explosions of Ultra-stripped Type Ic SNe,"
in "eighth BONN workshop," University of Bonn, Bonn, Germany
November 2015.

8. "From supernovae to neutron stars,"
   in "18th Workshop on Nuclear Astrophysics," Ringberg Castle, Munich, Germany
   March 2016.

Invited Seminars (Overseas)

1. "From supernovae to neutron stars,"
   Technische Universität Darmstadt, Germany, October 2015.

2. "From supernovae to neutron stars,"
   University of Bonn, Germany, December 2015.

3. "Neutrino acceleration: analogy with Fermi acceleration and Comptonization,"
   University of Amsterdam, Netherlands, January 2016.

4. "From supernovae to neutron stars,"
   University of Wroclaw, Poland, February 2016.

Fumihiro Takayama

Journal Papers

1. T. Kobayashi, Y.Omura, F.Takayama and D. Yasuhara, "Study of lepton flavor violation in flavor symmetric models for lepton sector," JHEP **1510** (2015) 042 arXiv:1505.07636 [hep-ph], YITP-15-43.

Tadashi Takayanagi

Journal Papers

1. J. Bhattacharya, V. E. Hubeny, M. Rangamani and T. Takayanagi, "Entanglement density and gravitational thermodynamics," Phys. Rev. D **91** (2015) no.10, 106009 [arXiv:1412.5472 [hep-th]].

2. S. He, T. Numasawa, T. Takayanagi and K. Watanabe, "Notes on Entanglement Entropy in String Theory," JHEP **1505** (2015) 106 [arXiv:1412.5606 [hep-th]].

3. M. Miyaji, S. Ryu, T. Takayanagi and X. Wen, "Boundary States as Holographic Duals of Trivial Spacetimes," JHEP **1505** (2015) 152 [arXiv:1412.6226 [hep-th]].

4. M. Miyaji and T. Takayanagi, "Surface/State Correspondence as a Generalized Holography," PTEP **2015** (2015) no.7, 073B03 [arXiv:1503.03542 [hep-th]].

5. P. Caputa, J. Simón, A. Štikonas, T. Takayanagi and K. Watanabe, "Scrambling time from local perturbations of the eternal BTZ black hole," JHEP **1508** (2015) 011 [arXiv:1503.08161 [hep-th]].

6. M. Miyaji, T. Numasawa, N. Shiba, T. Takayanagi and K. Watanabe, "Continuous Multiscale Entanglement Renormalization Ansatz as Holographic Surface-State Correspondence," Phys. Rev. Lett. **115** (2015) no.17, 171602 [arXiv:1506.01353 [hep-th]].

7. M. Miyaji, T. Numasawa, N. Shiba, T. Takayanagi and K. Watanabe, "Distance between Quantum States and Gauge-Gravity Duality," Phys. Rev. Lett. **115** (2015) no.26, 261602 [arXiv:1507.07555 [hep-th]].

8. T. Miyagawa, N. Shiba and T. Takayanagi, "Double-Trace Deformations and Entanglement Entropy in AdS," Fortsch. Phys. **64** (2016) 92 [arXiv:1511.07194 [hep-th]].

Talks at International Conferences

1. "Emergence of Holographic Spacetime from Quantum Entanglement" (Invited), International Workshop on Condensed Matter Physics and AdS/CFT, Kavli-IPMU, Tokyo U., May, 2015

2. "Surface/State Correspondence as a Generalized Holography"(Invited), KITP conference: Closing the entanglement gap: Quantum information, quantum matter, and quantum fields, KITP, UCSB, Santa Barbra, June, 2015.

3. "Gravity Dual of Information Metric" (Invited), workshop:"Numerical approaches to the holographic principle, quantum gravity and cosmology ", YITP , Kyoto, July, 2015.

4. "Gravity Dual of Information Metric" (Invited), Andy Fest "Black Holes, Holography and Strings ", Harvard , USA, July, 2015.

5. “Gravity Dual of Quantum Information Metric” (Invited), workshop:“Quantum Information in Quantum Gravity II ”, Perimeter Institute , Canada, Aug, 2015.

6. “Gravity Dual of Quantum Information Metric”(Invited), KIAS-YITP joint workshop “Geometry in Gauge Theories and String Theory”, KIAS, Seoul, Korea, Sep., 2015.

7. “Entanglement Entropy and Holography” (Invited), Lectures at Ph.D. school in Niels Bohr Institue, Denmark, Oct., 2015.

8. “Information Metric and Holography” (Invited), the 12th Vienna Central European Seminar on Particle Physics and Quantum Field Theory, Viena, Austria, Nov., 2015.

9. “Gravitational Spacetime and Quantum Entanglement” (Invited), KEK-PH 2016, Tsukuba, Feb., 2016.

10. “Holographic Quantum Teleportation” (Invited), Nathan Seiberg Symposium, IPMU, Kashiwa, Mar., 2016.

Atsushi Taruya

Journal Papers

1. Y-S. Song, A. Taruya, A. Oka,
“Cosmology with anisotropic galaxy clustering from the combination of power spectrum and bispectrum,”
JCAP **08** (2015) 007, (19 pages), YITP-15-7, arXiv:1502.03099 [astro-ph].

2. Y-S. Song, A. Taruya, E. Linder, K. Koyama, C. Sabiu, G-B. Zhao, F. Bernardeau, T. Nishimichi, T. Okumura,
“Consistent modified gravity analysis of anisotropic galaxy clustering using BOSS DR11,”
Phys. Rev. D **92** (2015) 043522 (13 pages), arXiv:1507.01592 [astro-ph].

3. T. Namikawa, A. Nishizawa, A. Taruya,
“Anisotropies of Gravitational-Wave Standard Sirens as a New Cosmological Probe without Redshift Information,”
Phys. Rev. Lett. **116** (2016) 121302 (5 pages), YITP-15-81, arXiv:1511.04638 [astro-ph].

Talks at International Conferences

1. “Describing cosmic neutrinos with and without Vlasov equations,”
in international molecule-type workshop on “Vlasov-Poisson: towards numerical methods without particles,” Yukawa Institute for Theoretical Physics, Kyoto University, Kyoto, Japan,
June 2014.

2. “A novel scheme for perturbation theory calculation of large-scale structure,” Plenary,
in MPA/ESO/MPE/Excellence Cluster Universe Joint Conference on “Theoretical and Observational Progress on Large-scale Structure of the Universe,” Headquarters of the European Southern Observatory, Garching, Germany,
July 2015.

3. “Cosmology with large-scale structure of the Universe,” Invited,
in Syposium on “New generation quantum theory -Particle Physics, Cosmology, and Chemistry-,” Faculty of Engineering, Kyoto University, Kyoto, Japan,
March 2016.

Invited Seminars (in Japan)

1. “Perturbation theory approach to large-scale structure formation – success, limitation & beyond –”,
Cosmology group at Kobe University, Kobe, 10th July, 2015

2. “Large-scale structure formation in the Universe: ΛCDM model and beyon”,
Colloquium at Department of Physics, Nagoya University, Nagoya, 30th November, 2015

Seiji Terashima

Journal Papers

1. N. Iizuka, A. Tanaka and S. Terashima,
“Exact Path Integral for 3D Quantum Gravity,”
Phys. Rev. Lett. **115** (2015) no.16, 161304 (5 pages), YITP-15-31,arXiv:1504.05991 [hep-th].

2. S. Terashima,
"A Nonperturbative Proof of Dijkgraaf-Vafa Conjecture,"
JHEP **1603** (2016) 136 (12 pages), YITP-15-77, arXiv:1509.02916 [hep-th].

3. M. Honda, N. Iizuka, A. Tanaka and S. Terashima,
"Exact Path Integral for 3D Quantum Gravity II,"
Phys. Rev. D **93** (2016) no.6, 064014 (5 pages), YITP-15-64, arXiv:1510.02142 [hep-th].

4. T. Nosaka, K. Shimizu and S. Terashima,
"Large N behavior of mass deformed ABJM theory,"
JHEP **1603** (2016) 063 (25 pages), YITP-15-106, arXiv:1512.00249 [hep-th].

Talks at International Conferences

1. "Exact computations in 4D N=1 SUSY gauge thoeries in confining phase," Invited,
in "Mathematical Perspectives in String Theory," Kyoto Univ., Kyoto,
Augusut 2015.

2. "Exact Path Integral for 3D Quantum Gravity," Invited,
in "Geometry in Gauge Theories and String Theory," KIAS, Seoul, Korea,
September 2015.

3. "Exact Path Integral for 3D Quantum Gravity," Invited,
in "KEK Theory Workshop 2015," KEK, Tsukuba,
December 2015.

4. "On M5-branes in ABJM theory," Invited,
in "Recent Developments in M-theory," CERN, Geneva, Switzerland,
February 2016.

Invited Seminars (in Japan)

1. "Ramond-Ramond couplings of D-branes," Dept. of Phys., Nagoya Univ. , April 2015.

2. "On exact results for four dimensional supersymmetric gauge theories in confining phase,"
Dept. of Phys., Shizuoka Univ. , May 2015 (in Japanese).

3. "A Localization Computation in Confining Phase,"
Dept. of Phys., Univ. of Tokyo, May 2015 (in Japanese).

Keisuke Totsuka

Journal Papers

1. T. Ohta, S. Tanaka, I. Danshita, and K. Totsukai,
"Phase Diagram and Sweep Dynamics of a One-Dimensional Generalized Cluster Model," J. Phys. Soc. Jpn. **84** (2015) 063001(1-4), arXiv:1503.03204.

2. S. Takayoshi, K. Totsuka, and A. Tanaka,
"Symmetry-protected topological order in magnetization plateau states of quantum spin chains," Phys. Rev. B **91** (2015) 155136(1-12), arXiv:1412.4029.

3. X. Plat, F. Alet, S. Capponi and K. Totsuka,
"Magnetization plateaus of an easy-axis kagome antiferromagnet with extended interactions," Phys. Rev. B **92** (2015) 174402 (1-14), arXiv:1505.07943.

4. M. Matsuda, S. E. Dissanayake, D. L. Abernathy, K. Totsuka, and A. A. Belik,
"Magnetic excitations in an $S = 1/2$ diamond-shaped tetramer compound Cu_2PO_4OH,"
Phys. Rev. **92** (2015) 184428 (1-6), arXiv:1509.05424.

5. S. Capponi, P. Lecheminant and K. Totsuka,
"Phases of one-dimensional SU(N) cold atomic Fermi gases –from molecular Luttinger liquids to topological phases,"
Ann. Phys. **367** (2016) 50-95, arXiv:1509.04597.

Talks at International Conferences

1. "Topological phases of quantum magnets at high field," ,
in "Entanglement in Strongly Correlated Systems," Benasque, Spain,
February 2016.

Invited Seminars (in Japan)

1. “Quantum spin liquid plateaus in Kagomé lattice antiferromagnet,”
   Dept. of Phys., Chiba University, October 23, 2015.

Yu Watanabe

Books and Proceedings

1. Y. Takaoka, Y. Watanabe,
   “Generalization of quantum f-divergence and its geometrical properties”
   The Institute of Electronics, Information and Communication Engineers, QIT2015-35 (2015).

Talks at International Conferences

1. “Analysis of time-scale of thermalization on isolated quantum systems by using random banded matrix,”
   in “Long-term workshop on New Frontiers in Non-equilibrium Physics 2015,” YITP, Kyoto, Japan,
   July 2015.

2.2.3 Publications and Talks by Hakubi Researchers, Research Fellows and Graduate Students

(April 2015– March 2016)

Hua Chen

Journal Papers

1. Hua Chen, Naoki Sasakura, Yuki Sato,
   "Emergent classical geometries on boundaries of randomly connected tensor networks",
   Phys. Rev. D **93**, 064071 (2016),
   arXiv:1601.04232 [hep-th], YITP-16-2.

Guillem Domènech

Journal Papers

1. G. Domènech, L. Chunshan, and M. Sasaki,
   "Inflationary Magnetogenesis with Broken Local U(1) Symmetry,"
   JCAP 1604 (2016) no.04, 013. arXiv:1512.01108

2. P. Chen, G. Domènech, M. Sasaki and D.h. Yeom
   "Stationary bubbles and their tunneling channels toward trivial geometry,"
   JCAP 1604 (2016) no.04, 013. arXiv:1512.00565

3. G. Domènech, S. Mukohyama, R. Namba, A. Naruko, R. Saitou and Y. Watanabe,
   "Derivative-dependent metric transformation and physical degrees of freedom,"
   Phys.Rev. D92 (2015) no.8, 084027. arXiv:1507.05390

4. G. Domènech, A. Naruko and M. Sasaki,
   "Cosmological Disformal Invariance,"
   JCAP 1510 (2015) no.10, 067. arXiv:1505.00174

Proceedings

1. G. Domènech and M. Sasaki,
   "Conformal frames in cosmology,"
   C15-12-14.2. arXiv:1602.06332

2. G. Domènech and M. Sasaki,
   "Stationary bubbles: information loss paradox?,"
   arXiv:1602.04969

Talks at International Conferences

1. "delta N consistency relation and a more gaussian inflaton,"
   Mini-Workshop on Cosmology. APCTP, Pohang, Korea.,
   May 2016.

2. "Invariance and degrees of freedom after a disformal transformation,"
   Mini-Workshop on Cosmology. APCTP, Pohang, Korea.,
   January 2016.

3. "Stationary bubbles and information loss paradox,"
   2nd LeCosPA International Symposium: Everything about Gravity. LeCosPa, Taiwan.,
   December 2015.

4. "Stationary bubbles and information loss paradox,"
   Workshop on General Relativity and Gravitation (JGRG). YITP, Kyoto University, Japan.,
   December 2015.

5. "Cosmological Disformal Invariance and Conformal Dependence of Inflation,"
   2nd mini-workshop on gravity and cosmology. IAP, Paris, France,
   November 2015.

Invited Seminars (Overseas)

1. "Metric transformations: Disformal invariance and Mimetic symmetries"
   NCTS. Hsinchu, Taiwan. May 2016.

2. "Metric transformations: Disformal invariance and Mimetic symmetries"
   LeCosPa. Taipei, Taiwan. April 2016.

3. "Cosmological Disformal Invariance and Conformal ĄgDependenceĄh of Inflation" University of Barcelona. Barcelona, Spain. December 2015.

4. "Cosmological Disformal Invariance and Conformal ĄgDependenceĄh of Inflation" APC. Paris, France. November 2015.

5. “Frame (In)Dependence in Cosmology” APCTP, Pohang, Korea, June 2015.

Joseph Fedrow

Journal Papers

1. Adam Rubin, Avishay Gal-Yam, Annalisa De Cia, Assaf Horesh, Danny Khazov, Eran O. Ofek, S. R. Kulkarni, Iair Arcavi, Ilan Manulis, Ofer Yaron, Paul Vreeswijk, Mansi M. Kasliwal, Sagi Ben-Ami, Daniel A. Perley, Yi Cao, S. Bradley Cenko, Umaa D. Rebbapragada, P. R. Woz Ęyniak, Alexei V. Filip- penko, K. I. Clubb, Peter E. Nugent, Y.-C. Pan, C. Badenes, D. Andrew Howell, Stefano Valenti, David Sand, J. Sollerman, Joel Johansson, Douglas C. Leonard, J. Chuck Horst, Stephen F. Armen, Joseph M. Fedrow, Robert M. Quimby, Paulo Mazzali, Elena Pian, Assaf Sternberg, Thomas Matheson, M. Sullivan, K. Maguire, Sanja Lazarevic,
“Type II supernova energetics and comparison of light curves to shock-cooling models”,
The Astrophysical Journal, Volume 820, Number 1, November 2015.

Talks at International Conferences

1. "What is the ultimate fate of our Universe?" International Symposium on Advanced Future Studies held at Coop-Inn Kyoto on March 14, 2016.

Takashi Hiramatsu

Journal Papers

1. S. Kuroyanagi, T. Hiramatsu and J. Yokoyama,
“Reheating signature in the gravitational wave spectrum from self-ordering scalar fields,”
J. Cosmo. Astropart. Phys. **1602** (2016) 023, YITP-15-61, arXiv:1509.08264 [astro-ph].

Talks at International Conferences

1. “CMB bispectrum,”
in “COSMO-15,” Uniwersytet Warszawski, Warsaw, Poland,
September 2015.

Invited Seminars (Overseas)

1. “CMB bispectrum,”
Max-Planck-Institut für Astrophysik, München-Garching, Germany, September 2015.

2. “CMB bispectrum,”
AstroParticule et Cosmologie, Paris, France, September 2015.

Invited Seminars (in Japan)

1. “CMB bispectrum,”
Nagoya University, June 2015.

Yuki Kamiya

Journal Papers

1. Y. Kamiya and T. Hyodo, “Structure of near-threshold quasibound states,” Phys. Rev. C **93**, no. 3, (2016) 035203 (6 pages), YITP-15-76, [arXiv:1509.00146 [hep-ph]].

Talks at International Conferences

1. “Compositeness of near-threshold Quasi-Bound States", Plenary,
in “16th International Conference on Hadron Spectroscopy (Hadron 2015)," Marriott at City Center Newport News, Virginia, America, September, 2015.

2. “Compositeness of hadrons and near-threshold dynamics", Plenary,
in “Joint Workshop on Strangeness and Hadron physics at J-PARK," KEK Tokai campus, Ibaraki, Japan, August 2015.

3. “Compositeness of near-threshold quasi-bound states", Plenary,
in “Quarks to Universe in Computational Science (QUCS 2015)," Nara Kasugano International Forum IRAKA, Nara, Japan, November 2015.

4. “Compositeness of near-threshold unstable states", Plenary,
in “J-PARC hadron physics in 2016", KEK Tokai campus, Ibaraki, Japan, March 2016.

5. “Compositeness of near threshold quasi-bound states", Plenary
in “Exotic hadrons from high energy collisions (ExHIC)," YITP Kyoto University, Kyoto, Japan, March 2016.

Kouji Kashiwa

Journal Papers

1. Y. Tanizaki, H. Nishimura and K. Kashiwa,
“Evading the sign problem in the mean-field approximation through Lefschetz-thimble path integral, ”
Phys. Rev. **D91** (2015) 101701 (6 pages), YITP-15-26, arXiv:1504.02979 [hep-th].

2. K. Kashiwa and A. Ohnishi,
“Topological feature and phase structure of QCD at complex chemical potential,”
Phys. Lett. B **750** (2015) 282 (5 pages), YITP-15-45, arXiv:1505.06799 [hep-ph].

3. T. Makiyama, Y. Sakai, T. Saito, M. Ishii, J. Takahashi, K Kashiwa, H. Kouno, A. Nakamura and M. Yahiro,
“Phase structure of two-color QCD at real and imaginary chemical potentials; lattice simulations and model analyses, ”
Phys. Rev. **D93** (2015) 014505 (18 pages), arXiv:1502.06191 [hep-lat].

4. H. Kouno, K. Kashiwa, J. Takahashi, T. Misumi and M. Yahiro,
“Understanding QCD at high density from a Z_3-symmetric QCD-like theory, ”
Phys. Rev. **D93** (2015) 056009 (10 pages), arXiv:1504.07585 [hep-ph].

Kyohei Kawaguchi

Journal Papers

1. K. Kawaguchi, K. Kyutoku, H. Nakano, H. Okawa, M. Shibata, K. Taniguchi,
“Black hole-neutron star binary merger: Dependence on black hole spin orientation and equation of state,”
Phys. Rev. **D92** (2015) 024014 (25 pages), arXiv:1506.05473 [astro-ph].

2. K. Kawaguchi, K. Kyutoku, M. Shibata, M. Tanaka,
“Models of Kilonova/Macronova emission from black hole-neutron star mergers,”
Astrophys. J. (2016) 074035 (12 pages), arXiv:1601.07711 [astro-ph].

Talks at International Conferences

1. “Black hole-neutron star binary merger: dependence on black hole spin orientation and equations of state,”
in “Gravitational Wave Physics and Astronomy Workshop 2015,” INTEX Osaka, Osaka, Japan
June 2015.

2. “Black Hole-Neutron Star Binary Merger: Dependence On Black Hole Spin Orientation And Equations Of State,”
in “Fourteenth Marcel Grossmann Meeting, ” Rome University, Rome, Italy,
July 2015.

3. “Gravitational waves from precessing black hole-neutron star mergers,”
in “The 25th Workshop on General Relativity and Gravitation in Japan, ” Kyoto University, Kyoto, Japan,
December 2015.

Invited Seminars (in Japan)

1. “Kilonova/Macronova from Blackhole-Neutron star mergers,”
, Division of Theoritical Astronomy, National Astronomical Observatory of Japan, October 2015 .

Yusuke Kimura

Journal Papers

1. Y. Kimura,
“Gauge Groups and Matter Fields on Some Models of F-theory without Section,”
JHEP **1603** (2016) 042 (23 pages), YITP-15-104, arXiv:1511.06912[hep-th].

Pak Hang Lau

Journal Papers

1. M. Haberichter, P.H.C. Lau, N.S. Manton, "Electromagnetic Transition Strengths for Light Nuclei in the Skyrme model," Phys.Rev. **C93** (2016) 3, 034304 (10 pages), YITP-15-94, arXiv:1510.08811 [nucl-th;hep-th].

Giacomo Marmorini

Journal Papers

1. D. Yamamoto, G. Marmorini and I. Danshita, "Magnetization process of spin-1/2 Heisenberg antiferromagnets on a layered triangular lattice," J. Phys. Soc. Jpn. **85**, 024706 (2016), arXiv:1510.04402 [cond-mat]

2. R. Yoshii, S. Takada, S. Tsuchiya, G. Marmorini, H. Hayakawa and M. Nitta, "Fulde-Ferrell-Larkin-Ovchinnikov states in a superconducting ring with magnetic fields: Phase diagram and the first-order phase transitions," Phys. Rev. B **92**, 224512 (2015), arXiv:1404.3519 [cond-mat]

Talks at International Conferences

1. "New results for triangular-lattice quantum antiferromagnets in a magnetic field," Contributed, in "20th International Conference on Magnetism (ICM2015)," Barcelona, Spain. July 2015.

Invited Seminars (in Japan)

1. "New results for triangular-lattice quantum antiferromagnets in a magnetic field," Dept. of Phys., Waseda Univ., March 2016.

Kenji Morita

Journal Papers

1. K. Morita and K. Redlich, "Momentum scale dependence of the net quark number fluctuations near chiral crossover" Progress of Theoretical and Experimental Physics **2015** (2015) 043D03 (14 pages), arXiv:1409.8001 [hep-ph], YITP-14-72.

2. K. Morita and A. Nakamura, "Stable Yang-Lee zeros in truncated fugacity series from net-baryon number multiplicity distribution" Physical Review D **92** (2015) 114507 (16 pages). arXiv:1505.05985 [hep-ph], YITP-15-44.

3. T. Ichihara, K. Morita, A. Ohnishi, "Net baryon number fluctuations across the chiral phase transition at finite density in the strong coupling lattice QCD" Progress of Theoretical and Experimental Physics **2015** 113D01 (2015) (16 pages), arXiv:1507.04527 [hep-lat], YITP-15-58.

4. H. Kim, K. Morita, S. H. Lee, "Temperature dependence of dimension-6 gluon operators and their effects on charmonium" Physical Review D **93** (2016) 016001 (6 pages), arXiv:1510.03563 [hep-ph], YITP-15-82.

5. F. Karsch, K. Morita, K. Redlich, "Effects of kinematical cuts on net-electric charge fluctuations" Physical Review C **93** (2016) 034907 (9 pages), arXiv:1508.02614 [hep-ph], YITP-15-60.

Books and Proceedings

1. K. Morita, T. Furumoto, A. Ohnishi, "Lambda-Lambda correlation in relativistic heavy ion collisions" EPJ Web of Conferences, **97** (2015) Resonance Workshop at Catania, 00020.

2. R. Fukuda, A. Nakamura, S. Oka, S. Sakai, A. Suzuki, T. Taniguchi, K. Morita, K. Nagata, "Net-baryon multiplicity and QCD phase diagram" Proceedings of Science, **CPOD2014** (2015) 021 (9 pages)

Talks at International Conferences

1. "Lambda-Lambda correlation in relativistic heavy ion collisions", invited,

in "Workshop on anti-matter, hyper-matter and exotica production at the LHC", CERN, Geneva, Switzerland,
July 2015.

2. "Effects of momentum cuts on cumulants of conserved charges", invited,
in "Fluctuations in Strongly Interacting Hot and Dense Matter: Theory and Experiment", GSI, Darmstadt, Germany,
November 2015

3. "Fluctuations of conserved charges in heavy ion collisions", invited,
in "The 31st Reimei WorkShop on Hadron Physics in Extreme Conditions at J-PARC", Tokai, Ibaraki,
January 2016

Takahiro Nishinaka

Journal Papers

1. M. Buican and T. Nishinaka,
"Argyres-Douglas Theories, the Macdonald Index, and an RG Inequality,"
JHEP **1602** (2016) 159, YITP-15-80, arXiv:1509.05402 [hep-th].

Invited Seminars (in Japan)

1. "Recent development on dualities of 4d supersymmetric gauge theories,"
Intensive lectures in a joint workshop of Ibaraki Univ. and Tokyo Institute of Technology, Japan, October 2015.

2. "On the Superconformal Index of Argyres-Douglas Theories,"
Theory Center, KEK, Japan, November 2015.

3. "On the Superconformal Index of Argyres-Douglas Theories,"
Dept. of Phys., Kyoto Univ., Japan, January 2016.

Takumi Ohta

Journal Papers

1. T. Ohta, S. Tanaka, I. Danshita, K. Totsuka,
"Phase diagram and sweep dynamics of a one-dimensional generalized cluster model,"
J. Phys. Soc. Jpn. **84** (2015) 063001 (4 pages), YITP-15-14, arXiv:1503.03204 [cond-mat].

Tomohiko Sano

Journal Papers

1. K. Kanazawa, T. G. Sano, T. Sagawa, and H. Hayakawa, "Asymptotic derivation of Langevin-like equation with non-Gaussian noise and its analytical solution," J. Stat. Phys. 160, 1294-1335 (2015).

Invited Seminars (Overseas)

1. "Non-equilibrium fluctuating motion of piston as a rectifier: From adiabatic piston to fluctuating engine,"
Queen Mary University of London, UK, October 2015.

Invited Seminars (in Japan)

1. "Dynamics of Granular Rotor Revisited: Roles of a frictional rotator as a non-equilibrium probe,"
Okinawa Institute of Science and Technology, April 2015.

Noburo Shiba

Journal Papers

1. T. Miyagawa, N. Shiba and T. Takayanagi,
"Double-Trace Deformations and Entanglement Entropy in AdS,"
Fortsch. Phys. **64**, 92 (2016) (13 pages) KUNS-2583, YITP-15-95, IPMU15-0197, arXiv:1511.07194 [hep-th]

2. M. Miyaji, T. Numasawa, N. Shiba, T. Takayanagi and K. Watanabe,
"Distance between Quantum States and Gauge-Gravity Duality,"
Phys. Rev. Lett. **115**, no. 26, 261602 (2015) (5 pages) YITP-15-62, IPMU15-0119, arXiv:1507.07555 [hep-th]

3. M. Miyaji, T. Numasawa, N. Shiba, T. Takayanagi and K. Watanabe,
"Continuous Multiscale Entanglement Renormalization Ansatz as Holographic

Surface-State Correspondence,"
Phys. Rev. Lett. **115**, no. 17, 171602 (2015) (5 pages) YITP-15-46, IPMU15-0077, arXiv:1506.01353 [hep-th]

4. S. Aoki, T. Iritani, M. Nozaki, T. Numasawa, N. Shiba and H. Tasaki,
"On the definition of entanglement entropy in lattice gauge theories,"
JHEP **1506**, 187 (2015) (29 pages) YITP-2015-8, arXiv:1502.04267 [hep-th]

Talks at International Conferences

1. "cMERA as Surface/State Correspondence in AdS/CFT," Invited,
in "Gravity, Quantum Fields and Entanglement," Lorentz Center at Leiden University, Leiden, Netherlands,
January 2016.

2. "Surface/State Correspondence in AdS/CFT," Invited,
in "Gravity and Beyond: 100 years after Einstein's theory," National Taiwan University, Taipei, Taiwan,
July 2015.

3. "Entanglement Entropy of Disjoint Regions in Excited States : An Operator Method,"
in " International Workshop on Strings, Black Holes and Quantum Information," Tohoku University, Japan,
September 2015.

Invited Seminars (Overseas)

1. "On the denition of entanglement entropy in lattice gauge theories,"
National Taiwan University, Taipei, Taiwan,
July 2015.

Invited Seminars (in Japan)

1. "Entanglement Entropy of Two Black Holes and Entanglement Entropic Force,"
Dept. of Phys., Nagoya University,
February 2016.

2. "cMERA as Surface/State Correspondence in AdS/CFT,"
Dept. of Phys., Tokyo Institute of Technology,
October 2015.

Masaki Shigemori

Journal Papers

1. M. Park and M. Shigemori,
"Codimension-2 solutions in five-dimensional supergravity,"
JHEP **1510** (2015) 011 (36 pages),
arXiv:1505.05169 [hep-th],
YITP-15-41.

2. I. Bena, S. Giusto, R. Russo, M. Shigemori and N. P. Warner,
"Habemus Superstratum! A constructive proof of the existence of superstrata,"
JHEP **1505** (2015) 110 (55 pages),
arXiv:1503.01463 [hep-th],
YITP-15-12.

Talks at International Conferences

1. "Codimension-1 supertubes," Invited, Plenary,
Duality and Novel Geometry in M-theory, APCTP, Pohang, Korea,
Jan. 27, 2016.

2. "Branes and black holes in string theory and supergravity," Invited, Plenary,
20th APCTP Winter School on Fundamental Physics, APCTP, Pohang, Korea,
Jan. 23–24, 2016.

3. "The microstate geometry program and superstrata," Invited, Plenary,
8th Taiwan String Workshop, National Center for Theoretical Sciences, National Tsing Hua University, Hsinchu, Taiwan,
Nov. 16–18, 2015.

4. "Habemus Superstratum," Invited, Plenary,
KEK Theory Workshop 2015 Dec., KEK, Tsukuba, Japan,
Dec. 2, 2015.

5. "Habemus Superstratum," Invited, Plenary,
KEK Theory Workshop 2015 Dec., KEK, Tsukuba, Japan,
Dec. 2, 2015.

6. "Habemus Superstratum," Invited, Plenary,
International Workshop on Strings, Black Holes and Quantum Information, Tohoku Forum for Creativity, Tohoku University,
Sep. 10, 2015.

7. “Habemus Superstratum,” Invited,
Strings 2015, ICTS-TIFR, Bengaluru, India,
Jun. 25, 2015.

8. “Habemus Superstratum,” Invited, Planery
de Sitter and Microstate Landscapes in String Theory, CEA Saclay, France,
Jun. 16, 2015.

9. “Codimension-2 solutions in five-dimensional supergravity,” Invited, Planery,
KIAS-YITP Joint Workshop 2015 Geometry in Gauge Theories and String Theory, KIAS, Seoul, Korea,
Sep. 16, 2015.

10. “Codimension-2 solutions in five-dimensional supergravity,” Invited, Planery,
CERN-CKC TH Institute on Duality Symmetries in String and M-Theories, CERN, Switzerland,
Aug. 14, 2015.

11. “The Microstate Geometry Program – the Past, Present and Future,” Invited, Plenary,
Second String Theory in Greater Tokyo, RIKEN, Japan,
Jun. 9, 2015.

Invited Seminars (Overseas)

1. “The Microstate Geometry Program and Superstrata”,
University of Southern California, USA, Mar. 23, 2016.

Invited Seminars (in Japan)

1. “Codimension-2 solutions in five-dimensional supergravity”,
Kyoto University, Japan, Oct. 21, 2015.

2. “The microstate geometry program – the past, present, and future”,
Nagoya University, Japan, Oct. 27, 2015.

3. “The microstate geometry program – the past, present, and future”,
Rikkyo University, Japan, May 12, 2015;

4. “The microstate geometry program – the past, present, and future”,
Kinki University, Japan, Apr. 20, 2015;

5. “The microstate geometry program – the past, present, and future”,
Yukawa Institute for Theoretical Physics, Kyoto University, Japan, Apr. 9, 2015.

Satoshi Takada

Journal Papers

1. R. Yoshii, S. Takada, S. Tsuchiya, G. Marmorini, H. Hayakawa, and M. Nitta,
“Fulde-Ferrell-Larkin-Ovchinnikov states in a superconducting ring with magnetic fields: Phase diagram and the first-order phase transitions,”
Phys. Rev. B **92** (2015) 224512 (7 pages), arXiv:1404.3519 [cond-mat].

2. S. Takada and H. Hayakawa,
“Drag Law of Two Dimensional Granular Fluids,"
J. Eng. Mech. (2016) C4016004 (6 pages), arXiv:1504.04805 [cond-mat].

3. K. Saitoh, S. Takada, and H. Hayakawa,
“Hydrodynamic instabilities in shear flows of dry cohesive granular particles,"
Soft Matter, **11** (2015) 6371 (15 pages), arXiv:1505.04076 [cond-mat].

Talks at International Conferences

1. “Kinetic theory for dilute cohesive granular gases with a square well potential,” Contributed,
in “Avalanches, plasticity, and nonlinear response in nonequilibrium solids,” YITP, Kyoto Univ., Kyoto, Japan,
March 2016.

Hidekazu Tsukiji

Journal Papers

1. H. Tsukiji, H. Iida, T. Kunihiro, A. Ohnishi, T.T. Takahashi, “Entropy production in quantum Yang-Mills mechanics in semi-classical approximation”, Prog. Theor. Exp. Phys. 083A01 (2015). arXiv:1505.04698 [hep-qh], YITP-15-42.

Talks at International Conferences

1. "Entropy production in Yang-Mills field theory with use of Husimi function"ĄA Central China Normal University, Wuhan, China, February 2016.

2. "Study of entropy production in Yang-Mills theory with use of Husimi function"ĄA Kobe, Hyogo, Japan, July 2015.

Marcus Werner

Journal Papers

1. A. B. Aazami and M. C. Werner,
"The geometry of gravitational lensing magnification,"
J. Geom. Phys. **100** (2016) 52-61, YITP-16-45, arXiv:1507.02765 [gr-qc].

Books and Proceedings

1. M. C. Werner,
"A geometrical approach to gravitational lensing magnification,"
Proc. Marcel Grossmann **14** (2016) (4 pages), YITP-15-142, arXiv:1507.05099 [gr-qc].

Talks at International Conferences

1. "Gravity and light: a centennial perspective," Invited, Plenary,
in "100 Years of General Relativity," Mathematics Department, Duke University, Durham NC, USA,
16 October 2015.

2. "A geometrical approach to gravitational lensing magnification,"
in 14th Marcel Grossmann Meeting, La Sapienza, Rome, Italy,
13 July 2015.

Invited Seminars (Overseas)

1. "New light on gravitational optics,"
Astrophysical Institute, Jena University, Germany, 12 February 2016.

Invited Seminars (in Japan)

1. "The Einstein-Struble correspondence and Lorentz invariance,"
in 25th Workshop on General Relativity and Gravitation in Japan, YITP, Kyoto University, 11 December 2015.

2. "Gravity and light: an introduction to gravitational lensing," 94th Hakubi Seminar, Hakubi Center, Kyoto University, 21 April 2015.

Shunsuke Yabunaka

Journal Papers

1. S. Yabunaka, R. Okamoto and A. Onuki,
"Hydrodynamics in bridging and aggregation of two colloidal particles in a near-critical binary mixture ,"
Softmatter **11** (2015) 5738 (10 pages), arXiv:1412.7398 [cond-mat].

2. B. Delamotte, D. Mouhanna, M. Dudka and S. Yabunaka,
"Functional renormalization group approach to non-collinear magnets ,"
Phys. Rev. B **93**, (2016) 064405 (16 pages), arXiv:1510.00169 [cond-mat].

3. A. Onuki, S. Yabunaka, T. Araki and R. Okamoto,
"Structure Formation due to Antagonistic Salts,"
Current Opinion in Colloid and Interface Science **22** (2016) 59 (6 pages), arXiv:1604.000598 [cond-mat].

Invited Seminars (in Japan)

1. "Self-propelled motion of a fluid droplet under chemical reaction,"
Department of engineering, Kyoto University, August 2015 (in Japanese).

2. "Self-propelled motion of a fluid droplet under chemical reaction,"
Department of physics, Tohoku University, October 2015 (in Japanese).

Takashi Yoshida

Journal Papers

1. C. Kato, D. A. Milad, S. Yamada, K. Takahashi, H. Umeda and T. Yoshida,
"Pre-supernova neutrino emissions from ONe cores in the progenitors of core-collapse supernovae: Are they distinguishable from those of Fe cores?,"
Astrophys. J. **808** (2015) 168 (20 pages), arXiv:1506.02358 [astro-ph].

2. S. Fujibayashi, T. Yoshida and Y. Sekiguchi,
"Nucleosynthesis in neutrino-driven winds from massive proto-neutron stars,"
Astrophys. J. **810** (2015) 115 (19 pages), arXiv:1507.05945 [astro-ph].

Invited Seminars (Overseas)

1. "Advanced Evolution of CO Stars and Ultra-Stripped Supernovae,"
Argelander Institute for Astronomy, University of Bonn, Germany, September 2015.

Yuta Yoshida

Journal Papers

1. Y. Yoshida, Y. Kanada-En'yo, and F. Kobayashi,
"α-cluster excited states in ^{32}S,"
Prog. Theor. Exp. Phys. (2016) 043D01.

2.3 Seminars, Colloquia and Lectures

▷ 2015.4.1 — 2016.3.31

4.3 Yuya Tanizaki (Univ. of Tokyo/RIKEN) Phase transition of matrix models through Lefschetz-thimble path integral

4.8 Giacomo Marmorini (YITP, Kyoto Univ.) Microscopic modeling of the quantum triangular antiferromagnet Ba3CoSb2O9

4.9 Masaki Shigemori (YITP, Kyoto Univ.) The microstate geometry program - the past, present, and future

4.10 Tomohiko Takahashi (Nara Womens Univ.) Multibrane Solutions and Chan-Paton Factors

4.15 Takeshi Kawasaki (Nagoya Univ.) Rheology on soft-particle suspensions

4.16 Nicholas Tsamis (Univ. of Crete) Gravitational Back-Reaction in Cosmology

4.17 Arpan Bhattacharyya (Centre For High Energy Physics, Indian Institute Of Science, Bangalore)Lessons for Gravity from Entanglement

4.17 Beni Yoshida (California Institute of Technology) Holographic quantum error-correcting codes: Toy models for the AdS/CFT correspondence

4.22 Yasuhiro Yamaguchi (YITP, Kyoto Univ.) Heavy quark spin symmetry in Hadronic molecules and Holography

4.22 Tatsuhiko Shirai (Univ. of Tokyo) Novel symmetry-breaking phenomenon in a driven cavity system

4.24 Toshifumi Noumi (RIKEN) Effective field theory approach for spacetime symmetry breaking

5.1 Shinya Gongyo (YITP, Kyoto Univ.) Massive Nambu-Goldstone bosons in nonrelativistic systems

5.8 Yifu Cai (McGill Univ.) A new model of axion monodromy and CMB anomalies

5.8 Teruhiko Kawano (Univ. of Tokyo) 5d SYM on 3-spheres

5.13 Sunil Mukhi (Indian Institute of Science Education and Research (IISER), Pune) Modular Invariance and Entanglement Entropy

5.13 Tetsuya Mitsudo (Kyoto Univ.) Large deviations for frequencies in forest-fire models, diffusive elements and earthquake data

5.21 Matteo Fasiello (Stanford Univ.) From Massive Gravity to Bigravity

5.22 Emanuela Dimastrogiovanni (Arizona State Univ.) Inflationary Tensor Fossils in CMB and LSS

5.22 Jakub Jankowski (Jagiellonian Univ.) Conformal defects in supergravity

5.25 Anzhong Wang (Baylor Univ.) Detecting quantum gravitational effects in the early universe

5.26 Anupam Mazumdar (Lancaster Univ.) Universal laws of Gravity without Singularity

5.27 Takeshi Fukuhara (CEMS, RIKEN) Quantum spin dynamics in optical lattices

5.27 Masato Itami (Kyoto Univ.) Derivation of Stokes' law without the hydrodynamic equations

5.29 Masafumi Fukuma (Kyoto Univ.) Random volumes from matrices

6.3 Daisuke Takahashi (RIKEN) Recent topics in Nambu-Goldstone modes - counting of quasi-NG modes, perfect tunneling phenomena, and oscillating topological defects

6.3 Yusuke Taniguchi (Univ. of Tsukuba) QCD phase transition at real chemical potential with canonical approach

6.3 Hiroyasu Tajima (CEMS, RIKEN) Measurement-based Formulation of Quantum Heat Engine and Optimal Efficiency with Finite-Size Effect

6.5 Hiroaki Matsunaga (YITP, Kyoto Univ.) Formulations for superstring field theory

6.10 John Molina (Kyoto Univ.) Rheology of Colloidal Dispersions using the Smooth Profile Method

6.12 Seiji Terashima (YITP, Kyoto Univ.) Exact Computations in Confining Phase using SUSY Localization

6.15 Jaeha Lee (Univ. of Tokyo) Modelling Quantum Measurement under Uncertainty

6.16 Stéphane Colombi (Institut d'Astrophysique de Paris/YITP, Kyoto U) YITP Colloquium: Vlasov-Poisson equations: a numerical point of view

6.17 Hiromitsu Takeuchi (Osaka City Univ.) Defect-survival problem in phase-separating binary superfluids

6.19 Sebastian Peirani (Institut d'Astrophysique de Paris) LyMAS: Predicting Large-Scale Lyman-alpha Forest Statistics from the Dark Matter Density Field

6.19 Ipsita Mandal (Perimeter Institute for Theoretical Physics) UV/IR Mixing in non-Fermi liquids

6.19 Takeshi Morita (Shizuoka Univ.) Instanton dynamics in finite temperature QCD via holography

6.22 Satoshi Takada (YITP, Kyoto Univ.) Kinetic theory for dilute cohesive granular gases with a square well potential

6.24 Atsushi Ikeda (Fukui Institute for Fundamental Chemistry, Kyoto Univ.) Glass transition of ellipsoids – A microscopic theory study

7.1 Yui Kuramochi (Kyoto Univ.) Minimal sufficient positive-operator valued measures

7.3 Anatoli Afanasjev (Mississippi State Univ.) Recent progress in covariant density functional theory

7.3 David Alexander McGady (Kavli IPMU, Univ. of Tokyo) Surprises in weakly coupled confining gauge theories

7.8 Shunji Matsuura (YITP, Kyoto Univ.) Mean-field analysis of quantum annealing correction

7.10 Andreas Karch (Univ. of Washington) Scaling laws for thermo-electric transport at quantum criticality

7.13 Sayantan Sharma (Brookhaven National Laboratory) The microscopic origin of axial anomaly and the high temperature phase of QCD

7.15 Takafumi Suzuki (The Institute for Solid State Physics, U of Tokyo) Photon-assisted current noises through a quantum dot system

7.17 Tokuro Shimokawa (Osaka Univ.) Quantum spin-liquid behavior in the bond-random S=1/2 Heisenberg antiferromagnet on the kagome lattice

7.17 Shunichiro Kinoshita (Chuo Univ.) Conic D-branes

7.27 Valentina Forini (Humboldt Univ. Berlin) Worldsheet string theory in AdS/CFT: perturbation theory and beyond

7.28 Nicolae Carjan (Joint Institute for Nuclear Research/Tokyo Inst. of Technology) Fission of Transactinide Elements Described in Terms of Generalized Cassinian Ovals: Fragment Mass and Total Kinetic Energy Distributions

7.28 Jean-Paul Blaizot (CEA Saclay/YITP, Kyoto Univ.) YITP Colloquium: Bose-Einstein condensation in unusual circumstances

8.3 Patriz Hinderer (Univ. of Tuebingen, Germany) New results on threshold resummation for QCD hard scattering

8.4 Junichi Takahashi (Waseda Univ.) Dynamical instability induced by zero mode in cold atomic system

8.19 Carlos A. R. Sa de Melo (Georgia Institute of Technology) Who is the Lord of the Rings in the Zeeman-spin-orbit Saga: Majorana, Dirac or Lifshitz?

8.24 Ataru Tanikawa (RIKEN) Hydrodynamical evolution of merging carbon-oxygen white dwarfs: their pre-supernova structure and observational counterparts

8.27-8.28 Jean-Paul Blaizot (CEA Saclay/YITP, Kyoto Univ.) Lecture series: Quantum Fields at Finite Temperature "from tera to nano Kelvin"

8.28 Rainer Sommer (NIC, DESY/YITP, Kyoto Univ.) YITP Colloquium: The strength of the QCD interactions - a fundamental parameter of Nature

9.4 Yoshinori Matsuo (Univ. of Crete) Hyperscaling-Violating Lifshitz hydrodynamics from black-holes

9.4 Vlatchesiav Mukhanov (Ludwig Maximilians Univ., Munich) Inflation without Multiverse

9.8 François Englert (Université Libre de Bruxelles) YITP Colloquium: The origin of elementary particle masses

9.9 Koshiro Suzuki (Canon Inc.) Theory for Divergent Viscosity in Jammed Granular Materials

9.9-9.10 Rainer Sommer (NIC, DESY/YITP, Kyoto Univ.) Lecture series: Heavy quarks beyond QCD perturbation theory

9.14 Masaru Hongo (Univ. of Tokyo/RIKEN) Derivation of relativistic hydrodynamics from quantum field theory

9.15 Daisuke Satow (ECT*, Trento) Chiral symmetry breaking and confinement effects on dilepton and photon production in heavy ion collision

9.24 Kazuharu Bamba (Fukushima Univ.) Large-scale magnetic fields, non-Gaussianity, and primordial gravitational waves in the inflationary universe

10.5 Umut Gursoy (Utrecht Univ.) Magnetically induced electric currents in QGP and holography

10.9 Yurika Kubo (Waseda Univ.) Magnetic saturation and an incommensurate spin-density-wave phase of antiferromagnets

10.9 Guido Cossu (IPNS, KEK) The $U(1)_A$ symmetry at finite temperature and the Dirac operator eigenmodes

10.13 Masatoshi Sato (YITP, Kyoto Univ.) YITP Colloquium: Topology in crystalline insulators and superconductors

10.16 Prasad Satish Hegde (Central China Normal Univ.) The QCD equation of state and more from Lattice QCD

10.16 Takahiro Nishinaka (YITP, Kyoto Univ.) On the superconformal index of Argyres-Douglas theories

10.19 Douglas Scott (Univ. of British Columbia, Canada) The Universe According to Planck

10.21 Koutarou Otomura (Univ. of Tokyo) Internal Structure and Non Linear Rheology of Non Brownian Suspension with Low Reynolds Number Fluid

10.23 Miguel A. Vazquez-Mozo (Univ. of Salamanca, Spain) On the double copy structure of soft gravitons

10.26 Ken Funo (Univ. of Tokyo) Work fluctuation-dissipation trade-off in heat engines

10.30 Pak Hang Chris Lau (YITP, Kyoto Univ.) Skyrmions and Carbon-12

11.4 Taiki Haga (Kyoto Univ.) Non-equilibrium quasi-long-range order of a driven random field O(N) model

11.11 Shiwani Singh (Kyushu Univ.) Lattice Fokker Planck Method for Complex Fluids

11.16 Werner Krauth (École normale supérieure) Two-dimensional melting: New algorithms, new insights

11.18 Nodoka Yamanaka (iTHES, RIKEN) Electric dipole moment of light nuclei

11.18 Takafumi Suzuki (Univ. of Tokyo) Functional renormalization group study of the current noise of the interacting resonant level model

11.19 Di-Lun Yang (RIKEN) Collective Flow of Photons in Strongly Coupled Gauge Theories

11.19 Kirill Shtengel (Univ. of California Riverside) Looking beyond Majoranas: Parafermions, Andreev conversion and exotic quantum circuitry

11.20 Ryo Yamamura (Osaka Univ.) The Yang-Mills gradient flow and lattice effective action

11.25 Nic Shannon (Theory of Quantum Matter Unit, OIST) From pinch points to pinch lines: a new spin liquid on the pyrochlore lattice

11.27 Toshiko Kojita (Maskawa Institute, Kyoto Sangyo Univ.) Defects in open string field theory

11.30 Hoi-Lai Yu (Academia Sinica, Taiwan) General Relativity: A Centennial Perspective

12.2 Sylvain Capponi (IRSAMC, Universite Toulouse III Paul Sabatier) Phase diagram of spinless fermions on the honeycomb lattice

12.7 Keiju Murata (Keio Univ.) Turbulent strings in AdS/CFT

12.9-12.11 Keisuke Fujii (Kyoto Univ.) Lecture series: An introduction to quantum computation and its interdisciplinary fields in physics

12.14 Yasuhiro Utsumi (Mie Univ.) Fluctuation Theorem for a Small Engine and Magnetization Switching by Spin Torque

12.14-12.15 Masayasu Harada (Nagoya Univ.) Lecture series: Analysis of low-energy hadron physics using chiral effective models

12.16 Parthasarathi Majumdar (Ramakrishna Mission Vivekananda Univ.,India) A Black Hole Entropy Perspective on Neutron Star Masses

12.16 Adrian Baule (Queen Mary Univ. of London) Optimal escape from metastable states driven by non-Gaussian noise

12.18 Shigenori Seki (RINS, Hanyang Univ.) Entanglement Entropy of Scattering Particles

1.7 Takahiro Ueda (NIKHEF, Amsterdam) Towards efficient calculation of 4-loop massless propagators

1.7 Chiara Caprini (Institut de Physique Théorique, CEA-Saclay) Cosmology with gravitational waves

1.8 Yuta Kikuchi (Dept. of Phys., Kyoto Univ.) Mesoscopic dynamics of fermionic cold atoms

1.12 Dan Xie (Harvard Univ.) Four dimensional N=2 SCFT and singularity theory

1.13 Akihiko Sekine (Inst. for Materials Research, Tohoku Univ.) Dynamical Cross-Correlated Responses of Insulators and Superconductors

1.15 Shinji Hirano (Univ. of Witwatersrand) Two tales of ABJ(M) –theory Higher spin limit and Background Independent Reformulation–

1.15 Kam Tuen Law (Hong Kong Univ. of Science and Technology) Ising Superconductivity and Majorana Fermions in Transition Metal Dichalcogenides

1.18 Nilakash Sorokhaibam (Tata Inst. of Fundamental Research, Mumbai) 2D Critical Quench, Thermalization and Non-Universality

1.18 Mangesh Mandlik (Tata Inst. of Fundamental Research, Mumbai) A Charged Membrane Paradigm at Large D

1.20 Bruce Normand (Renmin Univ. of China) Quantum and classical criticality in a dimerised quantum antiferromagnet

1.26 Xiong-Jun Liu (Peking Univ.) Symmetry-protected non-Abelian braiding of Majorana Kramers' pairs

1.27 Kazuhiro Yamamoto (Hiroshima Univ.) Constraints on modified dispersion relations for gravitational waves from gravitational Cherenkov radiation

1.27 Christian Ott (California Inst. of Technology) YITP Colloquium: New Insights into Massive Star Explosions

1.27 Michio Otsuki (Shimane Univ.) Shear modulus of granular materials under oscillatory shear near jamming transition

2.3-2.5 Frederic van Wijland (Université Paris Diderot/YITP, Kyoto Univ.) Lecture series: Quantum methods for stochastic dynamics

2.4 Adrien Bouhon (Uppsala Univ.) Dirac lines in the superconducting hyper-honeycomb lattice

2.5 Tamas Csorgo (WIGNER Research Centre for Physics, Hungarian Academy of Sciences) New exact solutions of fireball hydrodynamics, including the effects of rotation and lattice QCD equation of state

2.5 Jun Goryo (Hirosaki Univ.) Phenomenology of a hexagonal chiral d-wave superconductor with spin orbit coupling

2.5 Zhi-Zhong Xing (Institute for High Energy Physics, CAS) Leptonic CP violation, mu-tau reflection symmetry and Maki-Nakagawa-Sakata unitarity triangles in matter

2.8 Frederic van Wijland (Université Paris Diderot/YITP, Kyoto Univ.) YITP Colloquium: Dynamic phase transitions

2.9 Motoi Tachibana (Saga Univ.) Capture of dark matter by neutron stars

2.10 Andrea Cairoli (Queens Mary Univ., London) Anomalous processes with general waiting times: Functionals, Multipoint Structure and the role of Galilean invariance

2.12 Yuki Nakaguchi (Kavli IPMU, Univ. of Tokyo) Renormalized Entanglement Entropy on Cylinder

2.15 Philipp Moesta (UC Berkeley) Magneto-turbulence in rapidly rotating core-collapse supernovae

2.16-2.18 Takayuki Myo (Osaka Institute of Technology) Lecture series: resonance phenomena and role of tensor force in light nuclei

2.17-2.19 Hajime Yoshino (Cybermedia Center, Osaka Univ.) Lecture series: Statistical mechanics of glass/jamming systems: the replica method and its applications

2.18 Ming-Chiang Chung (National Chung-Hsing Univ.) Quench Dynamics of Majorana Fermions

2.19 Masahito Yamazaki (Kavli IPMU, Univ. of Tokyo) Comments on Representation Theory for Higher-Dimensional CFTs

2.22 Daisuke Mizuno (Kyushu Univ.) Non-Gaussian limit distributions out of truncated power-law interactions

2.22-2.24 Shin Nakamura (Chuo Univ.) Lecture series: Nonequilibrium Statistical Physics and AdS/CFT Correspondence

2.24 Anki Reddy Katha (Indian Institute of Technology, Guwahati) Molecular Dynamics Investigation of Polymer membranes and polyelectrolytes

2.24 Roberto Percacci (SISSA) Recent progress in asymptotic safety

2.26 Makoto Takamoto (Univ. of Tokyo) Relativistic Magnetohydrodynamic turbulence in Poynting-Dominated Plasmas and its effects on Current Sheet Dynamics

2.29-3.2 Kiyotomo Ichiki (Nagoya Univ.) Lecture series: Radio Cosmology

3.2 Etienne Fodor (Paris Diderot Univ. - Paris 7) Self-propelled particles as an active matter system

3.8 Hiroaki Ueda (Toyama Prefectural Univ.) Topological solitons with emergent interactions in SU(3) Heisenberg model on the triangular lattice

3.8-3.10 Hiroshi Suzuki (Kyushu Univ.) Lecture series: Gradient flow and its application to lattice gauge theory

3.11 Stefan Ruehe (Kiel Univ.) Smoothed Particle Hydrodynamics in the Einstein Toolkit

3.11 Jonathan Ellis (King's College London) Perspectives for Particle Physics beyond the Standard Model

3.14 Yi Wang (Hong Kong Univ. of Science and Technology) Probing the Primordial Universe using Massive Fields

3.15 Max Riegler (TU Wien) Flat Space, Higher-Spins and Holography in 2+1 Dimensions

3.15 Tomohiro Fujita (Stanford Institute for Theoretical Physics) Magnetogenesis and Baryogenesis

3.15 David Feder (Univ. of Calgary) Quantum phases with ultracold atoms in optical cavities

3.16 Christian Saemann (Heriot-Watt Univ.) Looking for the classical (2,0)-theory

3.16 László Árpád Gergely (Univ. of Szeged, Hungary) Gravitational, shear and matter waves in Kantowski-Sachs cosmologies

3.16 Yi Wang (Hong Kong Univ. of Science and Technology) On the initial condition of inflationary fluctuations

3.17 David Radice (California Institute of Technology) Neutron Star Merger Simulations with the WhiskyTHC Code

3.23 Tetsu Kitayama (Toho Univ.) Lecture series: The Physics of Galaxy Clusters

3.24 Shunji Tsuchiya (Tohoku Institute of Technology) Cooperon condensation and intra-valley spin-triplet pairing in Dirac fermion systems

3.25 Jie-qiang Wu (Peking Univ.) Entanglemenet entropy and higher genus partition function in AdS3/CFT2

3.28 Hideyuki Mizuno (Fukui Inst. for Fundamental Chemistry, Kyoto Univ.) Vibrational excitations and elastic heterogeneities in disordered solids

2.4 Visitors (April 2015 – March 2016)

Atom-type Visitors

Takahashi, Junichi (C)
Waseda University
2015-07-27 – 2015-08-09

Goto, Kanato (E)
The University of Tokyo
2015-09-24 – 2015-10-23

Kubo, Yurika (C)
Waseda University
2015-10-08 – 2015-10-28

Suzuki, Takafumi (C)
The University of Tokyo
2015-10-19 – 2015-12-18

Aoki, Katsuki (A)
Waseda University
2016-01-11 – 2016-02-02

Visitors

Tanizaki, Yuya (E)
Univ. of Tokyo/RIKEN
2015-04-02 – 2015-04-03

Tsamis, Nicholas (A)
Univ. of Crete
2015-04-04 – 2015-04-17

't Hooft, Gerard (E)
Utrecht University
2015-04-05 – 2015-04-08

Takahashi, Tomohiko (E)
Nara Women's Univ.
2015-04-10 – 2015-04-10

Furuya, Yu (A)
Hirosaki Univ.
2015-04-13 – 2015-04-22

Sendouda, Yuichi (A)
Hirosaki Univ.
2015-04-13 – 2015-04-22

Yoshida, Beni (E)
California Institute of Technology
2015-04-17 – 2015-04-22

Shirai, Tatsuhiko (C)
Univ. of Tokyo
2015-04-22 – 2015-04-23

Sindzingre, Philippe (C)
LPTMC, Univ. Pierre and Marie Curie, Paris
2015-04-30 – 2015-05-01

Lin, Kai (A)
University of São Paulo
2015-05-01 – 2015-05-15

Cai, Yifu (A)
McGill University
2015-05-07 – 2015-05-12

Kawano, Teruhiko (E)
Univ. of Tokyo
2015-05-07 – 2015-05-09

Ohkubo, Shigeo (N)
RCNP/U of Kochi
2015-05-08 – 2015-05-24

Mukhi, Sunil Parsram (E)
Indian Institute of Science Education and Research
2015-05-10 – 2015-05-24

Wang, Anzhong (A)
Baylor Univ.
2015-05-15 – 2015-05-28

Jankowski, Jakub (E)
Jagiellonian Univ.
2015-05-15 – 2015-05-24

Yokoyama Jun'ichi (A)
Univ. of Tokyo
2015-05-15 – 2015-05-15

Chen, Pisin (A)
LeCosPA, National Taiwan University
2015-05-17 – 2015-05-30

Page, Don (A)
University of Alberta
2015-05-18 – 2015-05-30

Fasoello, Matteo (A)
Stanford Univ.
2015-05-20 – 2015-05-23

Dimastrogiovanni, Emanuela (A)
Arizona State Univ.
2015-05-20 – 2015-05-23

Trevisan, Cynthia (C)
California Maritime Academy
2015-05-25 – 2015-05-30

Moller, Aage R. (C)
The University of Texas at Dallas
2015-05-25 – 2015-05-28

Mazumdar, Anupam (A)
Lancaster Univ.
2015-05-25 – 2015-05-26

Fukuhara, Takeshi (C)
RIKEN
2015-05-26 – 2015-05-27

Gumrukcuoglu, Emir (A)
Univ. of Nottingham
2015-05-27 – 2015-05-28

Kobayshi, Tatsuo (E)
Hokkaido Univ.
2015-05-28 – 2015-06-01

Peirani, Sebastien (A)
IAP
2015-05-31 – 2015-06-24

Sousbie, Thierry (A)
IAP
2015-05-31 – 2015-06-13

Besse, Nicolas (A)
University of Lorraine
2015-05-31 – 2015-06-14

Elskens, Yves (A)
Aix-Marseille University
2015-05-31 – 2015-06-13

Takahashi, Daisuke (C)
RIKEN
2015-06-02 – 2015-06-03

Taniguchi, Yusuke (E)
Univ. of Tsukuba
2015-06-03 – 2015-06-03

Scardigli, Fabio (A)
American Univ. of Middle East
2015-06-11 – 2015-06-12

Lee, Jaeha (C)
Univ. of Tokyo
2015-06-14 – 2015-06-16

Mandal, Ipsita (C)
Perimeter Institute for Theoretical Physics
2015-06-17 – 2015-06-19

Detweiler, Steven L. (A)
University of Florida
2015-06-20 – 2015-07-10

Vennin, Vincent (A)
Univ. of Portsmouth
2015-06-26 – 2015-07-02

Barack, Leor (A)
University of Southampton
2015-06-28 – 2015-07-04

McGady, David Alexander (E)
Kavli IPMU. Univ. of Tokyo
2015-07-01 – 2015-07-03

Afanasjev, Anatoli (N)
Mississippi State Univ.
2015-07-03 – 2015-07-03

Karch, Andreas (E)
Univ. of Washington/Nagoya Univ.
2015-07-10 – 2015-07-10

Sharma, Sayantan (N)
Brookhaven National Laboratory
2015-07-11 – 2015-07-13

Ryu, Shinsei (E)
Univ. of Illinois at Urbana Champaing
2015-07-14 – 2015-07-15

Zarei, Moslem (A)
Isfahan Univ. of Technology
2015-07-15 – 2015-08-31

Suzuki, Takafumi (C)
ISSP, Univ. of Tokyo
2015-07-15 – 2015-07-16

Kinoshita, Shunichiro (E)
Chuo Univ.
2015-07-16 – 2015-07-18

Shomokawa, Tokuro (C)
Osaka Univ.
2015-07-17 – 2015-07-17

Umeya, Atsuhi (N)
Nippon Inst. Of Technology
2015-07-21 – 2015-07-22

Forini, Valentina (E)
Humboldt University, Berlin
2015-07-25 – 2015-07-27

Carjan, Nicolae (N)
CENBG/TIT
2015-07-27 – 2015-07-29

Aritomo, Yoshihiro (N)
Kinki Univ.
2015-07-28 – 2015-07-28

Wada, Takahiro (N)
Konan Univ.
2015-07-28 – 2015-07-28

Hinderer, Patriz (N)
Univ. of Tuebingen, Germany
2015-08-03 – 2015-08-05

Sa de Melo, Carlos A. R. (C)
Georgia Institute of Technology
2015-08-13 – 2015-08-19

Saitou, Rio (A)
Kavli IPMU. Univ. of Tokyo
2015-08-16 – 2015-08-22

Namba, Ryo (A)
Kavli IPMU. Univ. of Tokyo
2015-08-17 – 2015-08-21

Watanabe, Yota (A)
Kavli IPMU. Univ. of Tokyo
2015-08-17 – 2015-08-21

Yoshida, Daisuke (A)
TIT
2015-08-17 – 2015-08-21

Tanikawa, Ataru (A)
RIKEN
2015-08-24 – 2015-08-24

Nakata, Hitoshi (N)
Chiba Univ.
2015-08-27 – 2015-09-18

Mukhanov, Viatcheslav (A)
Ludwig-Maximilians Universitat Munchen
2015-09-04 – 2015-09-09

Englert, Francois (A)
Universite Libre de Bruxelles
2015-09-04 – 2015-09-09

Hongo, Masaru (C)
Univ of Tokyo/RIKEN
2015-09-04 – 2015-09-18

Shiozaki, Ken (C)
University of Illinois at Urbana-Champaign
2015-09-08 – 2015-09-21

Mehtar-Tani, Yacine (N)
Inst. for Nuclear Theory, Univ. of Washington
2015-09-08 – 2015-09-26

Satow, Daisuke (N)
ECT*, Trento
2015-09-13 – 2015-09-25

Yang, Bohm-Jung (C)
Seoul National University
2015-09-14 – 2015-09-18

Cao, Shanshan (N)
Lawrence Berkeley National Lab
2015-09-15 – 2015-09-26

Bamba, Kazuharu (A)
Fukushima Univ.
2015-09-23 – 2015-09-25

Rasera, Yann (A)
Paris Diderot-Paris 7 University
2015-09-24 – 2015-10-07

Balog, Janos (E)
Wigner Research Center for Physics
2015-09-25 – 2015-10-07

Hegde, Prasad Satish (N)
Central China Normal University
2015-10-03 – 2015-10-17

Umut Gursoy (E)
Inst. for Theoretical Physics, Utrecht Univ.
2015-10-05 – 2015-10-05

Cossu, Guido (E)
KEK
2015-10-08 – 2015-10-10

Vazquez-Mozo, Miguel A. (E)
Univ. of Salamanca
2015-10-18 – 2015-11-15

Scott, Douglas (A)
Univ. of British Columbia, Canada
2015-10-18 – 2015-10-20

Otomura, Koutarou (C)
Univ. of Tokyo
2015-10-21 – 2015-10-22

Burset, Pablo (C)
Nagoya Univ.
2015-10-29 – 2015-10-30

Singh, Shiwani (C)
Kyushu Univ.
2015-11-11 – 2015-11-12

Romano, Antonio Enea (A)
University of Antioquia
2015-11-13 – 2015-12-13

Shtengel, Kirill (C)
Univ. of California Riverside
2015-11-16 – 2015-11-21

Yang, Di-Lun (N)
RIKEN
2015-11-17 – 2015-11-19

Yamanaka, Nodoka (N)
iTHES, RIKEN
2015-11-18 – 2015-11-19

Yu, Hoi-Lai (A)
Inst. Of Physics, Academia Sinica
2015-11-20 – 2015-12-05

Yamamura, Ryo (E)
Osaka Univ.
2015-11-20 – 2015-11-20

Shannon, Nic (C)
OIST
2015-11-23 – 2015-11-26

Firouzjahi, Hassan (A)
Institute for Research in Fundamental Sciences
2015-11-28 – 2015-12-12

Capponi, Sylvain (C)
IRSAMC, Universite Toulouse III Paul Sabatier
2015-11-30 – 2015-12-04

Plat, Xavier (C)
Univ. of Tokyo
2015-12-03 – 2015-12-04

Milgrom, Mordehai (A)
Weizmann Institute of Science
2015-12-04 – 2015-12-18

Zhang, Ying-li (A)
National Astronomical Observatories, Chinese Academy of Sciences
2015-12-05 – 2015-12-27

Jazayeri, Sadra (A)
Institute for Research in Fundamental Sciences
2015-12-05 – 2016-01-12

Utsumi, Yasuhiro (C)
Mie Univ.
2015-12-13 – 2015-12-14

Harada, Masayasu (N)
Nagoya Univ.
2015-12-14 – 2015-12-15

Uegaki, Eiji (N)
Akita Univ.
2015-12-16 – 2015-12-18

Watanabe, Yota (A)
Kavli IPMU. Univ. of Tokyo
2015-12-16 – 2015-12-24

Majumdar, Parthasarathi (E)
Ramakrishna Mission Vivekananda Univ.,India
2015-12-16 – 2015-12-16

Seki, Shigenori (E)
RINS, Hanyang Univ.
2015-12-17 – 2015-12-19

Ueda, Takahiro (N)
Nikhef
2015-12-21 – 2015-12-29

Naruko, Atsushi (A)
TIT
2015-12-21 – 2015-12-28

Meyer, Rene (E)
Stony Brook
2016-01-04 – 2016-01-05

Ueda, Takahiro (N)
Nikhef
2016-01-04 – 2016-01-09

Caprini, Chiara (A)
Institut de Physique ThÃl'orique, CEA-Saclay
2016-01-06 – 2016-01-08

Ott, Christian (A)
Caltech
2016-01-07 – 2016-03-31

Fodor, Etienne (C)
Universite Paris Diderot-Paris 7
2016-01-09 – 2016-03-11

Sekine, Akihiko (C)
Tohoku Univ.
2016-01-11 – 2016-01-23

Xie, Dan (E)
Harvard Univ.
2016-01-11 – 2016-01-15

Yuan, Fanqi (C)
The Hong Kong Univ. of Science and Technology
2016-01-14 – 2016-01-23

He, Wenyu (C)
The Hong Kong Univ. of Science and Technology
2016-01-14 – 2016-01-23

Law, Kam Tuen (C)
The Hong Kong Univ. of Science and Technology
2016-01-14 – 2016-01-24

Hirano, Shinji (E)
University of Witwatersrand
2016-01-14 – 2016-01-16

Mandlik, Mangesh (E)
Tata Institute of Fundamental Research,

Mumbai
2016-01-16 – 2016-01-19

Sorokhaibam, Nilakash (E)
Tata Inst. of Fundamental Research, Mumbai
2016-01-16 – 2016-01-19

Meyer, Rene (E)
Stony Brook
2016-01-17 – 2016-01-31

Saitoh, Kuniyasu (C)
Tohoku Univ.
2016-01-18 – 2016-01-21

Normand, Bruce (C)
Renmin Univ. of China
2016-01-19 – 2016-01-21

Liu, Xiong-Jun (C)
ICQM, Peking Univ.
2016-01-20 – 2016-01-27

Cairoli, Andrea (C)
Queen Mary University of London
2016-01-24 – 2016-02-23

Tsujikawa, Shinji (A)
Tokyo University of Science
2016-01-24 – 2016-01-29

Yamamoto, Daisuke (C)
Waseda Univ.
2016-01-27 – 2016-01-29

Otsuki, Michio (C)
Shimane Univ.
2016-01-27 – 2016-01-27

Kanazawa, Kiyoshi (C)
TIT
2016-02-01 – 2016-02-12

Xing, Zhi-zhong (E)
Institute for High Energy Physics, CAS
2016-02-01 – 2016-02-14

Csorgo, Tamas (N)
WIGNER Research Centre for Physics, Hungarian Academy of Sciences
2016-02-03 – 2016-02-05

Bouhon, Adrien (C)
Uppsala University
2016-02-03 – 2016-02-06

Goryo, Jun (C)
Hirosaki Univ.
2016-02-04 – 2016-02-06

Moesta, Philipp (A)
University of California, Berkeley
2016-02-07 – 2016-02-17

Tachibana, Motoi (E)
Saga Univ.
2016-02-08 – 2016-02-10

Yoshida, Daisuke (A)
TIT
2016-02-08 – 2016-02-10

West, Jevin (C)
Univ. of Washington
2016-02-09 – 2016-02-15

Saito, Rio (A)
Huazhong Univ. of Science & Technology
2016-02-09 – 2016-02-16

Watanabe, Yota (A)
Univ. of Tokyo
2016-02-09 – 2016-02-18

Nakaguchi, Yuki (E)
Kavli IPMU. Univ. of Tokyo
2016-02-12 – 2016-02-12

Chung, Ming-Chiang (C)
National Chung-Hsing University
2016-02-13 – 2016-02-21

Katha, Anki Reddy (C)
Indian Institute of Technology
2016-02-13 – 2016-03-09

Larrouturou, Francois (A)
Ecole Normale Superieure
2016-02-15 –2016–7-29

Umeya, Atsuhi (N)
Nippon Inst. Of Technology
2016-02-16 – 2016-02-17

Yoshino, Hajime (C)
Osaka Univ.
2016-02-17 – 2016-02-19

Ohkubo, Shigeo (N)
RCNP/U of Kochi
2016-02-18 – 2016-03-04

Mizuno, Daisuke (C)
Kyushu Univ.
2016-02-21 – 2016-02-23

Odintsov, Sergei (A)
ICE-ICREA
2016-02-22 – 2016-02-23

Goto, Kanato (E)
Univ. of Tokyo
2016-02-22 – 2016-02-26

Nakamura, Shin (E)
Chuo Univ.
2016-02-22 – 2016-02-24

Yanagishima, Taiki (C)
Inst. of Industrial Science, Univ of Tokyo
2016-02-22 – 2016-02-23

Wu, Jie Qiang (E)
Peking University
2016-02-22 – 2016-07-07

Takamoto, Makoto (A)
Univ. of Tokyo
2016-02-23 – 2016-02-26

Hirabashi, Yoshiharu (N)
Hokkaido Univ.
2016-02-23 – 2016-02-23

Saga, Shouhei (A)
Nagoya Univ.
2016-02-23 – 2016-02-26

Percacci, Roberto (A)
SISSA
2016-02-24 – 2016-02-25

Umeya, Atsushi (N)
Nippon Inst. Of Technology
2016-02-27 – 2016-02-29

Ichiki, Kiyotomo (N)
Nagoya Univ.
2016-02-29 – 2016-03-02

Schneider, Jonas (A)
Friedrich-Alexander University of Erlangen-Nuremberg
2016-03-01 – 2016-05-27

Feder, David (C)
University of Calgary
2016-03-01 – 2016-05-31

Ueda, Hiroaki (C)
Toyama Prec. Univ.
2016-03-02 – 2016-03-09

Nguyen, Quynh Lan (A)
Hanoi National University of Education
2016-03-06 – 2016-03-12

Byrnes, Christian (A)
Univ. of Sussex
2016-03-06 – 2016-03-12

Takahashi, Tomo (A)
Saga Univ.
2016-03-07 – 2016-03-11

Ruehe, Stefan (A)
Kiel Univ.
2016-03-08 – 2016-03-14

Suzuki, Hiroshi (E)
Kyushu Univ.
2016-03-08 – 2016-03-10

Suyama, Teruaki (A)
RESCEU, Univ. of Tokyo
2016-03-09 – 2016-03-11

Yokoyama, Shuichiro (A)
Rikkyo Univ.
2016-03-10 – 2016-03-11

Saitoh, Kuniyasu (C)
Tohoku Univ.
2016-03-10 – 2016-03-11

Ellis, Jonathan (E)
King's College London
2016-03-11 – 2016-03-12

Gergely, László Árpád (A)
University of Szeged, Hungary
2016-03-12 – 2016-03-20

Nagy, Cecília (A)
University of Szeged, Hungary
2016-03-12 – 2016-03-20

Wang, Yi (A)
Hong Kong U. of Science
2016-03-13 – 2016-03-18

Iancu, Edmond (N)
IphT, CEA Saclay
2016-03-14 – 2016-04-10

Kanno, Sugumi (A)
Univ. of the Basque Country
2016-03-14 – 2016-03-30

Riegler, Max (E)
TU Wien
2016-03-14 – 2016-03-18

Radice, David (A)
Caltech
2016-03-14 – 2016-03-20

Fujita, Tomohiro (A)
Stanford Inst. for Theoretical Physics
2016-03-14 – 2016-03-18

Saemann, Christian (E)
Heriot-Watt Univ.
2016-03-15 – 2016-03-17

Yang, Di-Lun (N)
RIKEN
2016-03-22 – 2016-03-25

Yokoyama, Shuichiro (A)
Rikkyo Univ.
2016-03-22 – 2016-03-25

Lee, Su Houng (N)
Yonsei University
2016-03-23 – 2016-04-06

Tsuchiya, Shunji (C)
Tohoku Inst. Of Technology
2016-03-23 – 2016-03-26

Kitayama Tetsu (A)
Toho Univ.
2016-03-23 – 2016-03-25

Naruko, Atsushi (A)
TIT
2016-03-24 – 2016-03-31

Okazaki, Tadashi (E)
National Taiwan U.
2016-03-28 – 2016-04-02

In the above lists, the symbols A, C, E and N in the parentheses are the following abbreviations of research fields:
A: Astrophysics and Cosmology
C: Condensed Matter and Statistical Physics
E: Elementary Particle Theory
N: Nuclear Physics Theory

2.5 Distinguished Papers

1. Editor's Suggestion of Physical Review C
   $\Lambda\Lambda$ interaction from relativistic heavy ion collisions
   Kenji Morita(YITP), Dr. Takenori Furumoto (Ichinoseki NCT, former PDF of YITP) and Prof. Akira Ohnishi(YITP)
   Phys. Rev. C91, 024916 (2015).

2. Editors Suggestion of Physical Review D
   Black hole-neutron star binary merger: Dependence on black hole spin orientation and equation of state
   Kyohei Kawaguchi
   Phys. Rev. D92, 024012 (2015).

3. JCP Editor's Choice for 2015
   Geometric pumping induced by shear flow in dilute liquid crystalline polymer solutions
   Shunsuke Yabunaka and Hisao Hayakawa
   J. Chem. Phys. 142, 054903 (2015).

4. Selected as one of inside front covers in Soft Matter
   Hydrodynamic instabilities in shear flows of dry cohesive granular particles
   Kuniyasu Saitoh(U. of Twente, former graduate student of YITP), Satoshi Takada(YITP) and Prof. Hisao Hayakawa(YITP)
   Soft Matter 32, 6346 (2015).

5. Editor's Choice Articles 2015
   Multi-disformal invariance of non-linear primordial perturbations
   Yuki Watanabe, Atsushi Naruko (former student of YITP) and Misao Sasaki(YITP)
   Europhys. Lett. 111, 39002 (2015).

6. Editor's Suggestions
   Universal damping mechanism of quantum vibrations in deep sub-barrier fusion reactions
   Takatoshi Ichikawa (YITP Research Assistant Professor) and Kenichi Matsuyanagi (YITP Affiliate Member)
   Phys. Rev. C93, 044306 (2016).

Chapter 3

Workshops and Conferences

3.1 International Workshops and Conferences

Since 1978, a series of international physics workshops, called *Yukawa International Seminar (YKIS)* are held annually or bi-annually. *The Nishinomiya Yukawa Memorial Project* was initiated by Nishinomiya city where the late Prof. Hideki Yukawa lived when he wrote his famous papers on the meson theory. As one of the major programs of this project, an international symposium open to public was held every year in Nishinomiya city, and its post/pre-workshop held at YITP. In recent years both the Nishinomiya Yukawa Symposium and its post/pre-workshops are held at YITP, Kyoto.

As of the academic year 2007, Yukawa Institute for Theoretical Physics launched a new five-year project, "*Yukawa International Program for Quark-Hadron Sciences* (YIPQS)." A few research topics are selected each year and a long-term workshop focused on each topic, extending over a period of a few months, is organized by inviting leading experts from the world. Emphasis is laid on fostering fruitful collaboration among the workshop participants.

In addition to these regular annual conferences, many international workshops and conferences of various sizes and durations from several days to more than one month are held every year.

Here is a list of main international workshops and conferences held in the academic year 2015.

Yukawa International Seminar (YKIS2015)

YKIS2015 : New Frontiers in Non-equilibrium Statistical Physics 2015
Aug.17 - Aug.19, 2015, Chaired by Hisao Hayakawa 96 participants (21 from abroad)
For details, see http://www2.yukawa.kyoto-u.ac.jp/˜ykis2015.ws/

Nishinomiya-Yukawa Symposium 2015

Long-term and Nishinomiya-Yukawa Memorial International Workshop on "Computational Advances in Nuclear and Hadron Physics"
Sep.21 - Oct.30, 2015, Chaired by Naoyuki Itagaki, 124 participants (55 from abroad)
For details, see http://www2.yukawa.kyoto-u.ac.jp/˜canhp2015/

3.2 YITP Workshops

YITP workshops are one of the main activities of Yukawa Institute. The aim of them is to open new research fields and stimulate nationwide collaborations. Workshop plans can be proposed by any researcher and are approved by the Committee on Research Projects of the Institute. Small workshops, summer schools and regional schools to educate young researchers are positively supported.
In the past 5 years, more than 20 workshops are held each year with 1500 strong participants visiting YITP. The list of the workshops together with the number of participants for the last academic year is given below.

▷ 2015.4.1 — 2016.3.31

Here is the list of workshops with the dates, the names of organizers, the number of participants.

YITP-W-15-01
New Trends in Novel Superconductors — From BCS to BEC —, Jun.09-Jun.10
H.Ikeda, R.Arita, Y.Ono, K.Kuroki, H.Kontani, I.Danshita, T.Tohyama, Y.Matsuda, Y.Yanase. *98-participants*

YITP-W-15-02
Quantum Information Science: Welcoming New Era through the Progress of Quantum Control Technology, Jul.13-Jul.16
M.Ohzeki, S.Kawakami, Y.Tsujimoto, Y.Tokura, M.Negoro, K.Fujii, T.Fukuhara. *124-participants*

YITP-W-15-03
Numerical approaches to the holographic principle, quantum gravity and cosmology, Jul.21-Jul.24
S.Aoki, David Berenstein, M. Hanada, G.Ishiki, J.Nishimura, Toby Wiseman. *49-participants*

YITP-W-15-04
Summer School on Astronomy and Astrophysics 2015, Jul.27-Jul.30
Y. Kitagawa, K.Onishi, T. Suski, Y. Aso, M.Onizuka, S.Sekiguchi, T.Suzuki, A.Taniguchi, K.Uehara, S.Ohashi, H.Baba,Y.Hirai, Y.Kato, T.Saito . *343-participants*

YITP-W-15-05
Condensed Matter Physics Summer School 60th, Jul.27-Jul.31
R.Numakura, T.Yamaguchi, S.Koshida, M.Shinozaki, N.Morishita, Y.Nakamura, T.Abe, J.Ichimura, K.Shinoda, S.Kusaba, R.Yamamura, M.Umeda, R.Hatakeyama, K.Hamamoto. *195-participants*

YITP-W-15-06
Searching principles of constructive destruction phenomena in complex systems, Aug.06-Aug.07
Y.Aizawa, T.Ohno, T.Ikegami, T.Utsumi, Y.Uchida, Y.Gunji, K.Hasegawa, H.Kokubu, K.Ikeda, T.Kobayashi, I.Tsuda, K.Nishimura, Y.Miwa, K.Mogi, M. Murase. *64-participants*

YITP-W-15-07
The 61th YONUPA Summer School, Aug.17-Aug.22
T.Tatsuishi, E.Shimoi, K.Endo, Y.Kaneta, H.Ito, H.Mori, D.Kawai, N.Fang, K.Matsui, R.Taniuchi, K.Yajima,Y.Murakami. *217-participants*

YITP-W-15-08
The 55th Summer School for Japanese Young Biophysics , Aug.21-Aug.24
H.Muta, K.Ono, M.Adachi, K.Kojima, Y.Imada, Y.Iida, S.Iida, H,Nishigami, A.Kusaka, M.Takenaka. *62-participants*

YITP-W-15-09
Thermal Quantum Field Theory and Their Applications, Aug.31-Sep.02
M.Asakawa, I.Ichinose, T.Inagaki, S.Ejiri, A.Ohnishi, M.Kitazawa, M.Sakagami, M.Tachibana, E.Nakano, Y.Nakamura, C.Nonaka, Y.Hidaka. *82-participants*

YITP-W-15-10
KIAS-YITP joint workshop 2015 "Geometry in Gauge Theories and String Theory", Sep.15-Sep.18
M.Sasaki, S.Sugimoto, T.Takayanagi, Kimyeong Lee, Piljin Yi. *86 -participants*

YITP-W-15-11
Progress in Particle Physics 2015, Sep.14-Sep.18
T.Abe, M.Ibe, T.Shindou, O.Seto, F.Takayama, K.Tsumura, K.Nakayama,T.Misumi. *116-participants*

YITP-W-15-12
Developments in String Theory and Quantum Field Theory, Nov.09-Nov.13
T.Azeyanagi, M.Hamanaka, K.Hashimoto, K.Hosomichi, H.Kunitomo, Y.Okawa, Y.Ookouchi, T.Sakai, M.Sakamoto, S.Sugimoto, Y.Tachikawa, T.Takayanagi, S.Yamaguchi, K.Yoshida. *113-participants*

YITP-W-15-13
The 4th workshop on observational cosmology, Nov.18-Nov.20
M.Oguri, A.Taruya, T.Hamana, C.Hikage. *64-participants*

YITP-W-15-14
Biological & Medical Science based on Physics: Radiation and phyiscs, Physics on medical science, Modeling for biological system, Nov.05-Nov.07
J. Kotoku, A.Haga, K.Nawa, M.Takashina, Y.Manabe, M.Bando, H.Kunitomo, T.Nakano, K.Nakai, M.Fujiwara, T.Wada, H.Nakajima, Y.Tsunoyama, D.Sakata, S.Tanaka, H.Yasuda, T.Nakaya. *78-participants*

YITP-W-15-15
Econophysics 2015 - Seeking a new direction, Dec.03-Dec.04
H. Aoyama, Y. Aruka, H. Iyetomi, Y. Ikeda, A. Ishikawa, H. Inoue, T. Ohnishi, A. Sato, W. Souma, Y. Fujiwara, J. Masukawa, T. Mizuno, H. Yoshikawa . *54-participants*

YITP-W-15-16
The 25th workshop on General Relativity and Gravitation (JGRG25), Dec.07-Dec.11
H.Asada, T.Chiba, T.Harada, K.Ioka, A.Ishibashi, H.Ishihara, M.Kawasaki, H.Kodama, Y.Kojima, K.Maeda, S.Mukohyama, T.Nakamura, K.Nakao, Y.Nambu, K.Oohara, M.Sasaki, M.Shibata, T.Shiromizu, J.Soda, N.Sugiyama, T.Tanaka, M.Yamaguchi, J.Yokoyama. *206-participants*

YITP-W-15-17
Dark Side of the Universe 2015, Dec.14-Dec.18
S.Aoki, T.Asaka, J.Hisano, K.Izawa, S.Mukohyama, M.Sasaki, O.Seto, F.Takayama, A.Taruya. *94-participants*

YITP-W-15-18
YITP Workshop on Quantum Information Physics (YQIP2016), Jan.05-Jan.08
M.Hotta, H.Matsueda, T.Morinari, Y.Nambu, M.Oshikawa, T.Takayanagi, S.Tanaka, K.Totsuka, I.Tsutsui, Y.Watanabe. *84-participants*

YITP-W-15-19
Avalanches, plasticity,and nonlinear response in nonequilibrium solids, Mar.07-Mar.09
H.Hayakawa, A.Ikeda, T.Ooshida, M.Otsuki, T.Yamaguchi, H.Yoshino. *48-participants*

YITP-W-15-20
Microstructures of black holes, Nov.23-Nov.27
M. Shigemori. *24-participants*

3.3 Regional Schools supported by YITP

▷ 2015.4.1—2016.3.31

Here is the list of the Regional Schools with the dates, the place, the name(s) of the main invited Lecturer(s) and the participating Universities.

YITP-S-15-01
43th Hokuriku Spring School, May.15-May.17, K. Yamawaki (Nagoya Univ), Y. Hidaka (RIKEN).
Niigata Univ., Kanazawa Univ., Fukui Univ., Shinshuu Univ.

YITP-S-15-02
Chuubu Summer School 2015, Aug.31-Sep.03, K. Sakai (Meiji Gakuin Univ.).
Shizuoka Univ., Shinshu Univ., Tokai Univ.

YITP-S-15-03
20th Niigata-Yamagata joint school, Oct.30-Nov.01, K. Hikasa (Tohoku Univ.).
Niigata Univ., Yamagata Univ., Tohoku Univ., Joetsu Univ. of Edu., Ohu Univ., Aizu Univ.

YITP-S-15-04
The 28th Hokkaido Nuclear Theory Group Meeting, Nov.25-Nov.27, S.Kubono (Univ of Tokyo), S. Wanajo(RIKEN).
Hokkaido Univ., Kitami Inst.of Tech., Sapporo Gakuin Univ., Hokusei Gakuen Univ.

YITP-S-15-05
38th Shikoku Seminar on Particle and Nuclear group , Dec.19-Dec.20, J. Nakamura (RIKEN).
Tokushima Univ., Ehime Univ., Kochi Univ., Kagawa Coll., Yonago Coll.

Chapter 4

Public Lecture and Outreach

4.1 Public lecture series

As an outreach activity, we are holding public lecture series co-hosted with Division of Physics and Astronomy (DPA), Graduate School of Science, Kyoto University. All lectures are free and open to the public. This has been held every year in the autumn, and taken over those held as an activity of the 21st Century COE Program, "Center for Diversity and Universality in Physics" (2003 - 2007), and the Global COE Program, "The Next Generation of Physics, Spun from Universality and Emergence" (2008 - 2012). Every time, three professors of Division of Physics and Astronomy and Yukawa Institute for Theoretical Physics explain their research for general audience at Kyoto University Clock Tower Centennial Hall.

In this academic year, we held

1. Physics and the Universe III,
   December 6, 2015

   "Find a Black Hole", [1]
   Yoshihiro Ueda (DPA)
   "Challenge from Micro to Order Emergence", [1]
   Shin-ichi Sasa (DPA)
   "Miracle of Superstring Theory", [1]
   Shigeki Sugimoto (YITP)

4.2 YITP public lectures

In addtion to the public lecture series presented above, we have held the following public lectures given by the members of YITP and/or leading researchers visiting YITP from abroad in this academic year.

1. Lecture by Nobel laureate,
   April 6, 2015

   "The Higgs Particle",
   Gerard 't Hooft (Utrecht University)

2. Centennial of General Relativity and Black Hole,
   November 22, 2015

   "Einstein and Gravity - 100 Years of General Relativity",
   Misao Sasaki (YITP)
   "The Evolusion of Black Hole",
   Nicholas Warner (Univ. of Southern California)
   "What's going on in the Black Hole",
   Masaki Shigemori (YITP)

3. Shinagawa Seminar,
   August 7, 2015

   "Jammed sands and unjammed sands"
   Hisao Hayakawa (YITP)

[1] Original titles of these lectures are given in Japanese. They are translated in English by our responsibility.

4. Colloquium by Nobel laureate,
   September 8, 2015

   “The origin of elementary particle masses”
   François Englert (Université Libre de Bruxelles)

5. Public lectures in celebration of the centennial anniversary of general relativity,
   November 28, 2015

   “General relativity and past, present and future of the Universe"
   Misao Sasaki (YITP)

4.3 Other outreach activities

1. November 6, 2015
   Prof. Atsushi Taruya gave a lecture to junior-high and high school students at Takatsuki high school.

2. October 2, 2015
   Prof. Masatoshi Murase gave a Kyoto University Special Lecture to the students of Shiga Prefectural Zeze High School.

3. February 18, 2016
   Prof. Atsushi Taruya gave a lecture in Tonoda junior high-school, Nantan city.

4. February 27, 2016
   An interview article with Prof. Masaru Shibata on the subject of gravitational wave research has appeared in Kyoto Shimbun (newspaper) on 27th February 2016.