YITP Annual Report

Yukawa Institute For
Theoretical Physics
Kyoto University

2018

Foreword

We present here an annual report of the scientific activities of Yukawa Institute for Theoretical Physics during the academic year 2018.

From the year 2007 we started our new project "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 2018, we held two long-term workshops "New Frontiers in String Theory 2018" and "New Frontiers in QCD 2018 (NFQCD 2018) – Confinement, Phase Transition, Hadrons and Hadron Interactions –", 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, seven workshops and symposiums were held in the year 2018, which stimulate discussion on various topics in science and culture. On April 2016, we newly established a research organization "Center for Gravitational Physics (CGP)", and has developed collaborative researches among particle physics, astrophysics and cosmology. In January, 2018, we newly established a quantum information theory group as our 5th main research group in YITP, in addition to high energy physics, nuclear physics, astrophysics and cosmology, and condensed matter groups. We then had the 1st YITP School on Quantum Information in March, 2019, which was very successful with many participants.

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
Sinya Aoki

Contents

Chapter 1

Members

1.1 Regular Staff, Visiting Professors and Advanced Future Studies Researchers (2018 April – 2019 March)

Regular Staff

Sinya Aoki
Professor (E)

Akira Ohnishi
Professor (N)

Hisao Hayakawa
Professor (C)

Masaru Shibata
Professor (A)

Tadashi Takayanagi
Professor (E)

Shigeki Sugimoto
Professor (E)

Shinji Mukohyama
Professor (A)

Masatoshi Sato
Professor (C)

Kunihito Ioka
Professor (A)

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) [2013.4.1 –2018.11.30]

Atsushi Taruya
Associate Professor (A)

Antonio De Felice
Associate Professor (A)

Kenta Kiuchi
Associate Professor (A) [2016.10.1 –2018.12.31]

Yasuaki Hikida
Associate Professor (E)

Takahiro Nishimichi
Associate Professor (A) [2019.1.1 –]

Tomoyuki Morimae
Senior Lecturer (Q)

Yuko Fujita
Senior Lecturer (Project Manager)

Seiji Terashima
Assistant Professor (E)

Yu Watanabe
Assistant Professor (C)

Tetsuo Hyodo
Assistant Professor (N) [2013.8.1 –2019.3.31]

Ken Shiozaki
Assistant Professor (C) [2018.9.1 –]

Koichi Hattori
Assistant Professor (N) [2018.12.1 –]

Yoshifumi Nakata
Assistant Professor (Q) [2019.1.1 –]

In this list, the symbols A, C, E, N and Q 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
Q: Quantum Information

Visiting Professors

Prof. Amir LEVINSON
(Tel Aviv University)
2018.4.1 — 2018.6.30
Propagation and emission of relativistic shocks and jets

Prof. Massimo PORRATI
(New York University)
2018.6.1 — 2018.8.31
Investigations in Anti de Sitter Gravity in Three Dimensions

Prof. Anatoli AFANASJEV
(Mississippi State University)
2018.9.14 — 2018.12.13
Analysis on the nuclear structure based on the density functional theory

Prof. Thors Hans HANSSON
(University of Stockholm)
2018.1.1 — 2018.3.31
Effective field theories for nonabelian topological matter

Advanced Future Studies

Andrew DARMAWAN
Program-Specific Assistant Professor
2018.6.1 - 2020.3.31

Amir LEVINSON
Visiting Fellow
(Tel Aviv University)
2017.7.1 - 2017.7.31

Bert Ingo FISCHER
Visiting Fellow
(Instituto de Física Interdisciplinary Sistemas Complejos IFISC (UIB-CSIC))
2018.10.3 - 2018.11.2

Johann HOHENEGGER
Visiting Fellow
University of Vienna
2018.10.8 - 2018.11.25

1.2 Hakubi Researchers, Research Fellows and Graduate Students (2018 April – 2019 March)

Hakubi Researchers

Marcus Christian Werner
Hakubi Project Assistant Professor (A)

Research Fellows

Wakana Iwakami (A) [2013.4.1 –]

Atsushi Watanabe (Program Coordinator) [2016.4.1 –]

Masaya Kunimi (C) [2016.4.1 – 2019.3.31]

Shuuichi Yokoyama (E) [2016.4.1 –]

Kenji Sasaki (E) [2016.5.1 –]

Jose Juan Fernandez-Melgarejo (E) [2016.9.30 – 2018.6.29]

Nilay Kundu (E) [2016.11.1 – 2018.9.30]

Pawel Piotr Caputa (E) [2017.1.1 –]

Nobuya Nishimura (A) [2017.4.1 –]

Toru Kikuchi (C) [2017.4.1 – 2019.1.31]

Sho Fujibayashi (A) [2017.4.1 – 2018.5.31]

Shuntaro Mizuno (A) [2017.4.1 – 2019.3.31]

Tatsumi Aoyama (E) [2017.4.1 – 2018.9.30]

Hironori Mori (E) [2017.4.1 – 2018.5.31]

Takuto Kawakami (C) [2017.4.1 –]

Shohei Saga (A) [2017.4.1 –]

Masato Nozawa (E) [2017.5.1 –]

Arpan Bhattacharyya (3) [2018.8.28 –]

Ryuichi Fujita (A) [2017.10.1 –]

Hayato Motohashi (A) [2017.11.1 –]

Kazuya Takahashi (A) [2017.11.1 –]

Sanjin Benic (N) [2017.11.20 –]

Katsuhisa Taguchi (C) [2018.1.1 –]

Yuta Asahina (A) [2018.4.1 – 2019.3.31]

Hamid Hamidani (A) [2018.4.1 –]

Nobuyuki Okuma (C) [2018.4.1 –]

Sosuke Noda (A) [2018.4.20 –]

Tatsuki Hashimoto (C) [2018.6.1 –]

Di-Lun Yang (N) [2018.9.1 – 2019.3.31]

Yun-Long Zhang (A) [2018.11.12 –]

Luca Jose Lionni (E) [2018.3.26 – 2019.3.25]

Graduate Students

Takaya Miyamoto (E) [2015.4.1 –]

Kazuhiko Tanimoto (C) [2012.4.1 –]

Chen Hua (E) [2015.10.1 –]

Yukihisa Imamura (C) [2014.4.1 –]

Yuki Kamiya (N) [2014.4.1 – 2019.3.31]

Masamichi Miyaji (E) [2014.4.1 – 2019.3.31]

Kazuma Nagao (C) [2014.4.1 – 2019.3.31]

Kazuma Shimizu (E) [2014.4.1 – 2019.3.31]

Haruki Uchida (A) [2014.4.1 – 2019.3.31]

Kazuhito Kuramoto (C) [2015.4.1 –]

Michele Oliosi (A) [2016.10.1 –]

Youhei Ishihara (A) [2016.4.1 –]

Naotaka Kubo (E) [2016.4.1 –]

Yuya Kusuki (E) [2016.4.1 –]

Tetsuya Okamura (C) [2016.4.1 – 2018.9.25]

Koji Umemoto (E) [2016.4.1 –]

Yutaro Akahoshi (E) [2017.4.1 –]

Takumi Bessho (C) [2017.4.1 –]

Haruki Kasuya (N) [2017.4.1 –]

Ryo Kanazawa (A) [2017.4.1 –]

Taigen Kawano (E) [2017.4.1 –]

Pradipto (C) [2017.10.1 –]

Tatsuya Sugimoto (E) [2017.4.1 –]

Atsushi Takiuchi (C) [2017.4.1 – 2019.3.31]

Tomoki Wada (A) [2017.4.1 –]

Zixia Wei (E) [2018.4.1 –]

Teppei Shimaji (E) [2018.4.1 –]

Kotaro Murakami (E) [2018.4.1 –]

Takamasa Kanai (N) [2018.4.1 – 2018.6.30]

Fumiya Kato (A) [2018.4.1 –]

Kazutaka Kimura (A) [2018.4.1 –]

Kota Hayashi (A) [2018.4.1 –]

Taisuke Matsuda (A) [2018.4.1 –]

Daisuke Ishima (C) [2018.4.1 –]

Yuki Hino (C) [2018.4.1 –]

Masahiro Ogura (C) [2018.4.1 –]

Riku Masui (C) [2018.4.1 –]

Chandhanapparambil Pookkillath Masroor (A) [2018.10.1 –]

Ville Matial Mikael Paasonen (C) [2018.10.1 –]

Ph.D Awarded

Yuki Kamiya
Model-independent study on the internal structure of exotic hadrons (N)
(Akira Ohnishi)

Masamichi Miyaji
Quantum Entanglement, Fidelity Susceptibility, and Scrambling from AdS/CFT correspondence (E)
(Tadashi Takayanagi)

Takaya Miyamoto
Charmed baryon interaction from lattice QCD and its application to charmed hypernuclei (E)
(Sinya Aoki)

Kazuma Nagao
Fluctuations and non-equilibrium phenomena in strongly-correlated ultracold atoms (C)
(Keisuke Totsuka)

Kazuma Shimizu
Phases of Supersymmetric Gauge Theories on the Three-Sphere (E)
(Hiroshi Kunitomo)

Haruki Uchida
Black Hole Formation, Explosion and Gravitational Wave Emission from Rapidly Rotating Very Massive Stars (A)
(Masaru Shibata)

1.3 Affiliate Professors and Affiliate Associate Professors (2018 April – 2019 March)

Affiliate Professors

Nathalie Deruelle
Professor, Astroparticule et Cosmologie - Université Paris Diderot

Hideo Kodama
Professor Emeritus, Kyoto University

Takahiro Tanaka
Professor, Graduate School of Science, Kyoto University

Yshai Avishai
Professor, Department of Physics, Ben Gurion Universiyt

Takashi Nakamura
Professor Emeritus, Kyoto University

Misao Sasaki
Deputy director, Kavli Institute for the Physics and Mathematics of the Universe, The University of Tokyo

Affiliate Associate Professors

Kohta Murase
Assistant Professor, Department of Physics, The Pennsylvania State University

Masaki Shigemori
Lecturer, School of Physics and Astronomy, Queen Mary University of London

Shinji Hirano
Senior Lecturer, School of Physics, University of Witwatersrand

Kenta Kiuchi [2019.1.1-]
Group Leader, Max Planck Institute for Gravitational Physics (Albert Einstein Institute)

Chapter 2

Research Activities

2.1 Research Summary

Astrophysics and Cosmology Group

Inflation and Early Universe

In our universe physical phenomena at various scales occur constantly, having mutual influence on each other. We consider it necessary for physics at the largest scales, i.e. cosmology, to be connected with physics at the shortest scales. For this reason we have been working on the early universe cosmology, where microscopic physics is essential, from various viewpoints by using every possible means such as general relativity, statistical physics, particle physics and superstring theory. For example, Mizuno and Mukohyama worked on quantum entanglement in the context of multi-field inflation, Mukohyama developed the kinetic equation for Lifshitz scalars, and Motohashi worked on constant-roll inflation and primordial black holes.

Theory of Gravity

Massive gravity, the possibility that the graviton may have a non-vanishing mass, has a long history since Fierz and Pauli proposed a linear theory in 1939. It has nonetheless been rather difficult to establish a stable cosmological solution in the context of massive gravity. The minimal theory of massive gravity (MTMG) that De Felice and Mukohyama proposed in 2015 evades such difficulties and provides a fully stable nonlinear completion of the self-accelerating cosmological solution in massive gravity. De Felice, Mizuno, Mukohyama, & Oliosi worked on theoretical developments of and observational constraints on MTMG. Recently, gravitational theories with higher derivative terms, called DHOST, have been attracting great interest among researchers in the field. Motohashi worked on various theoretical aspects and black hole solutions of DHOST.

Observational Cosmology

For increasing the statistical precision of large-scale structure observables, measurement of the bispectrum, the simplest higher-order statistics, is a key to tighten cosmological constraints, and exploring its statistical powers and modeling/testing theoretical templates are crucial in precision cosmology. Taruya and collaborators have developed theory and application of bispectrum. Namikawa, Bouchet, and Taruya showed that the CMB lensing bispectrum offers a way to constrain deviations from GR in a broad class of modified gravity called “beyond Horndeski”. Employing perturbation theory technique, Bose and Taruya also presented the matter bispectrum template beyond GR. In addition, Namikawa, Taruya, et al. critically tested analytical predictions of CMB lensing bispectrum based on non-linear fitting formulas.

Nishimichi, Taruya and their collaborators studied several essential ingredients to pursue precision cosmology with large-scale structure observations. Saga, Taruya and Colombi presented a first detailed comparison between analytic prediction based on Lagrangian perturbation theory and state-of-the-art 6D Vlasov simulation, finding a way to describe accurately the phase-space structure of proto-halos at the shell-crossing. Breton, Taruya, et al. built a large halo catalog taking self-consistently account of the relativistic contributions such as (transverse) Doppler, gravitational redshift, and lensing etc., and successfully measured the dipole asymmetry in the cross-correlation function arising from relativistic contributions. Further, Osato, Nishimichi, Taruya, et al. tested an ability of perturbation theory templates for power spectrum to the cosmological parameter estimation, and showed that their ability depends crucially on the parameter degeneracy with nuisance parameters. Takahashi, Nishimichi, et al. studied an impact of super-survey modes on the power spectrum covariances of cosmic shear and galaxy-galaxy lensing, and exploited a method to analytically estimate its effect by the "response-function approach". Finally, Han, Nishimichi, et al. developed a novel technique based on the Gaussian-Process Regression (GPR) to characterize the multi-variate nature of the halo bias in a parameter-free way.

Numerical relativity

The merger of neutron star (NS) and/or black hole (BH) is not only the most promising source of gravitational waves but also a source of strong electromagnetic transient signals and a promising site for the r-process nucleosynthesis. Latest gravitational-wave observation has shown that there are many massive black holes of mass $\gtrsim 30M_{\odot}$, but the formation process of the massive black holes is still unsolved. To predict the processes of neutron-star mergers and to clarify the black-hole formation process, the unique theoretical approach is numerical relativity which is intensively performed in YITP. This year, Fujibayashi, Kiuchi, Shibata, and Uchida with their collaborators performed most-advanced numerical-relativity simulations for neutron-star mergers, post-merger evolution, stellar collapse to a black hole. In their latest results of high-resolution magnetohydrodynamics simulations for NS-NS merger, Kiuchi et al. showed that the magnetic field is amplified up to 10^{16} G in the remnant neutron star and surrounding accretion disks, and demonstrated that turbulence viscosity is enhanced at least in the accretion disk. Fujibayashi et al. explored the post-merger evolution of remnant massive neutron stars

surrounded by a dense torus, and showed that this system is a promising ejection source of neutron-rich matter, which subsequently synthesizes relatively low-mass element through r-process nucleosynthesis. Uchida et al. explored the formation of black holes in the very massive rotating star via pair-instability collapse, and showed that such collapse could be the sources of supernova-like transient optical sources and of the third-generation gravitational-wave detectors.

Gravitational-wave astronomy

Modeling electromagnetic counterparts of gravitational-wave sources rapidly becomes a crucial task in gravitational-wave astronomy, because information on the gravitational-wave source is reflected more clearly in the electromagnetic signals than in gravitational waves. Hotokezaka, Kiuchi and Shibata explored the modeling of radio counterparts using numerical-relativity results. Kawaguchi, Shibata with a collaborator explored the modeling of UV-optical-IR counterparts in terms of kilonova hypothesis using a radiation transfer simulation with the ejecta models based on numerical relativity. Matsumoto, Ioka, Kisaka and Nakar discussed a kilonova (UV-optical-IR counterpart) powered by central engine activities such as jet activities and X-rays from the matter fallback and show that the engine model allows much broader parameter spaces, in particular, smaller ejecta mass, than the r-process model.

High Energy Astrophysics

Exploring high-energy universe is now strongly driven by multi-messenger astrophysics and big surveys. Theoretical studies are crucial for interpreting the observations and predicting new phenomena to reveal the origin of high-energy particles and the physics of relativistic jets in strong gravity around black holes and neutron stars. Kisaka, Ioka, Kashiyama, & Nakamura discussed the emission mechanism of the faint short gamma-ray burst GRB 170817A associated with the gravitational-wave event GW170817 and showed that the scattering of photons by a cocoon, which is produced through the jet-merger-ejecta interaction, could explain the spectrum of the gamma-ray burst, supporting the off-axis model of the gamma-ray burst proposed by Ioka and Nakamura. Kimura, Murase, and Ioka with collaborators discussed transejecta emission of high-energy neutrinos during the jet's propagation within the merger ejecta, suggesting a way to reveal the physical quantities of the choked jets even without electromagnetic signals. Ioka, Levinson, and Nakar found that in sufficiently fast shocks, for which the breakout velocity exceeds about 0.1c, the time-integrated spectrum of the breakout pulse is non-thermal, and the time-resolved temperature is expected to exhibit substantial decrease (roughly by one order of magnitude) during breakout, based on the workshop and discussions with Levinson, who stayed in YITP as a visiting professor in 2018.

Condensed Matter and Statistical Dynamics Group

Non-Hermitian topological phases

Whereas any Hamiltonian in a closed system is supposed to be Hermitian, it can be non-Hermitian in an open system. Such non-Hermitian systems sometimes show new phenomena that are not observed in Hermitian systems. For instance, non-Hermiticity enables new gapless structures called bulk Fermi arc with exceptional points, or it provides new functionality such as topological lasers. Sato, Shiozaki and collaborators explored possible topological phases intrinsic to non-Hermitian systems. They discovered that these topological phases are characterized by fundamental 38 symmetry classes and two different types of the gap structures, and completed the classification of non-Hermitian topological phases. Moreover, Bessho, Sato and collaborators classified possible gapless phases in non-Hermitan systems. The obtained classification uncovered the existence of a dumb-bell like gapless structure that was not discussed before. Okuma and Sato also revealed that topolgocal phase transition may take place by infinitesimal small perturbation in non-Hermitian systems

Coupled-wire construction of two-dimensional topological phases

Two-dimensional (intrinsic) topological phases of matter have many remarkable characteristics that do not exist in one dimension: bulk quasi-particles obeying statistics which is neither bosonic nor fermionic (fractional statistics), ground-state degeneracy depending on the topology of the system, and topological entanglement entropy. Coupled-wire construction (CWC) proposed some time ago gives a way of realizing such interesting phases in a physical way by coupling more conventional one-dimensional quantum fluids. Nevertheless, most studies on CWC have focused only on the boundary properties of the topological phases in question and little attention has been paid to their bulk properties. Imamura, Totsuka, and Hansson clarified how non-trivial (two-dimensional) topological gauge theories emerge in arrays of (ungauged) coupled quantum wires and showed that most of the remarkable bulk properties of two-dimensional topological phases are in fact reproduced in CWC.

Symmetry protected topological phases

Symmetry protected topological (SPT) phases are topologically distinct phases of gapped, short-range-entangled (SRE) quantum states with symmetry at zero temperature. SPT phases are a family of topological phases: Two SRE states are said to belong to the same SPT phase if there exists a continuous path of Hamiltonians interpolating between them that preserve both the symmetry and the energy gap. Developing the Kitaev's argument that SPT phases are classified by a generalized cohomology theory, Shiozaki and his collaborators studied a mathematical structure similar to the algebraic topology behind the physics of SPT phases. They discussed an SPT phase is classified by a generalized homology theory over a real space manifold on which Hamiltonians defined. The bulk-boundary correspondence is naturally regarded as the boundary map in the generalized homology theory. The hierarchical concepts such as SRE states, 't Hooft anomaly, and adiabatic pumps are turned out to be the degrees of the generalized homology theory. As a byproduct of the real space formulation, they constructed the Atiyah-Hirzebruch spectral sequence (AHSS) for SPT phases with crystalline symmetry. Using the AHSS, Okuma, Sato and Shiozaki uncovered the classification of higher-order topological insulators protected by magnetic point group symmetry in spinful electrons.

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 spreaded in variety of fields in social sciences, biology, chemistry, engineering, mathematics and physics. The current research activities of our group are nanophysics, granular physics, nonlinear rheology in glassy materials, biomechanics, and system biology. In this academic year, we organized a molecular-type two-weeks workshop "Rheology of disordered particles - suspensions, glassy and granular materials" held in June 18th-29th, and an international workshop "Physics of Jammed Matter" in October 26th-27th.

Theory of Dense Suspensions We have successfully obtain the theory of dense suspensions in which the visocity increses as the density increases and diverges at the jamming point. Our remarkable achievements are that (i) the exponent of the viscosity near the jamming point is -2, and (ii) the stress ratio becomes a constant at the jamming point and has a correction proportional to the square root of the viscous number. We also evaluate the anisotropic behavior of the radial distribution function. These results are known in experiments but our theory is the first explanation of these observations.

Theory of many-body systems activated by non-Gaussian noise We develop the theory to describe a collection of many-body systems activated by a non-Gaussian noise, which is a model of active matter. The formulation is anaologous to the Martin-Siggia-Rose formalism for the Gaussian noise, but it contains higher cumulants of the noise. The qualitative behavior of the theory is similar to that in the active Ornstein-Urhlenbeck process, in which there is an effective attractive interaction between two elements,

Kinetic theory of dilute cohesive granular particles If grains such as aerosol particles are small, mutual attrac-

tive interactions cannot be neglected. Then, we have developed the kinetic theory to describe many-body systems under a simple shear, What we found is that (i) there is a critical shear rate, (ii) below the shear rate, clusters is formed, which grows with the time, and (iii) above the critical shear rate, the description based on the Boltzmann equation works well.

Searching A Scale-invariant Principle Behind Dynamic Systems Nature of Life Nature is full of emergent complex dynamics. In order to understand such complex phenomena, the self-similar dynamic processes view would be introduced on the assumption that the underlying principles should be self-consistent, regardless of the scale with which we are concerned. It is the self?nonself circulation principle that governs the complexity of life.

Nuclear Theory Group

Nuclear theory group studies various aspects of quark-hadron-nuclear systems interacting via "strong interactions", widely extending from quarks and gluons, hadrons such as mesons and nucleons, to nuclei made of nucleons and hyperons. In order to study these systems belonging to different hierarchies, various theoretical techniques in physics are utilized — quantum mechanics, relativity, field theories, and many-body theories. Main subjects discussed in nuclear theory group at present include the structure and dynamics of nuclei and hadrons, and hadronic and quark matter under extreme conditions. These are closely related to particle physics, astrophysical phenomena, condensed matter theories as well as to recent accelerator experiments in the world.

Nuclear structure and dynamics

Nuclei sit at the center of atoms and specify the atomic element. Nuclei are composites made of nucleons (protons and neutrons) and have various structures and excitation schemes as quantum mechanical many-body systems. The primary goal of this area is to elucidate and predict the evolution of nuclear properties as functions of proton and neutron numbers — nuclear shape, density and mass of the ground and excited states, and the structure of the excited level spectrum. Especially, novel structure of neutron-rich nuclei is of particular interest.

Direct inclusion of the spin-orbit correlation in the THSR wave function: The Tohsaki-Horiuchi-Schuck-Röpke (THSR) wave function has been successfully used for the studies of gas-like nature of α clusters in various nuclei including the so-called Hoyle state of ^{12}C and four α states of ^{16}O. In standard α cluster models, however, each α cluster wave function has spin zero because of its spatial symmetry and antisymmetrization effect. Thus the non-central interactions do not contribute, and this situation is the same in the THSR wave function. In this work, the spin-orbit contribution, which is found to be quite important at short α-α distances, is taken into account in the THSR wave function by combing it with antisymmetrized quasi cluster model (AQCM). The application to ^{12}C was presented. The multi-integration in the original THSR wave function is carried out by using a Monte Carlo technique, which is called Monte Carlo THSR wave function. For the nucleon-nucleon interaction, the Tohsaki interaction, which contains finite-range three-body terms and simultaneously reproduces the saturation properties of nuclear systems, the α-α scattering phase shift, and the size and binding energy of ^{4}He, was adopted.

Direct inclusion of the tensor correlation in the cluster model: The tensor correlation is very important in the nuclear structure, but this is often renormalized in the central interaction. To directly include the tensor effect, the tensor version of antisymmetrized quasi cluster model (AQCM) was proposed. Although AQCM-T is phenomenological, The deuteron-like $T = 0$ NN-pair induced by the tensor interaction is introduced in a very simplified way, which allows us to proceed to heavier nuclei. Using AQCM-T, the the significant tensor contribution in ^{4}He is shown, which is almost comparable to the central interaction, where D-state mixes by 8% to the major S-state. The AQCM-T model with the new interaction is also applied to ^{8}Be. It is found that the tensor suppression gives a significant contribution to the short-range repulsion between two α clusters.

Density functional theory description of odd-mass nuclei: A method to describe odd-mass nuclei as a ground state under an appropriate constraint is proposed in a framework of density functional theory. Density functional theory (DFT) is an approach that describes ground-state properties of quantum many- body systems such as atomic nuclei in terms of the particle density. In principle, DFT is applicable to all nuclei systematically. However, there have been few studies of odd-mass nuclei by DFT. This is because the conventional treatment of odd-mass nuclei is complicated compared with that of even-even nuclei; odd-mass nuclei are obtained as an excited state from the neighboring even-even nuclei. Using the proposed method, one can get odd-mass nuclei with the same procedure as for even- even ones. The method was applied to neutron-rich Mg isotopes, and the structure of ^{37}Mg was analyzed microscopically.

Quark-Hadron Sciences

Quarks and gluons are strongly interacting fundamental particles, but they are confined inside hadrons in vacuum. Nuclear theory group in YITP also studies the quark-hadron aspects of nuclear physics. Focuses are put on quark-gluon structure of hadrons, hadron resonances, hadron-hadron interactions, and QCD matter properties.

Hadron structure and dynamics

The structure of hadron resonances are studied in hadron-hadron scattering, with emphasis on the unstable nature of the resonances. The hadron scattering amplitudes are described within the effective field theory technique, and the recent lattice QCD data was used to constrain the short distance behavior of the potentials. The internal structure of hadron resonances are discussed from the obtained scattering amplitudes.

$N\Omega$ interaction: Based on a baryon–baryon interaction model with meson exchanges, the origin of the strong attraction in the $N\Omega(^5S_2)$ interaction is studied, which was indicated by recent lattice QCD simulations. The long range part of the potential is constructed by the known mechanisms, the exchanges of the η meson and of the correlated two mesons in the scalar-isoscalar channel, denoted by "σ" in the literature, and the short range part

is represented by the contact interaction. It is found that the meson exchanges do not provide sufficient attraction. This means that most of the attraction is attributed to the short range contact interaction. The effect of the coupled channels to the $N\Omega(^5S_2)$ interaction is then studied. It is shown that, while the D-wave mixing of the $N\Omega$ channel is negligible, the inelastic $\Lambda\Xi$, $\Sigma\Xi$, and $\Lambda\Xi(1530)$ channels via the K meson exchange give the attraction of the $N\Omega(^5S_2)$ interaction to the same level with the elastic meson exchanges. Although the elimination of these channels induces the energy dependence of the single-channel $N\Omega$ interaction, this effect is not significant. With the present model parameters fitted to reproduce the scattering length of the HAL QCD result of the nearly physical quark masses, we obtain the $N\Omega(^5S_2)$ quasibound state with its eigenenergy $2611.3-0.7i$ MeV, which corresponds to the binding energy 0.1 MeV and width 1.5 MeV for the decay to the $\Lambda\Xi$ and $\Sigma\Xi$ channels. From the analysis of the spatial structure and the compositeness, the quasibound state is shown to be the molecular state of $N\Omega$. An equivalent local potential is also constructed for the $N\Omega(^5S_2)$ system which is useful for various applications.

Strangeness $S=-2$ baryon-baryon interactions in relativistic chiral effective field theory: The strangeness $S=-2$ baryon-baryon interactions is studied in relativistic chiral effective field theory at leading order. Among the 15 relevant low energy constants, eight of them are determined by fitting to the state of the art lattice QCD data of the HAL QCD Collaboration (with $m_\pi = 146$ MeV), and the rest are either taken from the study of the $S=-1$ hyperon-nucleon systems, assuming strict SU(3) flavor symmetry, or temporarily set equal to zero. By using the so-obtained low energy constants, the results are extrapolated to the physical point, which are consistent with the available experimental scattering data. Furthermore, it is demonstrated that the $\Lambda\Lambda$ and ΞN phase shifts near the ΞN threshold are very sensitive to the lattice QCD data fitted, to the pion mass, and to isospin symmetry breaking effects. As a result, any conclusion drawn from lattice QCD data at unphysical pion masses (even close to the physical point) should be taken with caution. The results at the physical point, similarly to the lattice QCD data, show that a resonance/quasi-bound state may appear in the $I=0$ $\Lambda\Lambda/\Xi N$ channel.

Nature of the D_0^* meson in the $D\pi$ scattering with chiral symmetry: The nature of the scalar D_0^* meson is studied from the viewpoint of chiral symmetry. With the linear representation of chiral symmetry, the $D\pi$ scattering amplitude satisfying the chiral low-energy theorem is constructed, in which the D_0^* meson appears as an s-wave resonance. It is shown that the properties of the D_0^* meson can be successfully reproduced as the chiral partner of the D meson coupled with the $D\pi$ scattering states. At the same time, it is found that the spectral function and the pole position of D_0^* are not very sensitive to the reduction of the chiral condensate, indicating the importance of the dressing of the bare state by the $D\pi$ molecular component.

High-Energy QCD

Our group focuses on the structure of the nucleons (protons and neutrons) and nucleus in terms of quarks and gluons. This includes the mass and spin structure of the nucleon/nucleus as well as the gluon saturation in high energy QCD. These are the main physics motivations of the Electron-Ion Collider (EIC) to be built in the US in future, and the effort of this group is closely coordinated with the objectives of EIC.

Nucleon mass structure: The mass of the proton (1 GeV) cannot be explained by the naive sum of the current quark masses ($\sim$ 10 MeV). Where does the remaining mass come from? One way to understand the proton mass is the trace anomaly of QCD. Hatta, together with collaborators, have succeeded in computing the trace anomaly separately for the quark and gluon parts of the energy momentum tensor. This has been done at two-loops in dimensional regularization. It has been proposed that the trace anomaly, or more precisely the gluon condensate in the proton can be measured experimentally in near-threshold J/ψ production in ep scattering. Hatta, Yang and a collaborator calculated the cross section using a holographic model and fitted their result to the recent experimental data from Jefferson Laboratory. They also proposed a new method to measure the gluon condensate using ultraperipheral collisions at RHIC.

Nucleon spin structure: The spin of the proton (1/2) cannot be explained by the naive sum of the helicity of the valence quarks. Where does the remaining spin come from? After decades of experimental efforts, it is known that the gluon helicity contributes significantly to the proton spin, but there are also contributions from the orbital angular momentum (OAM) which is poorly understood to date. It has been shown that the OAM is related to the so-called Wigner distribution of the nucleon. Hatta, together with collaborators, showed how to experimentally access the Weiszacker-Williams gluon Wigner distribution in double quarkonium production in pp collisions. Another research activity related to spin is transverse single spin asymmetry (SSA) which is a left-right asymmetry of produced hadrons in the scattering of transversely polarized proton and an unpolarized target. Recently it has been suggested that the twist-three fragmentation functions are the dominant source of SSA. To test this scenario, Benic and Hatta have studied two experimental processes. One is SSA in ultraperipheral pA collisions and the other is the mass number dependence of SSA in the forward pA collisions including the gluon saturation effects. These processes help disentangle different contributions to SSA.

Gluon saturation: At very high energy, or equivalently, at very small values of Bjorken-x variable, hadrons and nuclei become a densely packed, saturated system of glu-

ons called the Color Glass Condensate (CGC). To constrain the gluon distribution of such a system, Benic and his collaborators computed inclusive isolated photon production in p+p collisions. They used the dilute-dense Color Glass Condensate formalism and found about 10% breaking of k_T-factorization for low photon transverse momenta. This can be tested in the future at the LHC.

Heavy-Ion Collisions and QCD matter properties

Under the extreme conditions at high temperature and/or density, the strong interaction is no longer strong enough to confine quarks and gluons in the form of hadrons as a consequence of the asymptotic freedom in QCD. Such extreme environments are thought to be realized in the early universe and neutron-star core in nature and can be created in the relativistic heavy-ion collision experiments with Relativistic Heavy Ion Collider (RHIC) and Large Hadron Collider (LHC). The experimental data accumulated in the last two decades suggest the formation of the new state of matter called the quark-gluon plasma (QGP). In neutron star core, the baryon density may reach a few times of the normal nuclear density, where quarks may be deconfined. Dense nuclear matter properties are also important in binary neutron star mergers, where the density may reach 10 times nuclear matter density. Some of the members of nuclear theory group, Hattori, Ohnishi and collaborators, are studying QCD matter properties and their consequences measurable in the heavy-ion collisions.

Spin transport phenomena in quark-gluon plasma: In quantum theory, the angular momentum may have not only the orbital component generated by particle motion but also the intrinsic quantum component, i.e., spin. Quarks and gluons are carriers of spin, so that their flow could induce a spin current in the QGP. In many-body systems at high temperature, spins of particles are oriented in random directions, and there is no net spin current generically. However, the highly accelerated heavy ions create a strong electromagnetic field and an angular momentum, i.e., a global rotation of the QGP. A nonzero spin polarization could be created by those perturbations in the initial stage of the spacetime evolution of QGP, and will transport in the form of the spin current. Hattori and collaborators formulated the "relativistic spin hydrodynamics," and Hattori, Yang, and collaborators formulated the "axial kinetic equation." Both of them allow one to consistently describe the spacetime evolution of the dynamical spin degree of freedom in the QGP, but work in different regimes. Those frameworks are important for identifying the origins of the spin polarization of the final-state hadrons which have been found in the recent measurements. Incidentally, the spin transport phenomena are also hot topics in condensed matter physics, establishing a new research field as known as spintronics. The relativistic spin hydrodynamics was formulated in collaboration with an expert researcher from spintronics.

Initial-state dynamics: The dense gluonic system described by the CGC picture creates a strong chromo-electromagnetic field in between the colliding nuclei. Thus, the QGP is thought to be created from the classical gluon field, and the classical field dynamics is the key issue for deepening our understanding of the pre-QGP stage in the heavy-ion collisions. Ohnishi and collaborators studied the thermalization processes of the classical field dynamics by the numerical simulation.

Finite density QCD: The QCD phase transition at zero baryon density is known to be crossover, while the order of the transition is not known in the finite density phase transition. In the rage of the collision energy $\sqrt{s_{NN}} = (5-20)$ GeV, there is a possibility that the produced matter in heavy-ion collisions undergoes fluidization and finite density phase transition. In the static side of dense matter properties, one of the largest problems is the sign problem. Since the action becomes complex at finite densities, strong cancellation takes place in the path integral of the partition function in the Monte-Carlo simulations of lattice QCD. A promising method, the path optimization method, is recently proposed, where the integration path in the complexified variable space is optimized by using the neural network or gradient descent method so as to evade the sign problem. These subjects have been discussed by Ohnishi and collaborators. Hattori and collaborators proposed a new type of the Kondo effect emerging in high-density QCD. The Kondo effect has been known to modify the transport properties at finite density and low temperature. The new Kondo effect possibly affects the transport properties in the neutron-star cores and may be simulated in condensed matter systems such as ultracold atoms in the future.

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. Here is a summary of main works of the members of the particle physics group in the academic year 2018.

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. The Higgs sector explains the origin of the particle masses through the mechanism of the spontaneous symmetry breaking. Since the discovery of the Higgs boson in the LHC experiments at CERN, the knowledge for the Higgs sector including the coupling with matters has been experimentally updated and it's consistent with SM at present. 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, neutrino masses. Thus particle physics beyond the SM is actively investigated by members of this group. Under the recent significant development of cosmological and astrophysical observations, seeking the fundamental solution for the dark matter and dark energy problem has become one of the leading topics.

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. The stability against quantum corrections by the symmetry solves some of difficulties lying on the model building such as inflation. However, no experimental evidence of the supersymmetry has been observed yet. Reconciliation of the present experimental situation with theoretical requirements is highly wanted and the mechanism of the supersymmetry breaking is the important topic. Supergravity, a local gauge theory of supersymmetry, is also investigated by some of our group members.

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, and thus actively investigated by our group members.

In YITP, hadron interactions are investigated in lattice QCD, by using the HAL QCD potential method. This year, we calculated the potential between two Ω baryons at almost physical pion mass, which suggests an existence of a bound state, called the most strange dibaryon. It is interesting to search such dibaryons in heavy-ion experiments such as RHIC or LHC.

It is yet unknown how to incorporate the principle of quantum mechanics into gravity or the general relativity. The application of the standard quantization procedure to the general relativity has serious problems, including uncontrollable UV divergences. A consistent theory of quantum gravity seems to require a new notion of space-time, which replaces the classical space-time notion described by a continuous smooth manifold. There exists various proposals including non-commutative space-times, which actually appear in certain limits in string theory. Other than this, a few members of this group study a tensor model in the canonical formalism, which describes spacetimes in terms of tensors. A central idea of this model is to describe spacetimes in terms of tensors: Spacetimes do not exist at the basis of the model, and they are expected to emerge as a notion for effective description. The explicit correspondence between tensors and spaces can be constructed by using the recently developing mathematical techniques in data analysis, tensor-rank decomposition and persistent homology.

String theory is a theory of one-dimensionally extended objects like string. The superstring theory is its extension with supersymmetry associating bosons and fermions, and has intensively been studied as a promising candidate of theories unifying all the interactions and matters. As a result, remarkably, now it is believed that the five known superstring theories, and also the eleven-dimensional supergravity theory as low-energy effective theory, are merely looking at different aspects of one hypothetical theory, the M-theory. It is important to clarify what the M-theory is, which is actively investigated by the group members. Meanwhile, it is also important issue to study quantum phenomena in very strong gravitational field like Black hole by means of the superstring theory as a consistent theory of quantum gravity. Since such phenomena cannot be handled by perturbations, however, a non-perturbative formulation of the superstring theory is required. The superstring field theory is a strong candidate of such a non-perturbative formulation, and also studied by the group members.

The gauge/gravity correspondence, where gravitational theories are equivalent to non-gravitational theories which describe various matter systems, was first discovered by Juan Maldacena in 1997. The correspondence may play a key role to connect different fields in modern theoretical physics. On the other hand, the underlying principle why the correspondence occurs is not clear at present and we need to understand the basic principle of gauge/gravity correspondence. Recently the phenomenon called as quantum entanglement has been identified as the new tool

and a novel expectation has been obtained which tells us that the structures of quantum entanglement in quantum systems correspond to the geometry of universe in gravity.

Intriguing connections between gauge/gravity correspondence and quantum information theory have been studied from the viewpoint of quantum entanglement and computational complexity. In particular, we conjectured that the cross section of entanglement wedge in gauge/gravity correspondence is equal to a quantum information theoretic quantity, called entanglement of purification. Later we gave a field theoretic derivation of this conjecture by using the idea of path-integral optimization.

The non-perturbative formulation of superstring (and quantum gravity) may be done using gauge/gravity correspondence. In order to apply string theory to real physics, supersymmetry should be spontaneously broken, however, it was difficult to show supersymmetry breaking in gauge theories which has gravity duals. In this year, we succeeded to show that certain supersymmetric gauge theory with a gravity dual has supersymmetry broken phase, for the first time. This may be important in the study of the string theory and the particle phenomenology.

A simplified version of gauge/gravity correspondence can be constructed with higher spin gravity, which is expected to describe the tensionless limit of superstring theory. Applying the simplified version, we have investigated the quantum effects of three dimensional higher spin gravity from corresponding two dimensional conformal field theory (CFT). Specifically, we examined the quantum asymptotic symmetry of three dimensional extended higher spin gravity and proposed a prescription to deal with quantum gravity effects perturbatively.

Moreover, we have proposed the method to derive the $d+1$ dimensional AdS geometry from CFT in d dimensions using the flow method. This year, we calculated quantum corrections to the cosmological constant of the AdS space using the $1/N$ expansion through the flow method. We also extended this method to the case where the field theory itself defined on a curved space, and derived the AdS space with the curved boundary.

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 quantum information, condensed matter physics and integrable systems.

Quantum Information Group

Quantum supremacy

While large scale quantum computers may be many years off, it has been shown that relatively “weak" quantum computers can outperform classical computing. The goal of quantum supremacy is to show that sub-universal quantum computing models cannot be classically efficiently simulated unless some unlikely consequences in classical complexity theory occur. For example, quantum computing with non-interacting photonic qubits (Boson sampling) and with commuting gates (IQP) have been shown to exhibit such quantum supremacy. In this year, Morimae and his collaborators showed that the one-clean qubit model, which is one of the oldest models of sub-universal quantum computing, exhibits such a quantum supremacy. The one-clean qubit model is a restricted model of quantum computing where all but a single input qubits are maximally mixed. It was introduced to model the NMR quantum computing, but recently studied in many fields such as string theory, condensed matter physics, and statistical physics. Morimae and his collaborators also introduced another sub-universal model, so called HC1Q model, and showed its quantum supremacy. The HC1Q model is a circuit in the second level of Fourier hierarchy, where a classical circuit is sandwitched by two layers of Hadamard gates.

Verification of quantum computing

The classical verifiability of quantum computing is one of the long-standing open problems in quantum information. Several partial solutions have been obtained such as verifiable blind quantum computing protocols, multi-prover systems, protocols with complexity assumptions, etc. In the protocol where the server generates a resource state of measurement-based quantum computing and sends each particle to the verifier, it is essential to verify the correctness of the generated resource states. Morimae and his collaborators showed that several graph states, hyper-graph states, and ground states of Hamiltonians can be verified with only single-qubit Pauli measurements. Hyper-graph states are generalizations of graph states and used in various applications such as quantum supremacy and entanglement theory. Another approach to the classical verification of quantum computing is to focus on specific problems in BQP. For example, Simon’s problem and factoring can be trivially classically verifiable. It is known that recursive Fourier sampling is classically veirifiable with polynomial number of rounds between the prover and verifier. Morimae and his collaborators also showed that computing the order of solvable groups can be classically verified with two rounds communications.

Partial decoupling of quantum information

A decoupling approach is one of the most important concepts in quantum information theory, providing a unified framework to investigate how *quantum* information is transmitted via a noisy quantum channel. Motivated by the decoupling approach, a dequantization approach, offering a general method to study the transmission of *classical* information, was also proposed in the literature. Although these two approaches are very powerful and form the pillars of the modern understanding of quantum information theory, they are based on rather different techniques. There has been, hence, a lack of a general approach towards the unified understanding of transmitting information.

This year, Nakata and his collaborator proved new decoupling-type theorems, which we call non-randomized and randomized partial decoupling theorems. The former is of particular importance when we are interested in the information in the system with symmetry. On the other hand, the latter is the most general decoupling theorem that seamlessly interpolate the above two theorems, both conceptually and technically, and can be used to analyse the simultaneous transmission of quantum and classical information. Thus, the latter completes the decoupling-type approach in quantum information theory.

Benchmarking quantum devices

Checking whether experimentally realized quantum devices are working as intended is one of the most fundamental but important problems in quantum technology. Randomized benchmarking (RB) is the standard method based on a lower order quantum pseudo-randomness. Although RB has many advantages from an experimental viewpoint, it also has several disadvantages. In particular, we cannot retrieve from RB much information about the errors on the device, making it difficult to improve the device based on the results of RB.

To overcome the disadvantage, Nakata and his collaborators proposed a new variant of RB based on a higher order quantum pseudo-randomness, which can be used to extract more information about the errors on the device without loosing the advantages of the original RB. In particular, they investigated the devices of one qubit and showed that the proposed method makes it possible to experimentally check whether the error is unitary or not.

Surface-code error correction

Noise is one of the biggest obstacles to overcome in the construction of full scale quantum computers. Surface-code error correction represents a simple way to protect the information stored in a quantum computer from noise. There is a classical processing component of error correction, called decoding, which involves choosing the best correction given limited information from measurements performed during the error correcting process. The performance of the decoder can drastically affect the logical error rate, and overall cost of quantum computing.

Earlier in 2018, Darmawan and collaborators developed a decoding algorithm which can use information

about noise to perform decoding of the surface code in a near optimal way. They subsequently used this decoder to answer practical questions about surface-code error correction. By performing simulations using the above decoder, they determined which noise features need to be measured accurately, and which ones are largely inconsequential for the purpose of calibrating the surface code for optimal performance. For physically relevant local noise models, they found that only a few noise parameters need to be measured accurately for this purpose, and furthermore these parameters can be determined easily in experiment.

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, 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 fundamental 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, gravitational waves from compact star mergers, 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. May 28 – Jun3 29, 2018:
   "New Frontiers in QCD 2018 (NFQCD2018) – Confinement, Phase Transition, Hadrons, and Hadron Interactions –"
   http://www2.yukawa.kyoto-u.ac.jp/˜ nfqcd2018/
   Chairman: Akira Ohnishi

2. July 2 – August 3, 2018
   "New Frontiers in String Theory 2018"
   http://www2.yukawa.kyoto-u.ac.jp/˜ nfst2018/index.php
   Chairman: Shigeki Sugimoto

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. April 9 – April 20, 2018:
   "Floquet Theory:Fundamentals and Applications"
   Core members: Kenji Fukushima, Masahito Ueda, Takashi Oka, Andre Eckardt, Egidijus Anisimovas, Gediminas Juzeliunasm, Keiji Saito, Muneto Nitta, Koji Hashimoto

2. June 18 – June 29, 2018:
   "Rheology of disordered particles - suspensions, glassy and granular materials"
   Core members: Vicente Gazro

3. September 1 – September 14, 2018:
   "Dynamics in Strong Gravity Universe"
   Core members: Akihiro Ishibashi, Vitor Cardoso, Ulrich Sperhake, Carlos Herdeiro

4. March 11 – March 30, 2018:
   "Nucleosynthesis and electromagnetic counterparts of neutron-star mergers: Preparation for the new discovery"
   Core members: Meng-Ru Wi, Kenta Hotokezaka

5. March 25 – April 5, "Hadron Interactions and Polarization from Lattice QCD, Quark Model, and Heavy Ion Collisions"
   Core members: Su Houng Lee, Akira Ohnishi, Koichi Hattori

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, Yasuaki Hikida, Kenta Kiuchi, Teiji Kunihiro, Shinji Mukohyama, Masatoshi Sato, Shigeki Sugimoto, Takahiro Tanaka.

Three associate professors are employed in joint positions with the center for gravitational physics 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.

Center for Gravitational Physics

On 1st April, 2015, Yukawa Institute for Theoretical Physics established a new research organization, named the "Center for Gravitational Physics". This center has been supported by the Japanese MEXT since April, 2016. The initial appointment for this support is for 6 years (until the end of March, 2022).

Purpose of this center

Understanding nature of gravity has long been one of the central issues in particle physics/string theory and astrophysics/cosmology. As a result of significant developments of these fields in the past decades, we are now in an exciting position to enhancing the research activity of gravity toward various directions. For example, by the recent development of string theory, in particular by the discovery of the so-called gauge/gravity correspondence, gravity has become a core subject in a wider area of theoretical physics. It is anticipated that a new perspective on nature may be gained by a deeper understanding of gravity. For example, gravity may be the very key for the understanding of basic phenomena in quantum theory such as quantum entanglement.

It should be also emphasized that gravitational-wave astronomy just began quite recently (in 2015) by the first direct detection of gravitational waves from binary black holes achieved by advanced LIGO in USA. A number of subsequent discoveries of astrophysical phenomena in strong gravitational fields in the near future will lead to deeper understanding of physics associated with strong gravitational fields.

The purpose of this center is to stimulate various fields in theoretical physics from new perspectives, with "gravity" as the keyword, and to establish an international center for gravitational physics in the wider sense through collaborations with researchers and institutions from all over the world. Since January, 2018, a new faculty (T.Morimae) has joined the center and started a new group studying quantum information theory.

Primary research topics

This center has the following five sections. The research topics for each of them are as follows:

Quantum Graviy/String theory: At present, the most reliable theory of gravity is general relativity of Albert Einstein. However, it is notoriously difficult to be combined with the quantum theory, which describes the microscopic world, and the construction of the theory of quantum gravity is still a very important open problem. String theory is considered to be one of the most promising approaches for the quantum gravity. Many researchers believe that it is a candidate of an ultimate unified theory, because it describes all the elementary particles from just one type of "string". However, the complete formulation of string theory is not yet available. In our center, we are trying to develop non-perturbative formulation of string theory, understand strong coupling phenomena, and investigate applications to other fields. We also work on various related topics, such as matrix model, tensor model, higher spin gauge theory, non-perturbative effects in quantum field theory, elementary particles and the interactions among them, microscopic description of black hole, mathematical structure of supersymmetric gauge theory, etc.

Gauge-Gravity correspondence: Gauge/Gravity duality provides us a remarkable method that equivalently connects gravity (superstring theory, general relativity) with quantum matter (quantum field theories, quantum many-body systems). This enables us to reduce complicated analysis of strongly interacting quantum system to much simpler classical calculations in gravity. At the same time, we can convert difficult problems in quantum gravity into simpler ones. In our center, we are exploring various applications of gauge/gravity duality to QCD, Nuclear Physics and Condensed Matter Physics. Also, recent progresses have revealed a deep connection between gauge/gravity duality and quantum information theory, such as quantum entanglement. We are also making progresses, aiming at a new description of gravity from the viewpoint of quantum information.

Gravitational-wave astronomy: Soon after its first science run was started in 2015, advanced LIGO detected gravitational waves from binary black holes and announced the opening of gravitational-wave astronomy. Advanced VIRGO and KAGRA will also start observational run in the near future, and a larger number of gravitational waves from binary black hole and neutron-star binaries will be detected. We are working in the precise prediction of gravitational waves from these sources aiming at extraction of new physical information associated with strong gravity from the detected gravitational-wave signals and also in the prediction of electromagnetic signals using numerical-relativity and astrophysical phenomenology.

Cosmology and gravity: Cosmology has been rapidly developing, based on precision observational data. It is fair to say that many parameters describing our universe have been determined, or at least are in the process of being determined, with good precision. However, the physics behind the values of these parameters is still hidden in a veil of mystery. For example, we do not know what dark energy and dark matter really are, although our universe is thought to be filled mostly with them. Also, what made our universe so big? This question can be addressed by cosmic inflation, but again we do not know the physical origin of the inflaton field driving inflation. Three great mysteries, dark energy, dark matter and inflation, are standing in the way of cosmology with precision observational data. There also remain many other mysteries in cosmology such as the initial singularity and the origin of cosmic magnetic fields. In our center we tackle those mysteries by using every possible means such as general

relativity, statistical physics, particle physics and superstring theory.

Quantum Information Theory: Quantum theory is known to exhibit many "strange" phenomena, such as entanglement, coherence, etc. One of the most central research goals of quantum information theory is to control these strange phenomena to realize new information processing tasks, such as secure crypto-communication and superfast computing. In fact, it is known that unconditionally secure key distribution is possible with entanglement (quantum key distribution), and some problems that are not known to be solved efficiently with classical computing can be solved with quantum computing in polynomial time. These theoretical ideas have recently been implemented by not only experimentalists in academia but also engineers in companies such as Google, IBM, and Microsoft. Another important goal of the quantum information theory group in the Center is to develop new ideas through interactions with other members at YITP. In fact, many new concepts, ideas, techniques have been imported to the traditional physics, such as statistical physics, condensed matter physics, particle physics, and gravity, etc.

Achievements in the academic year 2018

Since the research of the members of the center are summarized in the other parts of this annual report, we only show some typical numbers that reflect the research activities and achievements of the center here.

We published 158 papers and 2 books. The number of workshops organized by us and held at YITP was 14 (10 of them were international and 4 were domestic), including a long term workshop "New Frontiers in String Theory 2018" which was held for 5 weeks and 217 people participated. The total number of participants of these workshops was 1,423. We were invited to give talks in various workshops. The total number of the invited talks given by our members was 80 (50 of them were international and 30 were domestic).

Home page

The home page of the center is
http://www2.yukawa.kyoto-u.ac.jp/~cgp/en/index.html.
The current members and research achievements are shown in this page.

International Research Unit of Advanced Future Studies

The International Research Unit of Advanced Future Studies (IRU-AFS) was established on July 28, 2015 in collaboration of 12 (Now 20) 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" would 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. Kyoto Transdisciplinary & Transnational Forum 2018
   Organizer: Masatoshi Murase
   Date: 2018/06/03
   Place: Panasonic Hall, Yukawa Institute for Theoretical Physics, Kyoto University
   Scope: Despite the advancement of science and technology, we are facing with so many difficulties such as education, energies, economies and even humanities. By focusing on external agents, we have tried to solve serious problems, although such intensive efforts have not been successful very well. The reason for this is that the central issue of our time across all system levels emerges from our internalconditions as well, but not only from external agents. It is now time to deal with both oppositions at the same location on the Earth and at the same time of the History. The present Kyoto Transdisciplinary & Transnational Forum 2018 on Circle of Nothingness and Wholeness would provide us with deep insights into the Advanced Future Studies, for it could deal with both external agents and internal conditions simultaneously on the basic transcendental frameworks. It is our hope to develop new perspectives and new actions toward our future through stimulating discussions beyond different disciplines.
   http://www2.yukawa.kyoto-u.ac.jp/future/news_en/2018-6-3-en.html

2. Transdisciplinary Mie-Symposium 2018 on "Evolution of Complexity and Education"
   Organizers: Terufumi Ohno (Mie Prefectural Museum) and Masatoshi Murase (IRU-AFS, Kyoto University)
   Date: 2018/11/17
   Place: Mie Prefectural Museum
   Scope: Scope: Nature is full of complexity. Due to the advancement of science and technology, we have discovered complex nature not only at the microscopic molecular level, but also at the macroscopic cosmic level. In between the above two extreme levels, we have rediscovered similar complex nature at any space and time scales. Fractal nature is now used to describe such self-nested hierarchy: particular characteristic patterns of structures and dynamics appear successively at descending or ascending scales so that their parts, at any scale, are similar in shape and dynamics to the whole. This means that there must be simple principles behind complexity, and that we can not only understand

complex systems at certain levels, but also can apply to the other systems at quite different levels to predict the future or to avoid the emerging problems. It is our hope to develop new perspectives and new actions toward our future through stimulating discussions beyond different disciplines through the present "Transdisciplinary Symposium". Especially, we would like to discuss education and learning in the broad context of evolution, as all of them are interconnected processes through our life and history.
http://www2.yukawa.kyoto-u.ac.jp/future/news/2018-11-17.html

3. 2018 Transdisciplinary & International Workshop on Advanced Future Studies on Self-Organizing Evolution
Chairman: Masatoshi Murase
Date: 2018/10/22-24
Place: Narita Radisson Hotel, Conference Room Cattleya (1st floor of the Garden Wing)
Scope: 2018 Kyoto University International Forum on Advanced Future Studies covers transdisciplinary disciplines from Physics, Evolutionary Biology, Complex System Sciences, Humanity, Ecology, and Creativity to many other related fields. We will discuss not only the various phenomena in some particular disciplines, but also the universal principles beyond the diverse phenomena. The forum is organized in order to enhance rather long discussion time. We would like to welcome untraditional approaches towards breakthrough in the future science. What is Evolution?, What is the limit of traditional thinking way?, Is it possible to develop New Science? All these fundamental questions are some of the problems that we will discuss in this forum.
http://www2.yukawa.kyoto-u.ac.jp/future/news_en/2018-10-22-en.html

4. 2018 Kyoto University Advanced Future Forum
Chairman: Masatoshi Murase
Date: 2018/10/27
Place: Memorial Hall of the Clock Tower, Kyoto University
Scope: 2018 Kyoto University International Forum on Advanced Future Studies covers transdisciplinary disciplines from Physics, Evolutionary Biology, Complex System Sciences, Humanity, Ecology, and Creativity to many other related fields. We will discuss not only the various phenomena in some particular disciplines, but also the universal principles beyond the diverse phenomena. The forum is organized in order to enhance lectures for public citizens and high school students. We would like to welcome untraditional approaches towards breakthrough in the future science. What is Evolution?, What is the limit of traditional thinking way?, Is it possible to develop New Science? All these fundamental questions are some of the problems that we will discuss in this forum.
http://www2.yukawa.kyoto-u.ac.jp/future/news/miraisouseiforum2018.html

5. Transdisciplinary & International Workshop on Advanced Future Studies on Exploring A Unified View Beyond Complexity
Chairman: Masatoshi Murase
Date: 2019/2/12-15
Place: Old Office for Exercise forest, Kyoto University
Scope: The main purpose of this workshop is to understand how analogies and similarities work in the Nature. It would be very exciting to realize that common principles would be observed even in the wide variety of many different fields of sciences. Professor Paul Mezey will present the overall perspectives. Professor Cynthia Trevisan will then present some specific viewpoints. Professor Jae Lee will give us the additional perspectives based on complex systems sciences. We would welcome undergraduate and graduate students who are interested in interdisciplinary topics including living phenomena and nonlinear phenomena.
http://www2.yukawa.kyoto-u.ac.jp/future/news/2019-02-12.html

6. Advanced Future Studies (AFS) Seminar on "The evolution of life in cities"
Speaker:Mayuko Ishigami (Violinist),Associate Member of the International Research Unit of Advanced Future Studies, Kyoto University
Date: 2018/5/17
Place: Seminar Room #21, 2nd floor of Institute for Liberal Arts and Sciences (ILAS) Bldg., Kyoto University
http://www2.yukawa.kyoto-u.ac.jp/future/news_en/advanced-future-studies-afs-seminar-11-2018-6-26.html

7. Advanced Future Studies (AFS) Seminar on "The evolution of life in cities"
Speaker: Marc T. J. Johnson (Associate Professor, University of Toronto, Canada),Distinguished Visiting Associate Professor, International Research Unit of Advanced Future Studies, Kyoto University (From April 15 to June 15)
Date: 2018/6/26
Place: Seminar Room, Yukawa Institute for Theoretical Physics, Kyoto University
http://www2.yukawa.kyoto-u.ac.jp/future/news/advanced-future-studies-afs-seminar-10-2018-5-17-2.html

2.2 Publications

2.2.1 YITP preprints (January – December 2018)

18-1 Evan Berkowitz, Masanori Hanada, Enrico Rinaldi, Pavlos Vranas
Gauged And Ungauged: A Nonperturbative Test
arXiv:1802.02985 [hep-th] JHEP06(2018)124 (January).

18-2 Yong-Seon Song, Yi Zheng, Atsushi Taruya, Minji Oh
Hybrid modeling of redshift space distortions
arXiv:1801.04950 [astro-ph.CO] JCAP07(2018)018 (January).

18-3 Andreas Albrecht, Sugumi Kanno, Misao Sasaki
Quantum entanglement in de Sitter space with a wall, and the decoherence of bubble universes
arXiv:1802.08794 [hep-th] Phys. Rev. D 97, 083520 (2018) (January).

18-4 Misao Sasaki, Teruaki Suyama, Takahiro Tanaka, Shuichiro Yokoyama
Primordial Black Holes - Perspectives in Gravitational Wave Astronomy -
arXiv:1801.05235 [astro-ph.CO] Class. Quantum Grav.35 063001 (January).

18-5 Tomoyuki Morimae, Yuki Takeuchi, Harumichi Nishimura
Merlin-Arthur with efficient quantum Merlin and quantum supremacy for the second level of the Fourier hierarchy
arXiv:1711.10605 [quant-ph] Quantum 2, 106 (2018) (January).

18-6 Yasuaki Hikida, Takahiro Uetoko
Conformal blocks from Wilson lines with loop corrections
arXiv:1801.08549 [hep-th] Phys. Rev. D 97, 086014 (2018) (January).

18-7 Joseph F. Fitzsimons, Michal Hajdusek, and Tomoyuki Morimae
Post hoc Verification of Quantum Computation
Phys. Rev. Lett. 120, 040501 (January).

18-8 Yoshitaka Hatta, Dong-Jing Yang
On the small-x behavior of the orbital angular momentum distributions in QCD
arXiv:1802.02716 [hep-ph] J. Phys.Let.B(2018), 781 (February).

18-9 Alexander Keshavarzi, Daisuke Nomura, Thomas Teubner
The muon $g-2$ and $\alpha(M_Z^2)$: a new data-based analysis
arXiv:1802.02995 [hep-ph] Phys. Rev. D 97, 114025 (2018) (February).

18-10 Jacob Oost, Shinji Mukohyama, Anzhong Wang
Constraints on Einstein-aether theory after GW170817
arXiv:1802.04303 [gr-qc] Phys. Rev. D 97, 124023 (2018) (February).

18-11 Andrew Coates, Charles Melby-Thompson, Shinji Mukohyama
Revisiting Lorentz violation in Horava gravity
arXiv:1805.10299 [hep-th] (February).

18-12 Arpan Bhattacharyya, Tadashi Takayanagi, Koji Umemoto
Entanglement of Purification in Free Scalar Field Theories
arXiv:1802.09545 [hep-th] JHEP 1804 (2018) 132 (February).

18-13 Takashi Hiramatsu, Eiichiro Komatsu, Masashi Hazumi, Misao Sasaki
Reconstruction of primordial tensor power spectra from B-mode polarization of the cosmic microwave background
arXiv:1803.00176 [astro-ph.CO] Phys. Rev. D 97, 123511 (2018) (February).

18-14 Naotaka Kubo, Sanefumi Moriyama
Two-Point Functions in ABJM Matrix Model
arXiv:1803.07161 [hep-th] J. High Energ. Phys. (2018) 2018: 181 (February).

18-15 Hrant Gharibyan, Masanori Hanada, Stephen H. Shenker, Masaki Tezuka
Onset of Random Matrix Behavior in Scrambling Systems
arXiv:1803.08050 [hep-th] JHEP07(2018)124 (March).

18-16 Michel-Andrès Breton, Yann Rasera, Atsushi Taruya, Osmin Lacombe, Shohei Saga
Imprints of relativistic effects on the asymmetry of the halo cross-correlation function: from linear to non-linear scales
arXiv:1803.04294 [astro-ph.CO] MNRAS,483,2 (2018) (March).

18-17 Antonio De Felice, David Langlois, Shinji Mukohyama, Karim Noui, Anzhong Wang
"Shadowy" modes in Higher-Order Scalar-Tensor theories

arXiv:1803.06241 [hep-th] Phys. Rev. D 98, 084024 (2018) (March).

18-18 Kenta Miyahara, Tetsuo Hyodo
Theoretical study of $\Lambda(1405)$ resonance in $\Xi_b^0 \to D^0(\pi\Sigma)$ decay
arXiv:1803.05572 [nucl-th] Phys. Rev. C 98, 025202 (March).

18-19 Tomoyuki Morimae
Blind quantum computing can always be made verifiable
arXiv:1803.06624 [quant-ph] (March).

18-20 Toshitaka Tatsumi, Ryo Yoshiike, Kouji Kashiwa
Anomalous Hall effect in dense QCD matter
arXiv:1803.10514 [hep-ph] Phys.Lett.B 785 (2018) (March).

18-21 unused

18-22 Yuya Kusuki
New Properties of Large-c Conformal Blocks from Recursion Relation
arXiv:1804.06171 [hep-th] JHEP(2018) 2018: 10 (March).

18-23 Seiji Terashima
Geometry from Matrices via D-branes
arXiv:1804.00647 [hep-th] JHEP(2018) 2018: 8 (March).

18-24 Pawel Caputa, Shinji Hirano
Airy Function and 4d Quantum Gravity
arXiv:1804.00942 [hep-th] JHEP(2018) 2018: 106 (April).

18-25 Nadia Bolis, Antonio De Felice, Shinji Mukohyama
Integrated Sachs-Wolfe-galaxy cross-correlation bounds on the two branches of the minimal theory of massive gravity
arXiv:1804.01790 (hep-th) Phys. Rev. D 98, 024010 (2018) (April).

18-26 Héctor Ramírez, Samuel Passaglia, Hayato Motohashi, Wayne Hu, Olga Mena
Reconciling tensor and scalar observables in G-inflation
arXiv:1802.04290 [astro-ph.CO] JCAP04(2018)039 (April).

18-27 Hayato Motohashi, Masato Minamitsuji
General Relativity solutions in modified gravity
arXiv:1804.01731 [gr-qc] Phys.Lett. B781, 728-734 (2018) (April).

18-28 Arpan Bhattacharyya, Pawel Caputa, Sumit R. Das, Nilay Kundu, Masamichi Miyaji, Tadashi Takayanagi
Path-Integral Complexity for Perturbed CFTs
arXiv:1804.01999 (quant-ph) JHEP 1807 (2018) 086 (April).

18-29 Tomoki Nosaka, Shuichi Yokoyama
Index and duality of minimal N=4 Chern-Simons-matter theories
arXiv:1804.04639 (hep-th) JHEP(2018) 2018: 28 (April).

18-30 Katsuki Aoki, Chunshan Lin, Shinji Mukohyama
Novel matter coupling in general relativity via canonical transformation
arXiv:1804.03902 (hep-th) Phys. Rev. D 98, 044022 (2018) (April).

18-31 Hayato Motohashi, Teruaki Suyama, Masahide Yamaguchi
Ghost-Free Theory with Third-Order Time Derivatives
arXiv:1711.08125 J. Phys. Soc. Jpn. 87, 063401 (2018) (April).

18-32 Hayato Motohashi, Teruaki Suyama, Masahide Yamaguchi
Ghost-free theories with arbitrary higher-order time derivatives
arXiv:1804.07990 [hep-th] JHEP 1806 (2018) 133 (April).

18-33 Tomoyuki Morimae, Harumichi Nishimura
Rational proofs for quantum computing
arXiv:1804.08868 [quant-ph] (April).

18-34 François Le Gall, Tomoyuki Morimae, Harumichi Nishimura, Yuki Takeuchi
Interactive Proofs with Polynomial-Time Quantum Prover for Computing the Order of Solvable Groups
arXiv:1805.03385 [quant-ph] (April).

18-35 Kenta Miyahara, Tetsuo Hyodo, Wolfram Weise
Construction of a local $\bar{K}N - \pi\Sigma - \pi\Lambda$ potential and composition of the $\Lambda(1405)$
arXiv:1804.08269 [nucl-th] Phys. Rev. C 98, 025201 (2018) (April).

18-36 Amit Jamadagni, Hendrik Weimer, Arpan Bhattacharyya
Robustness of Topological Order in the Toric Code with Open Boundaries
arXiv:1804.09718 [cond-mat.str-el] Phys. Rev. B 98, 235147 (2018) (April).

18-37 Yasuaki Hikida, Yuya Kusuki, Tadashi Takayanagi
ETH and Modular Invariance of 2D CFTs
arXiv:1804.09658 [hep-th] Phys. Rev. D 98, 026003 (2018) (April).

18-38 Taigen Kawano, Dennis Obster, Naoki Sasakura
Canonical tensor model through data analysis – Dimensions, topologies, and geometries –
arXiv:1805.04800 [hep-th] Phys. Rev. D 97, 124061 (2018) (April).

18-39 Takayasu Sekihara, Yuki Kamiya, Tetsuo Hyodo
$N\Omega$ interaction: meson exchanges, inelastic channels, and quasibound state

arXiv:1805.04024 [hep-ph] Phys. Rev. C 98, 015205 (April).

18-40 Arpan Bhattacharyya, Long Cheng, Ling-Yan Hung, Sirui Ning, Zhi Yang
Notes on the Causal Structure in a Tensor Network
arXiv:1805.03071 [hep-th] Phys. Rev. D 99, 086007 (2019) (May).

18-41 Koji Umemoto, Yang Zhou
Entanglement of Purification for Multipartite States and its Holographic Dual
arXiv:1805.02625 [hep-th] JHEP 1810:152,2018 (May).

18-42 Takumi Iritani, Sinya Aoki, Takumi Doi, Shinya Gongyo, Tetsuo Hatsuda, Yoichi Ikeda, Takashi Inoue, Noriyoshi Ishii, Hidekatsu Nemura, Kenji Sasaki
Systematics of the HAL QCD Potential at Low Energies in Lattice QCD
arXiv:1805.02365 [hep-lat] Phys. Rev. D 99, 014514 (2019) (May).

18-43 Kouji Kashiwa, Yuto Mori, Akira Ohnishi
Control the model sign problem via path optimization method: Monte-Carlo approach to QCD effective model with Polyakov loop
arXiv:1805.08940 [hep-ph] Phys. Rev. D 99, 014033 (2019) (May).

18-44 Madhurima Bhattacharjee, Shinji Mukohyama, Mew-Bing Wan, Anzhong Wang
Gravitational collapse and formation of universal horizons in Einstein-Ãęther theory
arXiv:1806.00142 [gr-qc] Phys. Rev. D 98, 064010 (2018) (May).

18-45 Antonio De Felice, Shinji Mukohyama, Michele Oliosi
Phenomenology of minimal theory of quasidilaton massive gravity
arXiv:1806.00602 [hep-th] Phys. Rev. D 99, 044055 (2019) (May).

18-46 Takashi Koretsune, Toru Kikuchi, Ryotaro Arita
First-Principles Evaluation of the Dzyaloshinskii–Moriya Interaction
arXiv:1801.09439 [cond-mat.mes-hall] J. Phys. Soc. Jpn. 87, 041011 (2018) (May).

18-47 Toru Kikuchi
Spin Connections for Nonrelativistic Electrons on Curves and Surfaces
arXiv:1804.10613 [cond-mat.mes-hall] (May).

18-48 Nadia Bolis, Tomohiro Fujita, Shuntaro Mizuno, Shinji Mukohyama
Quantum Entanglement in Multi-field Inflation
arXiv:1805.09448 [astro-ph.CO] JCAP09(2018)004 (May).

18-49 Shohei Saga, Atsushi Taruya, Stéphane Colombi
Lagrangian cosmological perturbation theory at shell-crossing
arXiv:1805.08787 [astro-ph.CO] Phys. Rev. Lett. 121, 241302 (2018) (May).

18-50 Toshiya Namikawa, François R. Bouchet, Atsushi Taruya
The CMB lensing bi-spectrum as a probe of modified gravity theories
arXiv:1805.10567 [astro-ph.CO] Phys. Rev. D 98, 043530 (2018) (May).

18-51 Jose J. Fernandez-Melgarejo, Tetsuji Kimura, Yuho Sakatani
Weaving the Exotic Web
arXiv:1805.12117 [hep-th] JHEP 1809 (2018) 072 (May).

18-52 Masashi Kimura, Takahiro Tanaka
Robustness of S-deformation method for black hole stability analysis
arXiv:1805.08625 [gr-qc] Class. Quantum Grav.35 195008 (May).

18-53 Remya Nair, Takahiro Tanaka
Synergy between ground and space based gravitational wave detectors II: Localisation
arXiv:1805.08070 [gr-qc] JCAP08(2018)033 (May).

18-54 Keisuke Fujii, Hirotada Kobayashi, Tomoyuki Morimae, Harumichi Nishimura, Shuhei Tamate, and Seiichiro Tani
Impossibility of Classically Simulating One-Clean-Qubit Model with Multiplicative Error
Phys. Rev. Lett. 120, 200502 (May).

18-55 Guillem Domènech, Shinji Mukohyama, Ryo Namba, Vassilis Papadopoulos
Vector disformal transformation of generalized Proca theory
arXiv:1807.06048 [gr-qc] Phys. Rev. D 98, 064037 (2018) (May).

18-56 Xuhao Wu, Akira Ohnishi, Hong Shen
Effects of quark-matter symmetry energy on hadron-quark coexistence in neutron-star matter
arXiv:1806.03760 [nucl-th] Phys. Rev. C 98, 065801 (2018) (May).

18-57 Ali Akbar Abolhasani, Misao Sasaki
Single-Field Consistency relation and δN-Formalism
arXiv:1805.11298 [astro-ph.CO] JCAP08(2018)025 (May).

18-58 Yuki Takeuchi, Atul Mantri, Tomoyuki Morimae, Akihiro Mizutani, Joseph F. Fitzsimons
Resource-efficient verification of quantum computing using Serfling's bound
arXiv:1806.09138 [quant-ph] npj Quant.Info.5, 27 (2019) (May).

18-59 Yuki Takeuchi, Tomoyuki Morimae
Verification of Many-Qubit States
arXiv:1709.07575 [quant-ph] Phys. Rev. X 8, 021060 (2018) (May).

18-60 Pisin Chen, Misao Sasaki, Dong-han Yeom
Hawking radiation as instantons
arXiv:1806.03766 [hep-th] (May).

18-61 Nicholas Loutrel, Takahiro Tanaka, Nicolas Yunes
Spin-Precessing Black Hole Binaries in Dynamical Chern-Simons Gravity
arXiv:1806.07431 [gr-qc] Phys. Rev. D 98, 064020 (2018) (June).

18-62 Holger B.Nielsen, Masao Ninomiya
Do we field high energy physics inside (almost) every solid or fluid at low temperature?
arXiv:1806.04504 [physics.gen-ph] (June).

18-63 Yuya Kusuki
Large c Virasoro Blocks from Monodromy Method beyond Known Limits
arXiv:1806.04352 [hep-th] JHEP(2018) 2018: 161 (June).

18-64 Yasuaki Hikida, Takahiro Uetoko
Superconformal blocks from Wilson lines with loop corrections
arXiv:1806.05836 [hep-th] JHEP(2018) 2018: 101 (June).

18-65 Kunihiko Terasaki
Open- and hidden-charm tetra-quark scalar mesons
arXiv:1806.05377 [hep-ph] (June).

18-66 Sanjin Benić, Yoshitaka Hatta
Single spin asymmetries in ultra-peripheral $p^{\uparrow}A$ collisions
arXiv:1806.10901 [hep-ph] Phys. Rev. D 98, 094025 (2018) (June).

18-67 Renaud Boussarie, Yoshitaka Hatta, Bo-Wen Xiao, Feng Yuan
Probing the Weizsäcker-Williams gluon Wigner distribution in pp collisions
arXiv:1807.08697 [hep-ph] Phys. Rev. D 98, 074015 (2018) (June).

18-68 Masamichi Miyaji
Time Evolution after Double Trace Deformation
arXiv:1806.10807 [hep-th] JHEP (2018) 2018: 74 (June).

18-69 Aritra Banerjee, Arpan Bhattacharyya
Probing analytical and numerical integrability: The curious case of $(AdS_5 x S^5)\eta$
arXiv:1806.10924 [hep-th] JHEP 1811 (2018) 124 (June).

18-70 Junsei Tokuda, Takahiro Tanaka
Can all the infrared secular growth really be understood as increase of classical statistical variance?
arXiv:1806.03262 [hep-th] JCAP11(2018)022 (June).

18-71 Nicholas Loutrel, Takahiro Tanaka, Nicolas Yunes
Scalar Tops and Perturbed Quadrupoles: Probing Fundamental Physics with Spin-Precessing Binaries
arXiv:1806.07425 [gr-qc] (June).

18-72 Shohei Saga, Hiroyuki Tashiro, Shuichiro Yokoyama
Limits on primordial magnetic fields from direct detection experiments of gravitational wave background
arXiv:1807.00561 [astro-ph.CO] Phys. Rev. D 98, 083518 (2018) (June).

18-73 Atsushi Taruya, Takahiro Nishimichi, Donghui Jeong
GridSPT: Grid-based calculation for perturbation theory of large-scale structure
arXiv:1807.04215 [astro-ph.CO] Phys. Rev. D 98, 103532 (2018) (July).

18-74 Sanjin Benić, Kenji Fukushima, Oscar Garcia-Montero, Raju Venugopalan
Constraining unintegrated gluon distributions from inclusive photon production in proton-proton collisions at the LHC
arXiv:1807.03806 [hep-ph] Phys.Lett.B 791(2019) (July).

18-75 Pawel Caputa, Javier M. Magan
Quantum Computation as Gravity
arXiv:1807.04422 [hep-th] (July).

18-76 Masazumi Honda, Tomoki Nosaka, Kazuma Shimizu, Seiji Terashima
Supersymmetry Breaking in a Large N Gauge Theory with Gravity Dual
arXiv:1807.08874 [hep-th] JHEP(2019) 2019: 159 (July).

18-77 Mohammad Ali Gorji, Shinji Mukohyama, Hassan Firouzjahi, Seyed Ali Hosseini Mansoori
Gauge Field Mimetic Cosmology
arXiv:1807.06335 [hep-th] JCAP 1808 (2018) no.08, 047 (July).

18-78 Tadashi Takayanagi, Tomonori Ugajin, Koji Umemoto
Towards an Entanglement Measure for Mixed States in CFTs Based on Relative Entropy
arXiv:1807.09448 [hep-th] JHEP (2018) 2018: 166 (July).

18-79 Yoshitaka Hatta, Di-Lun Yang
Holographic J/ψ production near threshold and the proton mass problem
arXiv:1808.02163 [hep-ph] Phys. Rev. D 98, 074003 (2018) (July).

18-80 Hugo A. Camargo, Pawel Caputa, Diptarka Das, Michal P. Heller, Ro Jefferson
Complexity as a novel probe of quantum quenches: universal scalings and purifications
arXiv:1807.07075 [hep-ph] Phys. Rev. Lett. 122, 081601 (2019) (July).

18-81 Shigeo S. Kimura, Kohta Murase, Imre Bartos, Kunihito Ioka, Ik Siong Heng, Peter Mészáros
Trans-Ejecta High-Energy Neutrino Emission from Binary Neutron Star Mergers
arXiv:1805.11613 [astro-ph.HE] Phys. Rev. D 98, 043020 (2018) (July).

18-82 Tatsuya Matsumoto, Kunihito Ioka, Shota Kisaka, Ehud Nakar
Is the macronova in GW170817 powered by the central engine?
arXiv:1802.07732 [astro-ph.HE] APJ 861,1 (2018) (July).

18-83 Nozomu Tominaga, Masaomi Tanaka, Tomoki Morokuma, Yousuke Utsumi, Masaki S. Yamaguchi, Naoki Yasuda, Masayuki Tanaka, Michitoshi Yoshida, Takuya Fujiyoshi, Hisanori Furusawa, Koji S. Kawabata, Chien-Hsiu Lee, Kentaro Motohara, Ryou Ohsawa, Kouji Ohta, Tsuyoshi Terai, Fumio Abe, Wako Aoki, Yuichiro Asakura, Sudhanshu Barway, Ian A. Bond, Kenta Fujisawa, Satoshi Honda, Kunihito Ioka, Youichi Itoh, Nobuyuki Kawai, Ji Hoon Kim, Naoki Koshimoto, Kazuya Matsubayashi, Shota Miyazaki, Tomoki Saito, Yuichiro Sekiguchi, Takahiro Sumi, Paul J. Tristram
Subaru Hyper Suprime-Cam Survey for An Optical Counterpart of GW170817
arXiv:1710.05865 [astro-ph.HE] PASJ 70, 2 (2018) (July).

18-84 Tomohiro Fujita, Sachiko Kuroyanagi, Shuntaro Mizuno, Shinji Mukohyama
Blue-tilted Primordial Gravitational Waves from Massive Gravity
arXiv:1808.02381 [gr-qc] Phys.Lett.B 789 (2019) (August).

18-85 Antonio De Felice, François Larrouturou, Shinji Mukohyama, Michele Oliosi
Black holes and stars in the minimal theory of massive gravity
arXiv:1808.01403 [gr-qc] Phys. Rev. D 98, 104031 (2018) (August).

18-86 Reza Javadinazhed, Uri Kol, Massimo Porrati
Comments on Lorentz Transformations, Dressed Asymptotic States and Hawking Radiation
arXiv:1808.02987 [hep-th] JHEP (2019) 2019: 89 (August).

18-87 Shinji Mukohyama, Mikhail S. Volkov
The Ogievetsky-Polubarinov massive gravity and the benign Boulware-Deser mode
arXiv:1808.04292 [hep-th] JCAP10(2018)037 (August).

18-88 Benjamin Bose, Atsushi Taruya
The one-loop matter bispectrum as a probe of gravity and dark energy
arXiv:1808.01120 [astro-ph.CO] JCAP 1810 (2018) no.10, 019 (August).

18-89 Arpan Bhattacharyya, Arvind Shekar, Aninda Sinha
Circuit complexity in interacting QFTs and RG flows
arXiv:1808.03105 [hep-th] JHEP 1810 (2018) 140 (August).

18-90 Shinya Gongyo, Sinya Aoki
Asymptotic behavior of Nambu-Bethe-Salpeter wave functions for scalar systems with a bound state
arXiv:1807.02967 [hep-lat] (August).

18-91 Stephane Dartois, Luca Lionni, Ion Nechita
On the joint distribution of the marginals of multipartite random quantum states
arXiv:1808.08554 [math.PR] (August).

18-92 Andrew S. Darmawan, Yusuke Nomura, Youhei Yamaji, Masatoshi Imada
Stripe and superconducting order competing in the Hubbard model on a square lattice studied by a combined variational Monte Carlo and tensor network method
arXiv:1808.06327 [cond-mat.str-el] Phys. Rev. B 98, 205132 (2018) (August).

18-93 Tadashi Takayanagi
Holographic Spacetimes as Quantum Circuits of Path-Integrations
arXiv:1808.09072 [hep-th] JHEP (2018) 2018: 48 (August).

18-94 Shinji Mukohyama
Stability of stealth magnetic field in de Sitter spacetime
arXiv:1808.09000 [hep-th] Phys. Rev. D 98, 104053 (2018) (August).

18-95 Kazuma Shimizu, Seiji Terashima
Supersymmetry Breaking Phase in Three Dimensional Large N Gauge Theories
arXiv:1809.03670 [hep-th] JHEP11(2018)064 (August).

18-96 Soichiro Isoyama, Ryuichi Fujita, Hiroyuki Nakano, Norichika Sago, Takahiro Tanaka
"Flux-balance formulae" for extreme mass-ratio inspirals
arXiv:1809.11118 [gr-qc] Prog. Theor. Exp. Phys. (2019) 013E01 (September).

18-97 Masashi Kimura, Takahiro Tanaka
Stability analysis of black holes by the S-deformation method for coupled systems
arXiv:1809.00795 [gr-qc] Class. Quantum Grav.36 055005 (September).

18-98 Yudai Suwa,Takashi Yoshida, Masaru Shibata, Hideyuki Umeda, Koh Takahashi
On the minimum mass of neutron stars
arXiv:1808.02328 [astro-ph.HE] MNRAS,481,3 (2018) (September).

18-99 Kazuma Shimizu
Aspects of Massive Gauge Theories on Three Sphere in Infinite Mass Limit
arXiv:1809.03679 [hep-th] JHEP01(2019)090 (September).

18-100 Kai-Wen Li, Tetsuo Hyodo, Li-Sheng Geng
Strangeness S=-2 baryon-baryon interactions in relativistic chiral effective field theory
arXiv:1809.03199 [nucl-th] Phys. Rev. C 98, 065203 (2018) (September).

18-101 K. Shizuya
Many-body effects on Landau-level spectra and cyclotron resonance in graphene
arXiv:1809.04351 [cond-mat.mes-hall] Phys. Rev. B 98, 115419 (2018) (September).

18-102 Chengcheng Han, Shi Pi, Misao Sasaki
Quintessence Saves Higgs Instability
arXiv:1809.05507 [hep-ph] Phys.Lett.B 791(2019) (September).

18-103 Yuki Takeuchi, Tomoyuki Morimae, Masahito Hayashi
Quantum computational universality of hypergraph states with Pauli-X and Z basis measurements
arXiv:1809.07552 [quant-ph] (October).

18-104 Masato Minamitsuji, Hayato Motohashi
Stealth Schwarzschild solution in shift symmetry breaking theories
arXiv:1809.06611 [gr-qc] Phys. Rev. D 98, 084027 (2018) (October).

18-105 Hayato Motohashi, Shinji Mukohyama
Shape dependence of spontaneous scalarization
arXiv:1810.12691 [gr-qc] Phys. Rev. D 99, 044030 (2019) (October).

18-106 Yuya Kusuki
Light Cone Bootstrap in General 2D CFTs and Entanglement from Light Cone Singularity
arXiv:1810.01335 [hep-th] JHEP(2019) 2019: 25 (October).

18-107 Ken Osato, Takahiro Nishimichi, Francis Bernardeau, Atsushi Taruya
Perturbation theory challenge for cosmological parameters estimation : Matter power spectrum in real space
arXiv:1810.10104 [astro-ph.CO] Phys. Rev. D 99, 063530 (2019) (October).

18-108 Katsuki Aoki, Antonio De Felice, Chunshan Lin, Shinji Mukohyama, Michele Oliosi
Phenomenology in type-I minimally modified gravity
arXiv:1810.01047 [gr-qc] JCAP01(2019)017 (October).

18-109 Éric Fusy, Luca Lionni, Adrian Tanasa
Combinatorial study of graphs arising from the Sachdev-Ye-Kitaev model
arXiv:1810.02146 [math.CO] (October).

18-110 Stéphane Dartois, Oleg Evnin, Luca Lionni, Vincent Rivasseau, Guillaume Valette
Melonic Turbulence
arXiv:1810.01848 [math-ph] (October).

18-111 Tibra Ali, Arpan Bhattacharyya, S. Shajidul Haque, Eugene H. Kim, Nathan Moynihan
Time Evolution of Complexity: A Critique of Three Methods
arXiv:1810.02734 [hep-th] JHEP 1904 (2019) 087 (October).

18-112 Yoshitaka Hatta, Abha Rajan, Kazuhiro Tanaka
Quark and gluon contributions to the QCD trace anomaly
arXiv:1810.05116 [hep-ph] JHEP(2018) 2018: 8 (October).

18-113 Kei-ichi Maeda, Shuntaro Mizuno, Ryota Tozuka
α-attractor-type Double Inflation
arXiv:1810.06914 [hep-th] Phys. Rev. D 98, 123530 (2018) (October).

18-114 Rong-gen Cai, Shi Pi, Misao Sasaki
Gravitational Waves Induced by non-Gaussian Scalar Perturbations
arXiv:1810.11000 [astro-ph.CO] (October).

18-115 Naotaka Kubo, Sanefumi Moriyama, Tomoki Nosaka
Symmetry Breaking in Quantum Curves and Super Chern-Simons Matrix Models
arXiv:1811.06048 [hep-th] JHEP (2019) 2019: 210 (October).

18-116 Tibra Ali, Arpan Bhattacharyya, S. Shajidul Haque, Eugene H. Kim, Nathan Moynihan
Post-Quench Evolution of Distance and Uncertainty in a Topological System: Complexity, Entanglement and Revivals
arXiv:1811.05985 [hep-th] (October).

18-117 Shintaro Nakamura, Antonio De Felice, Ryotaro Kase, Shinji Tsujikawa
Constraints on massive vector dark energy models from integrated Sachs-Wolfe-galaxy cross-correlations
arXiv:1811.07541 [astro-ph.CO] Phys. Rev. D 99, 063533 (2019) (November).

18-118 Sanjin Benić, Yoshitaka Hatta
Single spin asymmetry in forward pA collisions: Phenomenology at RHIC
arXiv:1811.10589 [hep-ph] (November).

18-119 Tomoyuki Morimae, Harumichi Nishimura, Yuki Takeuchi, Seiichiro Tani
Impossibility of blind quantum sampling for classical client
arXiv:1812.03703 [quant-ph] (November).

18-120 Akira Ohnishi, Yuto Mori, Kouji Kashiwa
Path optimization method with use of neural network

for the sign problem in field theories
arXiv:1812.11506 [hep-lat] (November).

18-121 Takumi Iritani, Sinya Aoki, Takumi Doi, Faisal Etminan, Shinya Gongyo, Tetsuo Hatsuda, Yoichi Ikeda, Takashi Inoue, Noriyoshi Ishii, Takaya Miyamoto, Kenji Sasaki
$N\Omega$ dibaryon from lattice QCD near the physical point
arXiv:1810.03416 [hep-lat] Phys. Lett. B792 (2019) 284-289 (November).

18-122 Teppei Shimaji, Tadashi Takayanagi, Zixia Wei
Holographic Quantum Circuits from Splitting/Joining Local Quenches
arXiv:1812.01176 [hep-th] JHEP 03 (2019) 165 (November).

18-123 Francesco Giacomello, Antonio De Felice, Stefano Ansoldi
Bounds of ISW-galaxy cross-correlations on generalized covariant Galileon models
arXiv:1811.10885 [astro-ph.CO] JCAP03(2019)038 (November).

18-124 Takumi Iritani, Sinya Aoki, Takumi Doi, Tetsuo Hatsuda, Yoichi Ikeda, Takashi Inoue, Noriyoshi Ishii, Hidekatsu Nemura, Kenji Sasaki
Consistency between Lüscher's finite volume method and HAL QCD method for two-baryon systems in lattice QCD
arXiv:1812.08539 [hep-lat] JHEP03(2019)007 (December).

18-125 Pawel Caputa, Masamichi Miyaji, Tadashi Takayanagi, Koji Umemoto
Holographic Entanglement of Purification from Conformal Field Theories
arXiv:1812.05268 [hep-th] Phys. Rev. Lett. 122, 111601 (2019) (December).

18-126 unused

18-127 Toshiya Namikawa, Benjamin Bose, François R. Bouchet, Ryuichi Takahashi, Atsushi Taruya
CMB lensing bi-spectrum: assessing analytical predictions against full-sky lensing simulations
arXiv:1812.10635 [astro-ph.CO] Phys. Rev. D 99, 063511 (2019) (December).

18-128 Samuel Passaglia, Wayne Hu, Hayato Motohashi
Primordial Black Holes and Local Non-Gaussianity in Canonical Inflation
arXiv:1812.08243 [astro-ph.CO] Phys. Rev. D 99, 043536 (2019) (December).

18-129 Thomas Creutzig, Yasuaki Hikida
Rectangular W-algebras, extended higher spin gravity and dual coset CFTs
arXiv:1812.07149 [hep-th] JHEP(2019) 2019: 147 (December).

18-130 Rong-Gen Cai, Sunly Khimphun, Bum-Hoon Lee, Sichun Sun, Gansukh Tumurtushaa, Yun-Long Zhang
Emergent Dark Universe and the Swampland Criteria
arXiv:1812.11105 [hep-th] (December).

18-131 Shinji Mukohyama, Yota Watanabe
Kinetic equation for Lifshitz scalar
arXiv:1812.10983 [hep-th] Phys. Rev. D 99, 065003 (2019) (December).

18-132 unused

18-133 Adi Armoni, Shigeki Sugimoto
Vacuum Structure of Charge k Two-Dimensional QED and Dynamics of an Anti D-String Near an O1-plane
arXiv:1812.10064 [hep-th] JHEP (2019) 2019: 175 (December).

18-134 Nejc Ceplak, Rodolfo Russo, Masaki Shigemori
Supercharging Superstrata
arXiv:1812.08761 [hep-th] JHEP (2019) 2019: 95 (January 2019).

18-135 Kunihito Ioka, Amir Levinson, Ehud Nakar
The Spectrum of a Fast Shock Breakout from a Stellar Wind
arXiv:1810.11022 [astro-ph.HE] MNRAS484,3 (2019) (February 2019).

18-136 Hiroki Nagakura, Kazuya Takahashi, Yu Yamamoto
On the importance of progenitor asymmetry to shock revival in core-collapse supernovae
arXiv:1811.05515 [astro-ph.HE] MNRAS483,1 (2019) (February 2019).

18-137 Kazuya Takahashi, Kenji Toma, Motoki Kino, Masanori Nakamura, Kazuhiro Hada
Fast-spinning black holes inferred from symmetrically limb-brightened radio jets
arXiv:1802.00292 [astro-ph.HE] APJ 868,82 (2018) (February 2019).

18-138 Masanori Nakamura, Keiichi Asada, Kazuhiro Hada, Hung-Yi Pu, Scott Noble, Chihyin Tseng, Kenji Toma, Motoki Kino, Hiroshi Nagai, Kazuya Takahashi, Juan-Carlos Algaba, Monica Orienti, Kazunori Akiyama, Akihiro Doi, Gabriele Giovannini, Marcello Giroletti, Mareki Honma, Shoko Koyama, Rocco Lico, Kotaro Niinuma, Fumie Tazaki
Parabolic Jets from the Spinning Black Hole in M87
arXiv:1810.09963 [astro-ph.HE] APJ 868,146 (2018) (February 2019).

2.2.2 Publications and Talks by Regular Staff and Advanced Future Studies Researchers (April 2018 — March 2019)

Sinya Aoki

Journal Papers

1. Shinya Gongyo, Kenji Sasaki, Sinya Aoki, Takumi Doi, Tetsuo Hatsuda, Yoichi Ikeda, Takashi Inoue, Takumi Iritani, Noriyoshi Ishii, Takaya Miyamoto, Hidekatsu Nemura,
"Most Strange Dibaryon from Lattice QCD,"
Phys. Rev. Lett. **120** (2018) 212001 [arXiv:1709.00654 [hep-lat]].

2. Daisuke Kawai, Sinya Aoki, Takumi Doi, Yoichi Ikeda, Takashi Inoue, Takumi Iritani, Noriyoshi Ishii, Takaya Miyamoto, Hidekatsu Nemura, Kenji Sasaki,
"$I = 2$ $\pi\pi$ scattering phase shift from the HAL QCD method with the LapH smearing,"
PTEP **2018** No.4 (2018) 043B04 [arXiv:1711.01883 [hep-lat]].

3. S. Aoki, T. Doi, T. Hatsuda and N. Ishii, "Comment on " Relation between scattering amplitude and Bethe-Salpeter wave function in quantum field theory ",," Phys. Rev. D **98** (2018) no.3, 038501 doi:10.1103/PhysRevD.98.038501 [arXiv:1711.09344 [hep-lat]].

4. S. Aoki and S. Yokoyama,
"AdS geometry from CFT on a general conformally flat manifold,"
Nucl. Phys. B **933** (2018) 262 [arXiv:1709.07281 [hep-th]].

5. S. Aoki, J. Balog and S. Yokoyama,
"Holographic computation of quantum corrections to the bulk cosmological constant,"
PTEP **2019** (2019) no.4, 043 [arXiv:1804.04636 [hep-th]].

6. Takumi Iritani, Sinya Aoki, Takumi Doi, Shinya Gongyo, Tetsuo Hatsuda, Yoichi Ikeda, Takashi Inoue, Noriyoshi Ishii, Hidekatsu Nemura, Kenji Sasaki,
"Systematics of the HAL QCD Potential at Low Energies in Lattice QCD,"
Phys. Rev. D **99** (2019) , 014514 (arXiv:1805.02365 [hep-lat]).

7. S. Gongyo and S. Aoki, "Asymptotic behavior of Nambu-Bethe-Salpeter wave functions for scalar systems with a bound state," PTEP **2018** (2018) no.9, 093B03 [arXiv:1807.02967 [hep-lat]].

Books and Proceedings

1. K. Suzuki *et al.* [JLQCD Collaboration], arXiv:1812.06621 [hep-lat].

Talks at International Conferences

1. "Holography from field theories and a realization of AdS/CFT correspondence - A proposal and some applications- ", New Frontier in String Theory 2018, July 2- August 3, 2018, YITP, Kyoto University, Kyoto, Japan

2. "Recent results from HAL QCD potential method", Scattering Amplitude and Resonances Properties from Lattice QCD, August 27-31, 2018, Mainz Institute for Theoretical Physics, Johannes Gutenberg University, Mainz, Germany

3. "Hadron interactions from Lattice QCD", International School of Nuclear Physics 40th course "The Strong Interaction: From Quarks and Gluons to Nuclei and Stars", September 16-24, 2018, Erice-Sicily, Italy

4. "Two Baryon Systems in Lattice QCD", Interface of Effective Field Theories and Lattice Gauge Theories, 15 October - 9 November, 2018, MIAPP, Munich, Germany

5. "Hadron interactions in Lattice QCD", Second International Workshop "Particles, Gravitation and the Universe" (PGU2018), 10-15 December, Hanoi, Vietnam

6. “Holography from field theories: a realization of AdS/CFT correspondence", December 20, 2018, KEK Theory Workshop, KEK, Japan

Invited Seminars (Overseas)

1. “Holography from field theories: a realization of AdS/CFT correspondence and beyond", 12 February, 2019, Seminar at Max Planck Institute for Gravitational Physics (Albert Einstein Institute), Potsdam-Golm, Germany

2. “Holography from field theories: a realization of AdS/CFT correspondence and beyond", 13 February, 2019, Seminar at Humboldt University, Berlin, Germany

3. “Hadron interactions in Lattice QCD", 15 February, 2019, Colloquium at Max Planck Institute for Gravitational Physics (Albert Einstein Institute), Potsdam-Golm, Germany

Antonio De Felice

1. “Bounds from ISW-galaxy cross-correlations on generalized covariant Galileon models”
F. Giacomello, A. De Felice and S. Ansoldi.
arXiv:1811.10885 [astro-ph.CO]
DOI:10.1088/1475-7516/2019/03/038
JCAP **1903**, no. 03, 038 (2019)

2. “Constraints on massive vector dark energy models from integrated Sachs-Wolfe-galaxy cross-correlations”
S. Nakamura, A. De Felice, R. Kase and S. Tsujikawa.
arXiv:1811.07541 [astro-ph.CO]
DOI:10.1103/PhysRevD.99.063533
Phys. Rev. D **99**, no. 6, 063533 (2019)

3. “Phenomenology in type-I minimally modified gravity”
K. Aoki, A. De Felice, C. Lin, S. Mukohyama and M. Oliosi.
arXiv:1810.01047 [gr-qc]
DOI:10.1088/1475-7516/2019/01/017
JCAP **1901**, no. 01, 017 (2019)
WU-AP/1806/18, YITP-18-108, IPMU18-0158

4. “Black holes and stars in the minimal theory of massive gravity”
A. De Felice, F. Larrouturou, S. Mukohyama and M. Oliosi.
arXiv:1808.01403 [gr-qc]
DOI:10.1103/PhysRevD.98.104031
Phys. Rev. D **98**, no. 10, 104031 (2018)
YITP-18-85, IPMU18-0128

5. “Phenomenology of minimal theory of quasidilaton massive gravity”
A. De Felice, S. Mukohyama and M. Oliosi.
arXiv:1806.00602 [hep-th]
DOI:10.1103/PhysRevD.99.044055
Phys. Rev. D **99**, no. 4, 044055 (2019)
YITP-18-45, IPMU18-0093

6. “Integrated Sachs-Wolfe-galaxy cross-correlation bounds on the two branches of the minimal theory of massive gravity”
N. Bolis, A. De Felice and S. Mukohyama.
arXiv:1804.01790 [astro-ph.CO]
DOI:10.1103/PhysRevD.98.024010
Phys. Rev. D **98**, no. 2, 024010 (2018)

7. “Generalized instantaneous modes in higher-order scalar-tensor theories”
A. De Felice, D. Langlois, S. Mukohyama, K. Noui and A. Wang.
arXiv:1803.06241 [hep-th]
DOI:10.1103/PhysRevD.98.084024
Phys. Rev. D **98**, no. 8, 084024 (2018)

8. “Stable cosmology in chameleon bigravity”
A. De Felice, S. Mukohyama, M. Oliosi and Y. Watanabe.
arXiv:1711.04655 [hep-th]
DOI:10.1103/PhysRevD.97.024050
Phys. Rev. D **97**, no. 2, 024050 (2018)
IPMU17-0137, YITP-17-106

Invited Seminars (Overseas)

1. “Minimal theory of Massive Gravity: theory and phenomenology”
Talk given at Marcel Grossmann 15
Università “La Sapienza”
Roma, Italy
5th of July 2018

2. “Phenomenology in Minimal Theory of Massive Gravity in the Starobinsky’s universe: self acc. and normal branch”
Talk given at the 5th Korea-Japan workshop

on Dark Energy
Korea Astronomy and Space Science Institute (KASI)
Daejeon, South-Korea
8th of August 2018

3. "Cosmological Implications in Massive Gravity"
Invited seminar
Talk given at the Institute for Fundamental Study (IF), Naresuan University
Phitsanulok, Thailand
15th of March 2019

4. "Cosmological Implications in Massive Gravity"
Invited seminar
Talk given at the Physics Department of Naresuan University
Phitsanulok, Thailand
20th of March 2019

Invited Seminars (in Japan)

1. "My research on dark energy in US and EU"
English special lecture
Talk given at the Physics Department of Kobe University
Kobe, Japan
15th of February 2019

Yoshitaka Hatta

Journal Papers

1. S. Benic and Y. Hatta,
"Single spin asymmetries in ultra-peripheral $p^{\uparrow}A$ collisions,"
Phys. Rev. **D98** (2018) 094025 (8 pages), YITP-18-66, arXiv:1806.10901 [hep-ph].

2. R. Boussarie, Y. Hatta, B. Xiao and F. Yuan,
"Probing the Weizsacker-Williams gluon Wigner distribution in pp collisions,"
Phys. Rev. **D98** (2018) 074015 (13 pages), YITP-18-67, arXiv:1807.08697 [hep-ph].

3. Y. Hatta and D. Yang,
"Holographic J/ψ production near threshold and the proton mass problem,"
Phys. Rev. **D98** (2018) 074003 (13 pages), YITP-18-79, arXiv:1808.02163 [hep-ph].

4. Y. Hatta and A. Rajan and K. Tanaka,
"Quark and gluon contributions to the QCD trace anomaly,"
JHEP 1812 (2018) 008 (18 pages), YITP-18-112, arXiv:1810.05116 [hep-ph].

5. S. Benic and Y. Hatta,
"Single spin asymmetry in forward pA collisions: Phenomenology at RHIC,"
Phys. Rev. **D99** (2019) 094012 (6 pages), YITP-18-118, arXiv:1811.10589 [hep-ph].

Books and Proceedings

1. Y. Hatta,
"Orbital angular momentum distribution at small-x,"
PoS DIS2018 (2018) 256.

Talks at International Conferences

1. "Working group 6 summary," Convener summary talk,
in "DIS2018," Kobe, Japan, April 2018.

2. "Recent developments in nucleon spin decomposition," Invited,
in "Light-cone 2018," Jefferson Lab, USA, May 2018.

3. "Probing the QCD Wigner distribution in diffractive dijet production," Invited,
in "Short-range nuclear correlations at an electron-ion collider,", BNL, USA, September 2018.

4. "Probing the QCD Wigner distribution in diffractive dijet production," Invited,
in "Resummation and factorization," Institute of Nuclear Physics, Krakow, Poland, November 2018.

5. "The science of the Electron-Ion Collider," Invited,
in "CFNS inaugural symposium," Stony Brook University, November 2018.

Invited Seminars (Overseas)

1. "Holographic J/ψ production near threshold and the proton mass problem,"
INT workshop, University of Washington, Seattle, USA, October 2018.

2. "Unraveling the nucleon's mass and spin structure at an Electron-Ion Collider,"
BNL Colloquium, BNL, USA, September 2018.

3. “Resummation of nonglobal logarithms in QCD,”
   MIT, USA, November 2018.

4. “Resummation of nonglobal logarithms in QCD,”
   Penn State University, USA, November 2018.

Koichi Hattori

Journal Papers

1. Koichi Hattori and Arata Yamamoto, “Meson deformation by magnetic fields in lattice QCD,” PTEP 2019 (2019) 043. [arXiv:1901.10182 [hep-lat]]. YITP-19-16.

Talks at International Conferences

1. “Magnetohydrodynamics with Chiral Anomaly,” Invited, Workshop on Recent Developments in Chiral Matter and Topology, National Taiwan University, Dec. 6-9 (2018).

Invited Seminars (Overseas)

1. “Formulation of relativistic magnetohydrodynamic”, Fudan University, Shanghai, China, Mar. 7, 2019.

Invited Seminars (in Japan)

1. “Recent progress in strong-field physics and application to relativitic heavy-ion collisions", "Heavy-ion Pub" workshop, Nara Women’s University、Jan.10, 2019 (in Japanese)

Hisao Hayakawa

Journal Papers

1. K. Suzuki, and H. Hayakawa,
   “Theory for the rheology of dense non-Brownian suspensions: divergence of viscosities and $\mu - J$ rheology,”
   J. Fluid. Mech. **864** (2019) 1125-1176.

2. E. Fodor, H. Hayakawa, J. Tailleur and F. van Wijland,
   “Non-Gaussian noise without memory in active matter,”
   Phys. Rev. **E98** (2018) 062610 (13 pages)

3. S. Takada, and H. Hayakawa,
   “Rheology of dilute cohesive granular gases,”
   Phys. Rev. **E97** (2018) 042902 (13 pages).

Talks at International Conferences

1. “Shear jamming, DST, dilatancy and compaction in oscillatory sheared granular materials,” Invited,
   in “BulbulFest 2019,” Brandeis University, MA, U. S. A.,
   March 2019.

2. “Shear jamming, DST and fragile of frictional granular materials under oscillatory shear,”
   in “APS March meeting,” Boston, MA, U. S. A.,
   March 2019.

3. “The characterization of dense.jammed matter: mutual relationships among the shear-jammed, fragile.states and the discontinuous shear thickening,” Invited,
   in “Entropy, Information and Order in Soft Mater,” ICTS, Bangalore, India,
   October 2018.

4. “Particles flows behind an intruder:.from Stokesian flow to tubulent flow,” Invited,
   in “The 9th Hungary-Japan Bilateral Joint Workshop on Statistical Physics of Breakdown Phenomena,” Univ. Debrecen, Debrecen, Hungary,
   October 2018.

5. “Theory for the rheology of dense non-Brownian suspensions,”
   in “10th European Solid Mechanics Conference,’ ’Bologna Congressi, Bologna, Italy.,
   July 2018.

6. “Time dependent interaction between intruders in the granular media,”
   in “9th international conference on Multiscale Materials, Modeling,” Osaka International Convention Center, Osaka, Japan.,
   November 2018.

7. “Effective interactions between intruders in nonequilibrium environments,”
   in “Physics of Jammed Matter,” YITP, Kyoto, Japan.,
   October 2018.

8. "Kinetic theory of shear thickening for inertia suspensions,"
   in "Rheology of disordered particles - suspensions, glassy and granular materials," YITP, Kyoto, Japan.,
   June 2018.

9. "Statistical mechanics of rheology of dense suspensions,"
   in "Rheology of disordered particles - suspensions, glassy and granular materials," YITP, Kyoto, Japan.,
   June 2018.

10. "Interaction and drag in non-equilibrium environments: from the study of granular materials,"
    in "Rheology of disordered particles - suspensions, glassy and granular materials," YITP, Kyoto, Japan.,
    June 2018.

Invited Seminars (Overseas)

1. "Shear jamming, discontinuous shear thickening, dilatancy and compaction of dense and frictional granular materials under oscillatory shear , "
   University of Illinoisät Urbana-Champaign, U.S. A., March 2019.

2. "Berry's phase in driven non-equilibrium systems , "
   University of Illinoisät Urbana-Champaign, U.S. A., March 2019.

3. "Physics of non-Gaussian noise and its application to many-body systems",
   KIAS, Korea, December 2018.

4. "Shear jamming, DST, and fragile states under oscillatory shear",
   KIAS, Korea, December 2018.

Yasuaki Hikida

Journal Papers

1. Y. Hikida, T. Uetoko,
   "Conformal blocks from Wilson lines with loop corrections,"
   Phys. Rev. **D97** (2018) 086014 (29 pages), YITP-18-06, arXiv:1801.08549 [hep-th].

2. Y. Hikida, Y. Kusuki, T. Takayanagi,
   "Eigenstate thermalization hypothesis and modular invariance of two-dimensional conformal field theories,"
   Phys. Rev. **D98** (2018) 026003 (9 pages), YITP-18-37, arXiv:1804.09658 [hep-th].

3. Y. Hikida, T. Uetoko,
   "Superconformal blocks from Wilson lines with loop corrections,"
   JHEP **1808** (2018) 101 (41 pages), YITP-18-64, arXiv:1806.05836 [hep-th].

4. T. Creutzig, Y. Hikida,
   "Rectangular W-algebras, extended higher spin gravity and dual coset CFTs,"
   JHEP **1902** (2019) 147 (31 pages), YITP-18-129, arXiv:1812.07149 [hep-th].

Talks at International Conferences

1. "Conformal blocks from Wilson lines with loop corrections," Invited,
   in "International Conference on Holography, String Theory and Discrete Approaches in Hanoi," VAST, Hanoi, Vietnam, August 2018.

2. "Rectangular W-algebras, extended higher spin gravity and dual coset CFTs," Invited,
   in ESI Programme and Workshop "Higher spins and holography," ESI, Vienna, Austria,
   March 2019.

Invited Seminars (in Japan)

1. "Conformal blocks from Wilson lines with loop corrections,"
   Dept. of Phys., Shinshu Univ., October 2018 (in Japanese).

Tetsuo Hyodo

Journal Papers

1. M. Sanchez Sanchez, L. S. Geng, J. X. Lu, T. Hyodo and M. P. Valderrama,
   "Exotic doubly charmed $D^*_{s0}(2317)D$ and $D^*_{s1}(2460)D^*$ molecules,"
   Phys. Rev. D **98** (2018) 034002 (6 pages), YITP-17-70, arXiv:1707.03802 [hep-ph].

2. U. Raha, Y. Kamiya, S. I. Ando and T. Hyodo,

"Universal physics of the few-body system of two neutrons and one flavored meson," Phys. Rev. C **98** (2018) 034002 (16 pages), YITP-17-85, arXiv:1708.03369 [nucl-th].

3. K. Miyahara, and T. Hyodo, "Theoretical study of $\Lambda(1405)$ resonance in $\Xi_b^0 \to D^0(\pi\Sigma)$ decay," Phys. Rev. C **98** (2018) 025202 (5 pages), YITP-18-18, arXiv:1803.05572 [nucl-th].

4. K. Miyahara, T. Hyodo and W. Weise, "Construction of a local $\bar{K}N - \pi\Sigma - \pi\Lambda$ potential and composition of the $\Lambda(1405)$," Phys. Rev. C **98** (2018) 025201 (20 pages), YITP-18-35, arXiv:1804.08269 [nucl-th].

5. T. Sekihara, Y. Kamiya and T. Hyodo, "$N\Omega$ interaction: meson exchanges, inelastic channels, and quasibound state," Phys. Rev. C **98** (2018) 015205 (20 pages), YITP-18-39, arXiv:1805.04024 [nucl-th].

6. K. W. Li, T. Hyodo and L. S. Geng, "Strangeness $S = -2$ baryon-baryon interactions in relativistic chiral effective field theory," Phys. Rev. C **98** (2018) 065203 (9 pages), YITP-18-100, arXiv:1809.03199 [nucl-th].

Books and Proceedings

1. W. Horiuchi, T. Hyodo and W. Weise, "Kaonic deuterium from realistic antikaon-nucleon interaction," EPJ Web Conf. **199** (2019) 03003 (6 pages).

2. W. Horiuchi and T. Hyodo, "Competition between nucleon- and $\bar{K}NN$-cluster correlations in kaonic nuclear systems," AIP Conf. Proc. **2038** (2018) 020040 (6 pages).

3. Y. Kamiya and T. Hyodo, "Structure of hadron resonance with nearby CDD zero," PoS Hadron **2017** (2017) 070 (6 pages).

Talks at International Conferences

1. "Structure of hadrons from effective field theory," Invited, in "EFTs and ab initio methods," Chengdu, China, April 2018.

2. "Kaonic deuterium from realistic antikaon-nucleon interaction," Invited, in "15th International Workshop on Meson Physics (MESON 2018)," Krakow, Poland, June 2018.

3. "Structure of hadrons from effective field theory," Invited, in "International workshop on realistic hadron interactions in QCD," Beijing, China, July 2018.

4. "Status of $\Lambda(1405)$ in chiral dynamics," Invited, in "Workshop on Dense Matter from Chiral Effective Theories 2018," Nagoya Univ., Japan, October 2018.

5. "Structure and compositeness of exotic hadrons," Invited, in "Fifth Joint Meeting of the Nuclear Physics Divisions of the APS and the JPS," Hawaii, USA, October 2018.

6. "Model-independent study on the structure of $\Lambda(1405)$," Invited, in "8th International Conference on Quarks and Nuclear Physics (QNP2018)," Tsukuba, Japan, November 2018.

7. "Compositeness of hadrons from effective field theory," Invited, in "Reimei Workshop "Universal physics in Many-Body Quantum Systems – From Atoms to Quarks –"," Tokai, Japan, December 2018.

8. "Status of $\Lambda(1405)$ in chiral dynamics," Invited, in "Korea-Japan Joint Workshop on the Present and the Future in Hadron Physics at J-PARC," Busan, Korea, March 2019.

Invited Seminars (in Japan)

1. "Structure and compositeness of hadron resonances," Sendai Nuclear Science Colloquium, Tohoku Univ., July 2018 (in Japanese).

2. "Structure and compositeness of hadron resonances,"
   Nagoya Univ., August 2018 (in Japanese).

Kunihito Ioka

Journal Papers

1. S. Kisaka, K. Ioka, K. Kashiyama and T. Nakamura,
   "Scattered Short Gamma-Ray Bursts as Electromagnetic Counterparts to Gravitational Waves and Implications of GW170817 and GRB 170817A,"
   The Astrophysical Journal **867** (2018) 39 (11 pages), YITP-17-138, arXiv:1711.00243 [astro-ph].

2. S. S. Kimura, K. Murase, I. Bartos, K. Ioka, I. S. Heng and P. Mészáros,
   "Trans-Ejecta High-Energy Neutrino Emission from Binary Neutron Star Mergers,"
   Physical Review D **98** (2018) 043020 (12 pages), YITP-18-81, arXiv:1805.11613 [astro-ph].

3. T. Matsumoto, K. Ioka, S. Kisaka and E. Nakar,
   "Is the Macronova in GW170817 Powered by the Central Engine?,"
   The Astrophysical Journal **861** (2018) 55 (12 pages), YITP-18-82, arXiv:1802.07732 [astro-ph].

4. K. Ioka and T. Nakamura,
   "Can an Off-axis Gamma-Ray Burst Jet in GW170817 Explain All the Electromagnetic Counterparts?,"
   Progress of Theoretical and Experimental Physics **043E02** (2018) (25 pages), YITP-17-140, arXiv:1710.05905 [astro-ph].

Books and Proceedings

1. Kunihito Ioka,
   "What is the Gamma-Ray Burst Associated with the Gravitational Wave?,"
   Journal of the Physical Society of Japan **73** (2018) vol. 9.

Talks at International Conferences

1. "Spectral puzzle of the Off-Axis Gamma-Ray Burst in GW170817,"
   in "Aspen Winter Conference: Gravitational-Wave Astrophysics with Populations," Aspen, Colorado, USA,
   Feb. 2019.

2. "The Spectrum of a Fast Shock Breakout from a Stellar Wind,"
   in "10th NAOJ DTA symposium: Stellar deaths and their diversity" NAOJ, Mitaka, Tokyo,
   Jan. 2019.

3. "An Off-Axis Jet in Electromagnetic Counterparts to GW170817,"
   in "The extreme Universe viewed in very-high-energy gamma rays 2018" H10 Hotel Tabriente Playa, La Palma,
   Oct. 2019.

4. "Electromagnetic Counterparts to Gravitational Waves and Gamma-Ray Burst Jets," Invited,
   in "Second international workshop: Particles, Gravitation and the Universe," Vietnam national space centre (VNSC), Vietnam academy of science and technology (VAST), Hanoi,
   Dec. 2018.

5. "Jet in Electromagnetic Counterparts to GW170817?," Invited,
   in "The 3rd PANDA Symposium on Time Domain Astronomy and first results from Insight-HXMT," Chengdu, China,
   Jun. 2018.

Invited Seminars (in Japan)

1. "Study of Black Holes and Multi-Messenger Astronomy with CTA,"
   Kyushu Univ., Mar. 2019 (Cosmic Rays/Astrophysics Symposium, The Physical Society of Japan).

2. "Seimei Telescope and Gamma-Ray Bursts,"
   Dept. of Astronomy, Kyoto Univ., Dec. 2018 (Special MHD seminar).

3. "Jet in Electromagnetic Counterparts to GW170817,"
   ICRR, Kashiwa, Nov. 2018 (ICRR workshop on "Diversity of High-Energy Astrophysical Phenomena").

4. "Recent Progresses in Gravitational Wave Astrophysics,"

Ibaraki Univ., Nov. 2018 (First Star and First Galaxy Workshop 2018).

5. "An Off-Axis Jet in Electromagnetic Counterparts to GW170817,"
Nagoya Univ., Sep. 2018 (in the intensive lecture).

6. "Electromagnetic Phenomena from Compact Star Mergers and GW170817,"
Osaka City Univ., May 2018 (Colloquium).

Naoyuki Itagaki

Journal Papers

1. H. Matsuno, Y. Kanada-En'yo and N. Itagaki,
"Tensor correlations in 4He and 8Be with antisymmetrized quasi cluster model,"
Phys. Rev. C **98** (2018) 054306, arXiv:1805.10087 [nucl-th].

2. N. Itagaki, H. Matsuno and A. Tohsaki,
"Explicit inclusion of spin-orbit contribution in Tohsaki-Horiuchi-Schock-Roepke wave function,"
Phys. Rev. C **98** (2018) 044306, arXiv:1806.03817 [nucl-th].

3. A. Tohsaki and N Itagaki,
"Coulomb Energy of alpha-Aggregates distributed on Archimedean solids,"
Phys. Rev. C **98** (2018) 014302, arXiv:1804.06551 [nucl-th].

4. T. Furumoto, T. Suhara and N. Itagaki,
"Channel coupling effect on elastic scattering of Li isotope,"
Phys. Rev. C **97** (2018) 044602, arXiv:1712.03819 [nucl-th].

Talks at International Conferences

1. "A trial for the general description of shell and cluster structures," Invited,
in "Recent advances on proton-neutron pairing and quartet correlations in nuclei," Saclay, Paris, France,
September 2009.

Kenta Kiuchi

Journal Papers

1. K. Kiuchi, K. Kyutoku, Y. Sekiguchi and M. Shibata,
"Global simulations of strongly magnetized remnant massive neutron stars formed in binary neutron star mergers,"
Phys. Rev. D **97**, no. 12, 124039 (2018) arXiv:1710.01311 [astro-ph.HE].

2. S. Yamasaki, T. Totani and K. Kiuchi,
"Repeating and Non-repeating Fast Radio Bursts from Binary Neutron Star Mergers,"
Publ. Astron. Soc. Jap. **70**, no. 3, Publications of the Astronomical Society of Japan, Volume 70, Issue 3, 1 June 2018, 39, arXiv:1710.02302 [astro-ph.HE].

3. S. Fujibayashi, K. Kiuchi, N. Nishimura, Y. Sekiguchi and M. Shibata,
"Mass Ejection from the Remnant of a Binary Neutron Star Merger: Viscous-Radiation Hydrodynamics Study,"
Astrophys. J. **860**, no. 1, 64 (2018) arXiv:1711.02093 [astro-ph.HE].

4. K. Hotokezaka, K. Kiuchi, M. Shibata, E. Nakar and T. Piran,
"Synchrotron radiation from the fast tail of dynamical ejecta of neutron star mergers,"
Astrophys. J. **867**, no. 2, 95 (2018) arXiv:1803.00599 [astro-ph.HE].

5. H. Lin, T. Totani and K. Kiuchi,
"Non-thermal afterglow of the binary neutron star merger GW170817: a more natural modelling of electron energy distribution leads to a qualitatively different new solution,"
Mon. Not. Roy. Astron. Soc. **485**, no. 2, 2155 (2019) arXiv:1810.02587 [astro-ph.HE].

Talks at International Conferences

1. " Binary Neutron Star Merg,,"r Invited,
in "Workshop on Jet and Shock breakout in Cosmic transient," YITP, Kyoto, Japan
May 2018.

2. "Exploring the nuclearphysic equation of state in binary neutron star merger," Invited,
in "Workshop on r-Process and Unstable Nuclei in Multi-messenger Astronomy," Riken, Wako, Japan
June 2018.

3. "Frontiers in Numerical Relativit," Invited, in "2019 YITP Asia-Pacific Winter School and Workshop on Gravitation and Cosmology," YITP, Kyoto, Japan
Feb. 2019

Hiroshi Kunitomo

Journal Papers

1. H. Kunitomo, T. Sugimoto,
"Heterotic string field theory with cyclic L_∞ structure,"
Prog. Theo. Exp. Phys. in press, YITP-19-08, arXiv:1902.02991 [hep-th].

Books and Proceedings

1. H. Kunitomo,
"Heterotic string field theory and new relations extending L_∞ algebra,"
Journal of Physics: Conference Series, 1194 (2019) 012063.

Talks at International Conferences

1. "Heterotic string field theory and new relations extending L_∞ algebra," Invited,
in "The 32nd International Colloquium on Group Theoretical Methonds in Physics," July 09-13, 2018, Prague, Czech Republic.

Tomoyuki Morimae

Journal Papers

1. T. Takeuchi and T. Morimae,
"Verification of many-qubit states,"
Phys. Rev. **X8** (2018) 021060 (16 pages), YITP-18-59, arXiv:1709.07575 [quant-ph].

2. K. Fujii, H. Kobayashi, T. Morimae, H. Nishimura, S. Tamate, and S. Tani,
"Impossibility of classically simulating one-clean qubit model with multiplicative error,"
Phys. Rev. Lett. **120** (2018) 200502 (4 pages), YITP-18-54, arXiv:1409.6777 [quant-ph].

3. T. Morimae, Y. Takeuchi, and H. Nishimura,
"Merlin-Arthur with efficient Merlin and quantum supremacy for the second level of the Fourier hierarchy,"
Quantum **2** (2018) 106 (4 pages), YITP-18-05, arXiv:1711.10605 [quant-ph].

4. T. Morimae and T. Koshiba,
"Impossibility of perfectly secure one-round delegated quantum computing for classical client,"
Quant. Inf. Comput. **19** (2019) 0214 (7 pages), YITP-19-19, arXiv:1407.1636 [quant-ph].

Books and Proceedings

1. F. Le Gall, T. Morimae, H. Nishimura and Y. Takecuhi,
"Interactive proofs with polynomial-time quantum prover for computing the order of solvable groups,"
Proceedings of the 43rd International Symposium on Mathematical Foundations of Computer Science, (2018) 26:1 (13 pages), YITP-18-34, arXiv:1805.03385 [quant-ph].

Talks at International Conferences

1. "Rational proofs for quantum computing,"
18th Asian Quantum Information Science Conference, Nagoya, Japan, September 2018.

Invited Seminars(Overseas)

1. "Fine-grained quantum supremacy,"
Tokyo Crypto Day, NTT, Japan, March 2019.

Shinji Mukohyama

Journal Papers

1. K. Aoki, C. Lin and S. Mukohyama,
"Novel matter coupling in general relativity via canonical transformation,"
Phys. Rev. D **98**, no. 4, 044022 (2018) doi:10.1103/PhysRevD.98.044022 [arXiv:1804.03902 [gr-qc]].

2. J. Oost, S. Mukohyama and A. Wang,
"Constraints on Einstein-aether theory after GW170817,"
Phys. Rev. D **97**, no. 12, 124023 (2018) doi:10.1103/PhysRevD.97.124023 [arXiv:1802.04303 [gr-qc]].

3. N. Bolis, A. De Felice and S. Mukohyama, "Integrated Sachs-Wolfe-galaxy cross-correlation bounds on the two branches of the minimal theory of massive gravity," Phys. Rev. D **98**, no. 2, 024010 (2018) doi:10.1103/PhysRevD.98.024010 [arXiv:1804.01790 [astro-ph.CO]].

4. M. A. Gorji, S. Mukohyama, H. Firouzjahi and S. A. Hosseini Mansoori, "Gauge Field Mimetic Cosmology," JCAP **1808**, no. 08, 047 (2018) doi:10.1088/1475-7516/2018/08/047 [arXiv:1807.06335 [hep-th]].

5. N. Bolis, T. Fujita, S. Mizuno and S. Mukohyama, "Quantum Entanglement in Multi-field Inflation," JCAP **1809**, 004 (2018) doi:10.1088/1475-7516/2018/09/004 [arXiv:1805.09448 [astro-ph.CO]].

6. M. Bhattacharjee, S. Mukohyama, M. B. Wan and A. Wang, "Gravitational collapse and formation of universal horizons in Einstein-aether theory," Phys. Rev. D **98**, no. 6, 064010 (2018) doi:10.1103/PhysRevD.98.064010 [arXiv:1806.00142 [gr-qc]].

7. G. Domènech, S. Mukohyama, R. Namba and V. Papadopoulos, "Vector disformal transformation of generalized Proca theory," Phys. Rev. D **98**, no. 6, 064037 (2018) doi:10.1103/PhysRevD.98.064037 [arXiv:1807.06048 [gr-qc]].

8. A. De Felice, D. Langlois, S. Mukohyama, K. Noui and A. Wang, "Generalized instantaneous modes in higher-order scalar-tensor theories," Phys. Rev. D **98**, no. 8, 084024 (2018) doi:10.1103/PhysRevD.98.084024 [arXiv:1803.06241 [hep-th]].

9. S. Mukohyama and M. S. Volkov, "The Ogievetsky-Polubarinov massive gravity and the benign Boulware-Deser mode," JCAP **1810**, no. 10, 037 (2018) doi:10.1088/1475-7516/2018/10/037 [arXiv:1808.04292 [hep-th]].

10. A. De Felice, F. Larrouturou, S. Mukohyama and M. Oliosi, "Black holes and stars in the minimal theory of massive gravity," Phys. Rev. D **98**, no. 10, 104031 (2018) doi:10.1103/PhysRevD.98.104031 [arXiv:1808.01403 [gr-qc]].

11. S. Mukohyama, "Stability of stealth magnetic field in de Sitter spacetime," Phys. Rev. D **98**, no. 10, 104053 (2018) doi:10.1103/PhysRevD.98.104053 [arXiv:1808.09000 [hep-th]].

12. T. Fujita, S. Kuroyanagi, S. Mizuno and S. Mukohyama, "Blue-tilted Primordial Gravitational Waves from Massive Gravity," Phys. Lett. B **789**, 215 (2019) doi:10.1016/j.physletb.2018.12.025 [arXiv:1808.02381 [gr-qc]].

13. K. Aoki, A. De Felice, C. Lin, S. Mukohyama and M. Oliosi, "Phenomenology in type-I minimally modified gravity," JCAP **1901**, no. 01, 017 (2019) doi:10.1088/1475-7516/2019/01/017 [arXiv:1810.01047 [gr-qc]].

14. A. De Felice, S. Mukohyama and M. Oliosi, "Phenomenology of minimal theory of quasidilaton massive gravity," Phys. Rev. D **99**, no. 4, 044055 (2019) doi:10.1103/PhysRevD.99.044055 [arXiv:1806.00602 [hep-th]].

15. H. Motohashi and S. Mukohyama, "Shape dependence of spontaneous scalarization," Phys. Rev. D **99**, no. 4, 044030 (2019) doi:10.1103/PhysRevD.99.044030 [arXiv:1810.12691 [gr-qc]].

16. S. Mukohyama and Y. Watanabe, "Kinetic equation for Lifshitz scalar," Phys. Rev. D **99**, no. 6, 065003 (2019) doi:10.1103/PhysRevD.99.065003 [arXiv:1812.10983 [hep-th]].

Talks at International Conferences

1. "Horava-Lifshitz cosmology revisited," Invited,

in “Quarks-2018”, Valday, Russia,
May 2018.

2. “Horava-Lifshitz cosmology revisited,” Invited,
in “GRAVITY, COSMOLOGY & PHYSICS BEYOND THE STANDARD MODEL”, Paris,
June 2018.

3. “Horava-Lifshitz cosmology revisited,” Invited,
in “StringPheno18”, Warsaw,
July 2018.

4. “Minimalism in Modified Gravity,” Invited,
in “5th Korea-Japan workshop on Dark Energy”, Daejeon,
August 2018.

5. “Horava-Lifshitz cosmology revisited,” Invited,
in “Analytical Methods”, Paris,
September 2018.

6. “Minimalism in Modified Gravity,” Invited,
in “Modern aspects of gravity and cosmology 2018”, Orsay,
October 2018.

Invited Seminars (Overseas)

1. “Minimalism in Modified Gravity,”
Simon Fraser University, Vancourver, Canada, August 2018.

2. “Minimalism in Modified Gravity,”
University of Alberta, Edmonton, Canada, August 2018.

3. “Horava-Lifshitz cosmology revisited,”
University of Victoria, Victoria, Canada, August 2018.

4. “Minimalism in Modified Gravity,”
Institut de Physique Theorique, Sacray, France, September 2018.

5. “Minimalism in Modified Gravity,”
University of Tours, Tours, France, October 2018.

6. “Minimalism in Modified Gravity,”
USTC, China, October 2018.

7. “Horava-Lifshitz cosmology revisited,”
USTC, China, October 2018.

8. “Minimalism in Modified Gravity,”
Meudon Observatory, Meudon, France, December 2018.

9. “Minimalism in Modified Gravity,”
CEICO, Prague, Czech, December 2018.

10. “Minimalism in Modified Gravity,”
University of Tours, Tours, France, December 2018.

11. “Horava-Lifshitz cosmology revisited,”
IPM, Tehran, Iran, January 2019.

12. “Minimalism in Modified Gravity,”
IPM, Tehran, Iran, January 2019.

13. “Minimalism in Modified Gravity,”
Baylor University, Texas, USA, February 2019.

Masatoshi Murase

Journal Papers

1. M. Murase,
“A Self-Similar Dynamic Systems Perspective of “Living” Nature: The Self-Nonself Circulation Principle Beyond Complexity ”
Springer,pp.257-283, 2018.

2. M. Murase,I. Murase and T. Murase,
“Literacy of Creativity - Expansion of Self-nonself Circulation Theory ”
Journal of Quality Education Vol.9, 53-96, 2018.

Talks at International Conferences

1. M. Murase,
"Globalization as a double-edged sword — Paths of transformation towards creative problem solving —" International Kyoto Symposium 4 on "Being Now" Community, Humanity and the Sacred: Platform for a New Economics at Kyoto University on June 3, 2018

2. M. Murase,
"Introduction to Advanced Future Studies" Transdisciplinary Mie-Symposium on Advanced Future Studies held at Mie Prefectural Musium, Kyoto University on November 17, 2018

3. M. Murase,
"Introduction to Advanced Future Studies" Kyoto University Forum on Advanced Future Studies held at Kyoto University Clock Tower, Kyoto University on October 27, 2018

4. M. Murase,
"Perspectives on Advanced Future Studies" International Workshop on Advanced Future Studies held at Kyoto University Clock Tower, Kyoto University on February 12-15, 2019

5. M. Murase,
"Five Elementary Processes in Creative Processes" International and Transdisciplinary Symposium on Advanced Future Studies held at Narita Radisson Hotel on October 22-24, 2018

Organizer of International Conferences

1. M. Murase
International Kyoto Symposium 4 at Kyoto University on June 3, 2018

2. M. Murase
Transdisciplinary Mie-Symposium on Advanced Future Studies held at Mie Prefectural Musium, Kyoto University on November 17, 2018

3. M. Murase
Kyoto University Forum on Advanced Future Studies held at Kyoto University Clock Tower, Kyoto University on October 27, 2018

4. M. Murase
International and Transdisciplinary Symposium on Advanced Future Studies held at Narita Radisson Hotel on October 22-24, 2018

5. M. Murase,
International Workshop on Advanced Future Studies held at Kyoto University Clock Tower, Kyoto University on February 12-15, 2019

Organizer of Interdisciplinary Seminar

1. M. Murase
The Interdisciplinary Seminar on Advanced Future Studies on Universe and Mind at Yukawa Institute for Theoretical Physics, Kyoto University on May 17, 2018.

2. M. Murase
The Interdisciplinary Seminar on Advanced Future Studies on Life and Death at Yukawa Institute for Theoretical Physics, Kyoto University on June 26, 2018.

3. M. Murase
The Interdisciplinary Seminar on Advanced Future Studies on Evolution of Life at Kyoto University on July 12, 2018.

4. M. Murase
The Interdisciplinary Seminar on Advanced Future Studies on Invisible World at Yukawa Institute for Theoretical Physics, Kyoto University on July 26, 2018.

5. M. Murase
The Interdisciplinary Seminar on Advanced Future Studies on What is truth? at Clock Tower, Kyoto University on March 15, 2019.

Invited and Public Lectures (in Japan)

1. M. Murase "Integrated Life Science and Medicine,"
Mie University, Graduate School of Medicine, July 17, 2018.

2. M. Murase, "Life Science and Biolgocal Physics"
Kyoto University Lectures, Institute for Riberal Arts and Science, Kyoto University, April-July, 2018.

3. M. Murase, "Life Science and Biolgocal Physics"
Kyoto University Lectures for Graduate Students, Institute for Riberal Arts and Science, Kyoto University, April-July, 2018.

4. M. Murase, “Origin and Evolution of Living Systems,”
Ritsumeikan University Advanced Lectures, at Ritsumeikan University, September,3-6, 2018.

5. M. Murase, “Structuralism and Living Systems,”
Oki High School of Kyoto Prefecture, September,10, 2018.

6. M. Murase, "Integrated Biolgocal Physics 1"
Zeze High School Advanced Lcture, at Yukawa Institute for Theoretical Physics, Kyoto University, September 30, 2018.

7. M. Murase, "Integrated Biolgocal Physics 2"
Zeze High School Advanced Lcture, at Yukawa Institute for Theoretical Physics, Kyoto University, December 2, 2018.

Yoshifumi Nakata

Journal Papers

1. E. Wakakuwa and Y. Nakata, One-Shot Randomized and Nonrandom-ized Partial Decoupling," arXiv:1903.05796 [quant-ph].

Invited Seminars (in Japan)

1. Introduction to quantum randomness," YITP, Kyoto univ., March 2019 (QI school).

Takahiro Nishimichi

Journal Papers

1. J. Han, Y. Li, Y. Jing, T. Nishimichi, W. Wang and C. Jiang,
   "The multidimensional dependence of halo bias in the eye of a machine: a tale of halo structure, assembly and environment ,"
   Mon. Not. R. Astron. Soc., **482** (2019) 1900 (20 pages), arXiv:1802.09177 [astro-ph.CO].

2. R. Takahashi. T. Nishimichi, M. Takada, M. Shirasaki and K. Shiroyama,
   "Covariances for cosmic shear and galaxy-galaxy lensing in the response approach,"
   Mon. Not. R. Astron. Soc., **482** (2019) 4253 (25 pages), arXiv:1805.11629 [astro-ph.CO].

3. K. Osato, T. Nishimichi, F. Bernardeau and A. Taruya,
   "Perturbation theory challenge for cosmological parameters estimation: Matter power spectrum in real space, "
   Phys. Rev. **D99** (2019) 063530 (19 pages), YITP-18-107, arXiv:1810.10104 [astro-ph.CO].

Talks at International Conferences

1. "Statistical Computational Cosmology with Subaru HSC, "
   in "CREST/PRESTO Big Data Areas Joint PI Meeting with NSF/DATAIA Researchers, "Kyoto International Conference Center, Kyoto, Japan,
   March 2019.

Akira Ohnishi

Journal Papers

1. Y. Mori, K. Kashiwa, A. Ohnishi,
   "Lefschetz thimbles in fermionic effective models with repulsive vector-field",
   Phys. Lett. B **781** (2018), 688-693, arXiv:1705.03646 [hep-lat], YITP-17-50.

2. N. Ikeno, A. Ono, Y. Nara, A. Ohnishi, "Erratum: Probing neutron-proton dynamics by pions [Phys. Rev. C **93** (2016), 044612] Phys. Rev. C **97** (2018), 069902(E)(1-5).

3. Y. Akamatsu, M. Asakawa, T. Hirano, M. Kitazawa, K. Morita, K. Murase, Y. Nara, C. Nonaka, A. Ohnishi, "A dynamically integrated transport approach for heavy-ion collisions at high baryon density",
   Phys. Rev. C **98** (2018), 024909 (1-9), arXiv:1805.09024 [nucl-th].

4. X. Wu, A. Ohnishi, H. Shen,
   "Quark matter symmetry energy effects on hadron-quark coexistence in neutron star matter",
   Phys. Rev. C **98** (2018), 065801 (1-9), arXiv:1806.03760 [nucl-th], YITP-18-56.

5. K. Kashiwa, Y. Mori, A. Ohnishi, "Controlling the model sign problem via the path optimization method: Monte Carlo approach to a QCD effective model with Polyakov loop", Phys. Rev. D **99** (2019), 014033 (1-9), arXiv:1805.08940 [hep-ph], YITP-18-43.

Books and Proceedings

1. A. Ohnishi, Y. Mori, K. Kashiwa,
   "Path optimization method with use of neural network for the sign problem in field theories",
   PoS **LATTICE2018** (2019), 023 (1-15), arXiv:1812.11506 [hep-lat], YITP-18-120.

Talks at International Conferences

1. "Path optimization method with use of neural network for the sign problem in field theories", Plenary, in the 36th International Symposium on Lattice Field Theory (Lattice 2018), East Lansing, USA, July 2018.

2. "Path Optimization Using Neural Network in Field Theories", Invited, in the International Workshop on the Sign Problem in QCD and Beyond (Sign 18), Bielefeld, Germany, September 2018.

3. "Higher-order symmetry energy parameters and neutron star properties", in the Fifth Joint Meeting of the Nuclear Physics Divisions of the APS and JPS (HAW18), October 2018.

4. “Constraint on higher-order symmetry energy parameters and its relevance to neutron star properties”, in the international workshop on Hadron Structure and interaction in dense matter, Tokai, Japan, November 2018.

5. “Path Optimization for the Sign Problem in Field Theories using Neural Network Akira Ohnishi, Yuto Mori, Kouji Kashiwa”, in the 8th International Conference on Quarks and Nuclear Physics (QNP 2018), Tsukuba, Japan, November, 2018.

6. “Nuclear matter symmetry energy and neutron star properties — Neutron star radius from gravitational wave vs nuclear experiments”, Invited, in the Gravitational wave physics and astronomy: Genesis, 2nd annual area symposium, Kyoto, Japan, November 2018.

Invited Seminars (in Japan)

1. “Symmetry Parameter Constraints from a Lower Bound on the Neutron-Matter Energy and Its Relevance to Neutron Star Physics”, Nagoya, Japan, December 2018.

Naoki Sasakura

Journal Papers

1. T. Kawano, D. Obster and N. Sasakura,
“Canonical tensor model through data analysis: Dimensions, topologies, and geometries,”
Phys. Rev. D **97**, 124061 (2018), [arXiv:1805.04800 [hep-th]].

2. D. Obster and N. Sasakura,
“Emergent symmetries in the canonical tensor model,”
PTEP **2018**, 043A01 (2018), [arXiv:1710.07449 [hep-th]].

Talks at International Conferences

1. “Canonical Tensor Model through data analysis ― Dimensions, topologies, and geometries ―," Invited,
in “International Conference on Holography, String and Discrete approaches in Hanoi," Vietnam Academy of Science and Technology (VAST), Hanoi, August 2018.

2. “Spacetimes in the canonical tensor model through data analysis techniques," Invited,
in “Nagoya international workshop on the Physics and Mathematics of Discrete Geometries, " Nagoya University, Nagoya, November 2018.

3. “Data analysis and the canonical tensor model," Invited,
in “3rd Bangkok Conference on Discrete Geometry Dynamics and Statistics," Chulalongkorn University, Bangkok, January, 2019.

Invited Seminars (in Japan)

1. “Canonical Tensor Model through data analysis ― Dimensions, topologies, and geometries ―,"
Tokyo Electron House of Creativity, Tohoku University, September 2018 (in “Discrete Approaches to the Dynamics of Fields and Space-Time").

2. “Spacetimes in the canonical tensor model through data analysis techniques,"
Faculty of Education, Hirosaki University, November 2018.

3. “Spacetime notion in the canonical tensor model through mathematical techniques in data analysis," (in Japanese)
Faculty of Pure and Applied Sciences, University of Tsukuba, March 2019.

Masatoshi Sato

Journal Papers

1. Nobuyuki Okuma, Masatoshi Sato, Ken Shiozaki,
"Topological classification under nonmagnetic and magnetic point group symmetry: Application of real-space Atiyah-Hirzebruch spectral sequence to higher-order topology"
Physical Review B 99, 085127-1-17 (Feb. 2019).

2. Peng Zhang, Zhijun Wang, Xianxin Wu, Koichiro Yaji, Yukiaki Ishida, Yoshimitsu Kohama, Guangyang Dai, Yue Sun, Cedric Bareille, Kenta Kuroda, Takeshi Kondo, Kozo Okazaki, Koichi Kindo, Xiancheng Wang, Changqing Jin, Jiangping

Hu, Ronny Thomale, Kazuki Sumida, Shilong Wu, Koji Miyamoto, Taichi Okuda, Hong Ding, G. D. Gu, Tsuyoshi Tamegai, Takuto Kawakami, Masatoshi Sato, Shik Shin,
"Multiple topological states in iron-based superconductors"
Nature Physics 15, 41-47 (Jan. 2019).

3. Ayami Hattori, Keiji Yada, Masaaki Araidai, Masatoshi Sato, Kenji Shiraishi, Yukio Tanaka,
"Influence of edge magnetization and electric fields on zigzag silicene, germanene and stanene nanoribbons"
Journal of Physics: Condensed Matter 31, 105302-1-15 (Jan. 2019).

4. Igor Kuzmenko, Tetyana Kuzmenko, Yshai Avishai, Masatoshi Sato,
"Spin-orbit coupling and topological states in an F=3/2 cold Fermi gas"
Physical Review B 98, 165139-1-12 (Oct. 2018).

5. Takuto Kawakami, Tetsuya Okamura, Shingo Kobayashi, Masatoshi Sato,
"Topological Crystalline Materials of J=3/2 Electrons: Antiperovskites, Dirac points, and High Winding Topological Superconductivity",
Physical Review X 8, 041026-1-23 (Nov. 2018)

6. Shingo Kobayashi, Shuntaro Sumita, Youichi Yanase, Masatoshi Sato,
"Symmetry-protected line nodes and Majorana flat bands in nodal crystalline superconductors"
Physical Review B 97, 180504(R)-1-5 (May 2018).

Books and Proceedings

1. K. Fukushima, F. Gelis and T. Lappi,
"Multiparticle correlations in the Schwinger mechanism,"
Nucl. Phys. **A831** (2009) 184 (31 pages), YITP-09-45, arXiv:0907.4793 [hep-ph].

Talks at International Conferences

1. 2019/Jan/19 "Topological Superconductivity in Topologicla Materials" M. Sato Plasma 2019 Workshop (Univ. of Central Florida, Orland, USA, 2019/Jan/18-21)

2. 2019/Jan/10 "Multiple Topological Superconductivity in Iron-based Superconductors" M. Sato Majorana workshop (Kavli ITS, Beijin, China, 2019/Jan/8-11)

3. 2018/Dec/6 "Quantum Response of Majorana Fermions in Topological Crystalline Superconductors" M. Sato Workshop on Recent Developments in Chiral Matter and Topology (National Taiwan Univ., Taipei, Taiwan, 2018/Dec/6-9)

4. 2018/Nov/3 "Topological Crystalline Materials of J=3/2 Electrons" M. Sato The Kavli-APW-Tsinghua-Riken workshop on "highlights of condensed matter physics" (Kavli ITS, Beijin, China, 2018/Nov/1-3)

5. 2018/Oct/25 "Topological Superconductivity in Topological Materials in Pioneer Symposia "Topological superconductivity and Majorana fermion"" M. Sato 2018 KPS Fall Meeting, (Changwon Exhibition Convention Center. Korea, 2018/Oct/24-26)

6. 2018/Sep/25 "Majorana fermions in topological crystalline superconductors" M. Sato The 2nd TMS-PKU Alliance Workshop on Topological Materials and Quantum Materials (Peking Univ., Bejing, China, 2018/Sep/25-28)

7. 2018/Jul/26 "Majorana fermions in topological crystalline superconductors" M. Sato Erice Workshop 2018 "Majorana Fermions and Topological Materials Science" (Erice, Sicily, Italy, 2018/Jul/21-27)

8. 2018/Jul/17 "Topological Crystalline Materials" M. Sato Topological Matter Beyond the Ten-Fold Way (Nordita, Stockholm, Sweden, 2018/Jul/2-27)

9. 2018/Jun/25 "Topological Crystalline Materials" M. Sato International Workshop in New Paradigms in Quantum Matter (Chinease Academy of Science, Beijin, China, 2018/Jun/25-Jul/6)

10. 2018/Jun/19 "Toplogical Crystalline Materials" M. Sato International Workshop on Symmetry and Topology in condensed-matter physics (Univ. of Tokyo, Japan, 2018/Jun/19-21)

11. 2018/Jun/11 "Non-Hermitian Topologicla Phases" M. Sato NON-HERMITIAN PHYSICS âĂŞ PHHQP XVIII (ICTS Bangalore, India, 2018/Jun/4-13)

12. 2018/Apr/24 "Topological Crystalline Materials of J=3/2 Electrons: Antiperovskite, Dirac points, and High Winding Topological Superconductivity" M. Sato RCQM Spring Workshop "Topological superconductors: Materials, topological order, and quenched disorder" (Rice Univ., Houston, Texas, USA, 2018/Apr/24-25)

13. 2018/Apr/6 "Topological crystalline materials" M. Sato Workshop: Mathematical approach for topological physics (I) (Nagoya Univ., Nagoya, Japan, 2018/Apr/6)

Invited Seminars (Overseas)

1. "Chiral Phase Transition and Axial Anomaly,"
   Technische Universität München, Germany, April 2009.

2. "Chiral Magnetic Effect – Some Effective Model Results –,"
   Brookhaven National Lab., USA, June 2009.

Masaru Shibata

Journal Papers

1. S. Fujibayashi, K. Kiuchi, N. Nishimura, Y. Sekiguchi, and M. Shibata,
   "Mass ejection from the remnant of binary neutron star merger: Vicsous-radiaiton hydrodynamics study",
   Astrophys. J. **860** (2018), 94 (20 pages).

2. K. Kiuchi, K. Kyutoku, Y. Sekiguchi, and M. Shibata,
   "Global simulations of strongly magnetized remnant massive neutron stars formed in binary neutron star mergers",
   Phys. Rev. D **97** (2018), 124039 (16 pages).

3. K. Kawaguchi, M. Shibata, and M. Tanaka,
   "Radiative-transfer simulation for the optical and near-infrared electromagnetic counterparts of GW170817",
   Astrophys. J. Lett. **865** (2018), L21 (6 pages).

4. K. Hotokezaka, K. Kiuchi, M. Shibata, E. Nakar, and T. Piran,
   "Synchrotron radiation from the fast tail of dynamical ejecta of neutron star mergers",
   Astrophys. J. **867** (2018), 95 (8 pages).

5. Y. Suwa, T. Yoshida, M. Shibata, H. Umeda, and K. Takahashi,
   "On the minimum mass of neutron stars",
   Mon. Not. R. Astron. Soc. **481** (2018), 3305-3312.

6. K. Chakravati et al.,
   "Systematic effects from black hole-neutron star waveform model uncertainties on the neutron star equation of state",
   Phys. Rev. D **99** (2019), 024049.

7. H. Uchida, M. Shibata, K. Takahashi, and T. Yoshida,
   "Black hole formation and explosion from rapidly rotating very massive stars",
   Astrophys. J. **870** (2019), 98 (15 pages).

8. H. Uchida, M. Shibata, K. Takahashi, and T. Yoshida,
   "Gravitational waves from very massive stars collapsing to a black hole",
   Phys. Rev. D **99** (2019), 041402 (6 pages).

Books

1. M. Shibata and K. Kyutoku,
   "Sources of gravitational waves (in Japanese: 重力波の源),"
   Yukawa Library Series Vol. 1, Asakura Shoten, 212 pages (Aug. 25, 2018).

Talks at International Conferences & School

1. "Mass ejection from neutron-star mergers in numerical relativity", invited
   in "Physics of neutron star mergers at GSI/FAIR" GSI/FAIR, Darmstadt, Germany,
   June 4-15, 2018 (talk at June 8).

2. "GW170817 and neutron-star merger", invited
   in "CTA consortium workshop", Berlin, Germany,
   September 24-27, 2018 (talk at Sept. 27).

3. "Variety of kilonova of neutron-star merger", invited

in "Physics and Astrophysics at the extreme: Multimessenger Transients", Penn State, USA,
February 7-9, 2019 (talk at Feb. 7).

4. "Lecture I: Coalescence of neutron-star binaries",invited
in "School on Multimessenger Physics and Astrophysics with compact binaries", Jena, Germany,
March 11-13, 2019 (talk at March 12)

5. "Lecture II: Mass ejection and electromagnetic counterparts of neutron-star mergers",invited
in "School on Multimessenger Physics and Astrophysics with compact binaries", Jena, Germany,
March 11-13, 2019 (talk at March 12)

Invited Seminars (Overseas)

1. "GW170817, Neutron-star Merger, & Numerical Relativity",
DESY, Berlin, Germany, November 30, 2018.

2. "Merger and mass ejection of neutron-star binaries in numerical relativity" (Colloquium),
Princeton University, Princeton, USA, February 5, 2019.

Ken Shiozaki

Journal Papers

1. N. Okuma, M. Sato and K. Shiozaki,
"Topological classification under nonmagnetic and magnetic point group symmetry: Application of real-space Atiyah-Hirzebruch spectral sequence to higher-order topology,"
Phys. Rev. B **99**, 085127 (2019), arXiv:1810.12601 [cond-mat].

Shigeki Sugimoto

Journal Papers

1. A. Armoni, S. Sugimoto,
"Vacuum structure of charge k two-dimensional QED and dynamics of an anti D-string near an O1$^-$-plane"
JHEP 1903 (2019) 175, YITP-18-133, arXiv:1812.10064 [hep-th].

Talks at International Conferences

1. "Comments on finite temperature/density in holographic QCD," Invited, in YKIS2018b Symposium "Recent Developements in Quark-Hadron Sciences," YITP, Kyoto, June 2018.

2. "2 dim QED and String Theory revisited," Invited, "East Asia Joint Workshop on Fields and Strings 2018," KIAS, Korea November 2018.

3. "2 dim QED and String Theory revisited," Invited, "KEK Theory workshop 2018," KEK, Tsukuba, December 2018.

Invited Seminars (in Japan)

1. "SUSY breaking and superstring theory,"
invited talk in a domestic workshop at Shinshu university, September 2018.

2. "2 dim QED and string theory,"
invited seminar at Kyoto Sangyo University, February 2019.

Tadashi Takayanagi

Journal Papers

1. P. Caputa, M. Miyaji, T. Takayanagi and K. Umemoto, "Holographic Entanglement of Purification from Conformal Field Theories," Phys. Rev. Lett. **122** (2019) no.11, 111601, arXiv:1812.05268 [hep-th]].

2. T. Shimaji, T. Takayanagi and Z. Wei, "Holographic Quantum Circuits from Splitting/Joining Local Quenches," JHEP **1903** (2019) 165, aXiv:1812.01176 [hep-th].

3. T. Takayanagi, "Holographic Spacetimes as Quantum Circuits of Path-Integrations," JHEP **1812** (2018) 048, arXiv:1808.09072 [hep-th].

4. T. Takayanagi, T. Ugajin and K. Umemoto, "Towards an Entanglement Measure for Mixed States in CFTs Based on Relative Entropy," JHEP **1810** (2018) 166, arXiv:1807.09448 [hep-th].

5. Y. Hikida, Y. Kusuki and T. Takayanagi, "Eigenstate thermalization hypothesis and modular invariance of two-dimensional

conformal field theories," Phys. Rev. D **98** (2018) no.2, 026003, arXiv:1804.09658 [hep-th].

6. A. Bhattacharyya, P. Caputa, S. R. Das, N. Kundu, M. Miyaji and T. Takayanagi, "Path-Integral Complexity for Perturbed CFTs," JHEP **1807** (2018) 086, arXiv:1804.01999 [hep-th].

7. A. Bhattacharyya, T. Takayanagi and K. Umemoto, "Entanglement of Purification in Free Scalar Field Theories," JHEP **1804** (2018) 132, arXiv:1802.09545 [hep-th].

8. T. Takayanagi and K. Umemoto, "Entanglement of purification through holographic duality," Nature Phys. **14** (2018) no.6, 573, arXiv:1708.09393 [hep-th].

Talks at International Conferences

1. "From Glasma to Quarkyonic," Invited, in "Quantum Field Theory in Extreme Environments," Saclay, Paris, France, April 2009.

2. "Quantum Entanglement and Holography'', Invited Lectures at Spring School on Superstring Theory and Related Topics, Trieste, Italy, March, 2019.

3. "Entanglement of Purification and Holography", Invited, at Tensor Networks from Simulation to Holography II, Berlin, DESY Zeuthen, Germany, March, 2019.

4. "Recent Developments in AdS/CFT', Invited, at The 4th KMI International Symposium, KMI, Nagoya, Feb., 2019.

5. "Holographic Entanglement of Purification and CFT Dual", Invited, at NCTS Annual Theory Meeting 2018: Particles, Cosmology and Strings, Hsinchu, Taiwan, Dec., 2018.

6. "Holographic Entanglement of Purification and CFT Dual", Invited, KEK Theory Workshop 2018, KEK, Dec. 17, 2018.

7. "Holographic Spacetimes as Quantum Circuits of Path-Integrations", Invited at East Asia Joint Workshop on Fields and Strings 2018, Seoul, Nov., 2018.

8. "From Black holes to Qubits through String Theoretic Microscopes", Plenary Invited Talk, at ICHEP2018, Seoul, July, 2018.

9. "Holographic Entanglement of Purification", Invited at Groningen Scanning New Horizons Meeting, Groningen, Netherlands, Jun., 2018.

10. "Aspects of Entanglement Evolutions under Local Excitations", Invited at AdS/CFT @ 20 and Beyond, ICTS, India, May, 2018.

Invited Seminars (Overseas)

1. "Quantum Entanglement and Holographic Spacetime", Coloquium, AEI, Potsdam, Germany, March, 2019.

Atsushi Taruya

Journal Papers

1. Y-S. Song, Y. Zheng, A. Taruya and M. Oh,
"Hybrid modeling of redshift space distortions,"
JCAP **07** (2018) 018 (23 pages), YITP-18-02, arXiv:1801.04950 [astro-ph.CO].

2. T. Namikawa, F. Bouchet and A. Taruya,
"CMB lensing bispectrum as a probe of modified gravity theories,"
Phys. Rev. **D 98** (2018) 043530 (12 pages), YITP-18-50, arXiv:1805.10567 [astro-ph.CO].

3. B. Bose and A. Taruya,
"The one-loop matter bispectrum as a probe of gravity and dark energy,"
JCAP **10** (2018) 019 (32 pages), YITP-18-88, arXiv:1808.01120 [astro-ph.CO].

4. A. Taruya, T. Nishimichi and D. Jeong,
"Grid-based calculation for perturbation theory of large-scale structure,"
Phys. Rev. **D 98** (2018) 103532 (19 pages), YITP-18-73, arXiv:1807.04215 [astro-ph.CO].

5. S. Saga, A. Taruya and S. Colombi,
"Lagrangian Cosmological Perturbation Theory at Shell Crossing,"
Phys. Rev. Lett. **121** (2018) 241302 (6 pages), YITP-18-49, arXiv:1805.08787 [astro-ph.CO].

6. M-A. Breton, Y. Rasera, A. Taruya, O. Lacombe and S. Saga,
"Imprints of relativistic effects on the asymmetry of the halo cross-correlation function: from linear to non-linear scales,"
Mon. Not. Roy. Soc. **483** (2018) 2671-2696 (26 pages), YITP-18-16, arXiv:1803.04294 [astro-ph.CO].

7. T. Namikawa, B. Bose, F. Bouchet, R. Takahashi and A. Taruya,
"CMB lensing bispectrum: Assessing analytical predictions against full-sky lensing simulations,"
Phys. Rev. **D 99** (2019) 063511 (18 pages), YITP-18-127, arXiv:1812.10635 [astro-ph.CO].

8. K. Osato, T. Nishimichi, F. Bernardeau and A. Taruya,
"Perturbation theory challenge for cosmological parameters estimation: Matter power spectrum in real space,"
Phys. Rev. **D 99** (2019) 063530 (19 pages), YITP-18-107, arXiv:1810.10104 [astro-ph.CO].

Books and Proceedings

1. W.J. Percival, A. Taruya (Japanese translation),
"Baryon Acoustic Oscillations: A cosmological ruler,"
Parity vol.˙**34** (2019) No.2̇ (10 pages) (in Japanese).

Talks at International Conferences

1. "Nonlinear structure formation in CDM cosmology: shell-crossing & multi-stream flows," Invited,
in "5th Korea-Japan Workshop on Dark Energy: Starobinsky ' s Universe," Korea Astronomy and Space Science Institute, Daejeon, Korea,
August 2018.

2. "Lagrangian perturbation theory at shell crossing and beyond," Invited,
in "IHP Trimester 2018: Analytics, Inference and computation in cosmology," Institut Henri Poincare, Paris, France,
September 2018.

3. "Perturbation theory challenge for cosmological parameters estimation," Invited,
in "4th CosKASI-ICG-NAOC-YITP joint workshop," Invited, National Astronomical Observatories of China, Chinise Academy of Science, Beijing, China,
October-November 2018.

4. "CMB constraints on stochastic gravitational waves at $0.1 - 10$Mpc scales," Invited,
in Area workshop on "gravitational wave physics and astronomy: Genesis," Invited, Nagaoka University of Technology, Niigata, Japan,
February 2019.

Invited Seminars(Overseas)

1. "Relativistic effects on observed large-scale structure of the Universe,"
National Taiwan University, Taiwan, June 2018.

2. "Nonlinear structure formation in cold dark matter cosmology – Shell-crossing & multi-stream flows –,"
Academia Sinica Institute of Astronomy and Astrophysics, Taiwan, June 2018.

Invited Seminars (in Japan)

1. "Distorted large-scale structure of the Universe: new probe of cosmology,"
Institute of Theoretical Physics, Rikkyo University, June 2018 (in Japanese).

2. "Fluctuations in the Universe: Formation and nonlinear evolution of large-scale structure,"
Research Institute for Mathematical Sciences, Kyoto University, July 2018 (in Japanese).

3. "Cold dark matter halos: Structure formation from phase space,"
Department of Astronomy, Tohoku University, February 2019.

Seiji Terashima

Journal Papers

1. S. Terashima,
"Geometry from Matrices via D-branes,"
JHEP **1807** (2018) 008 [arXiv:1804.00647 [hep-th]].

2. M. Honda, T. Nosaka, K. Shimizu and S. Terashima,
"Supersymmetry Breaking in a Large N Gauge Theory with Gravity Dual,"
JHEP **1903** (2019) 159 [arXiv:1807.08874 [hep-th]].

3. K. Shimizu and S. Terashima,
"Supersymmetry Breaking Phase in Three Dimensional Large N Gauge Theories,"
JHEP **1811** (2018) 064 [arXiv:1809.03670 [hep-th]].

Talks at International Conferences

1. Lectures on "4d N = 1 localization," Invited, at the international school "2018 IHES Summer School: Supersymmetric localization and exact results" IHES, Paris, France, July 2018.

2. "AdS/CFT Correspondence in Operator Formalism," Invited,
at OIST Mini Symposium "Holographic Tensors", OIST, Okinawa,
October 2018.

Invited Seminars (in Japan)

1. "Geometry from Matrices via D-branes ,"
Dept. of Phys., Hokkaido University, June 2018.

Keisuke Totsuka

Journal Papers

1. P. Fromholz, S. Capponi, P. Lecheminant, D. Papoular, and K. Totsuka,
"Haldane phases with ultracold fermionic atoms in double-well optical lattices,"
Phys.Rev.B **99** (2019) 054414 (6 pages), arXiv:1709.10409 [cond-mat].

Talks at International Conferences

1. "Emergent gauge theories from a coupled array of wires ... coupled-wire construction demystified," Invited,
in "TOPMAT 2018," IPhT Saclay, Paris, France,
June 11-July 6, 2018.

2. "Symmetry-protected topological phases with broken parity in cold fermions in a double-well optical lattice," Invited,
in "Quantum Magnetism: Frustration, Low-dimensionality, Topology," Kavli ITS, Beijing, China,
August 27-September 10, 2018.

3. "Hunt for symmetry-protected topological phases in SU(N) ultra-cold fermions in double-well optical lattices," Invited,
in "BEC2018X," Tsukuba University, Tokyo, Japan,
December 9-13, 2018.

Invited Seminars (Overseas)

1. "Hunt for symmetry-protected topological phases in SU(N) ultra-cold fermions in one-dimensional optical lattices,"
Tsinghua University, Taiwan, November 14, 2018.

Invited Seminars (in Japan)

1. "Emergence of topological gauge theories from coupled arrays of wires,"
Okinawa Inst. Sci. Tech., October 11, 2018.

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

(April 2018– March 2019)

Ryuichi Fujita

Journal Papers

1. S. Isoyama, R. Fujita, H. Nakano, N. Sago and T. Tanaka,
   "Flux-balance formulae" for extreme mass-ratio inspirals,"
   Progress of Theoretical and Experimental Physics **2019**, 013E01 (2019) (28 pages), YITP-18-96, arXiv:1809.11118 [gr-qc]

Talks at International Conferences

1. "Gravitational waves from extreme mass ratio inspirals," Invited, Plenary,
   in "Gravitational wave physics and astronomy: Genesis, Second Annual Area Symposium," Yukawa Institute for Theoretical Physics, Kyoto, Japan,
   November 2018.
2. "Gravitational waves from eccentric orbits in Kerr spacetime," Plenary,
   in "XI Black Holes Workshop," Instituto Superior Tecnico, Lisbon, Portugal,
   December 2018.

Invited Seminars (Overseas)

1. "Gravitational radiation from extreme mass ratio inspirals using analytical and numerical approaches,"
   Max Planck Institute for Gravitational Physics, Germany, February 2019.

Hamid Hamidani

Talks at International Conferences

1. "A Numerical Explanation of low luminosity GRBs high rate in the local Universe," contribution talk,
   in "Jet and Shock Breakouts in Cosmic Transients," Yukawa Institute for Theoretical Physics, Kyoto University , Kyoto, Japan,
   May 2018.
2. "Hunting GW170817?s Dark Horse," contribution talk,
   in "The Second Annual Area Symposium," Yukawa Institute for Theoretical Physics, Kyoto University , Kyoto, Japan,
   November 2018.
3. "Beyond R-Process: Jet and Cocoon Emission in Neutron Star Mergers and GW170817," contribution talk,
   in "Nucleosynthesis and electromagnetic counterparts of neutron-star mergers: Preparation for the new discovery," Yukawa Institute for Theoretical Physics, Kyoto University , Kyoto, Japan,
   March 2019.

Toru Kikuchi

Journal Papers

1. N. Kato, M. Kawaguchi, Y.-C. Lau, T. Kikuchi, Y. Nakatani, and M. Hayashi,
   "Current-Induced Modulation of the Interfacial Dzyaloshinskii-Moriya Interaction,"
   Phys. Rev. Lett. **122**, (2019) 257205 (6 pages), arXiv:1806.07746 [cond-mat].

Books and Proceedings

1. T. Kikuchi and G. Tatara,
   "Spin, spinning top, and magnetic monopole,"
   Proc. SPIE 10732, Spintronics XI, 107322F (20 September 2018).

Talks at International Conferences

1. "Spin, spinning top, and magnetic monopole," Invited,
   in "Spintronics XI," San Diego, USA,
   August 2018.

Invited Seminars (in Japan)

1. "Dzyaloshinskii–Moriya interaction induced by lattice-generated spin current,"
   National Institute of Material Science, June 2018 (in Japanese).

Naotaka Kubo

Journal Papers

1. N. Kubo, S. Moriyama and T. Nosaka, Symmetry Breaking in Quantum Curves and Super Chern-Simons Matrix Models, JHEP 1901, 210 (2019), YITP-18-115, arXiv:1811.06048 [hep-ph].

Talks at International Conferences

1. "Two-Point Functions in ABJM Matrix Model,", in "Strings and Fields 2018," Yukawa Institute for Theoretical Physics, Kyoto, Japan, August 2018.

2. "Linking center symmetry and chiral symmetry," Invited, Plenary, in "4th International Symposium on Symmetries in Subatomic Physics," National Taiwan University, Taipei, Taiwan, August 2018.

Masaya Kunimi

Journal Papers

1. K. Nagao, M. Kunimi, Y. Takasu, Y. Takahashi, and I. Danshita, “Semiclassical quench dynamics of Bose gases in optical lattices", Phys. Rev. A **99**, 023622 (2019).

Invited Seminars (in Japan)

1. “Superfluidity of Bose-Einstein condensates in ring traps", School of Environmental Science and Engineering, Kochi University of technology, August 2018.

2. “Effects of particle loss on superflow in cold atomic gases", Workshop on topological phases and excitations in ^{3}He and spinor BEC, Department of Physics, Kindai University, December 2018 (in Japanese).

3. “Decay of superflow in cold atomic gases at finite temperature", Department of Photo-Molecular Science, Institute for Molecular Science, February 2019.

Luca Lionni

Journal Papers

1. Luca Lionni, Johannes Thürigen,
   Multi-critical behaviour of 4-dimensional tensor models up to order 6
   Nuclear Physics B 941 (2019), pp:600-635
   arxiv:1707.08931

2. L. Lionni, V. Rivasseau,
   Note on the Intermediate Field Representation of Φ^{2k} Theory in Zero Dimension,
   Mathematical Physics, Analysis and Geometry (2018) 21: 23.
   arxiv:1601.02805

Books and Proceedings

1. L. Lionni,
   Colored discrete spaces: higher dimensional combinatorial maps and quantum gravity,
   Springer (2018).
   (PhD Univ. Paris-Saclay (2017))
   arxiv:1710.03663

2. S. Dartois, L. Lionni, I. Nechita,
   On the joint distribution of the marginals of multipartite random quantum states,
   arXiv :1808.08554.
   Accepted for publication on April 25 2019 by Random Matrices: Theory and Applications.

Talks at International Conference

1. "Counting colored triangulations", invited seminar at City University of Hong-Kong, January 2019.

Invited Seminars (in Japan)

1. "Escaping the branched polymer phase in random tensor models and dynamical triangulations", invited seminar in the physics department of Kyoto University, December 2018.

2. "Uncolored tensor models : 1/N expansions and universality classes", invited talk at the international workshop "Holographic tensors ", OIST, Okinawa, November 2018.

3. "Escaping the branched polymer phase in dynamical triangulations", invited talk at the workshop "Discrete approaches to the dynamics of fields and space-time ", Tohoku University, September 2018.

4. "Escaping the branched polymer phase in dynamical triangulations", invited seminar at Tokyo Institute of Technology, July 2018.

5. "Some recent exact results in dynamical triangulations", seminar at YITP, Kyoto University, Japan, May 2018.

6. "Random geometry, tensor models, and some applications", seminar at YITP, Kyoto University, Japan, April 2018.

Shuntaro Mizuno

Journal Papers

1. N. Bolis, T. Fujita, S. Mizuno and S. Mukohyama,
"Quantum Entanglement in Multi-field Inflation,"
JCAP **1809**, 004 (2018) (24 pages), YITP-18-18, arXiv:1805.09448 [hep-th].

2. T. Fujita, S. Mizuno and S. Mukohyama,
"Blue-tilted Primordial Gravitational Waves from Massive Gravity,"
Phys. Lett. B **789**, 215 (2019) (6 pages), YITP-18-84, arXiv:1808.02381 [gr-qc].

3. K. Maeda, S. Mizuno and R. Tozuka,
"α-attractor-type double inflation,"
Phys. Rev. **D98** (2018) 123530 (25 pages), YITP-18-113, arXiv:1810.06914 [hep-th].

Talks at International Conferences

1. "Quantum Entanglement in Multi-field inflation," Plenary,
in "COSMO18," Institute of Basic Sicence, Daejeon, Korea,
April 2018.

2. "Blue-tilted Primordial Gravitational Waves from Massive Gravity,"Invited, Plenary,
in "CosKASI-ICG-NAOC-YITP joint workshop on LSS," NAOC, Beijing, China,
October 2018.

3. "Blue-tilted Primordial Gravitational Waves from Massive Gravity,"Plenary,
in "27th JGRG," Rikkyo, Tokyo, Japan,
November 2018.

4. "Blue-tilted Primordial Gravitational Waves from Massive Gravity,"Plenary,
in "YITP Asian-Pacific Winter School and Workshop on Gravitation and Cosmology,"
YITP, Kyoto, Japan,
February 2019.

5. "Blue-tilted Primordial Gravitational Waves from Massive Gravity,"Plenary,
in "Accelerating Universe in the Dark,"
YITP, Kyoto, Japan,
March 2019.

Invited Seminars (Overseas)

1. "Blue-tilted Primordial Gravitational Waves from Massive Gravity,"
ICG, Portsmouth, UK, August 2018.

2. "Blue-tilted Primordial Gravitational Waves from Massive Gravity,"
Swansea, UK, August 2018.

Hayato Motohashi

Journal Papers

1. H. Motohashi, M. Minamitsuji,
"Exact black hole solutions in shift-symmetric quadratic degenerate higher-order scalar-tensor theories,"
Phys.Rev. D 99, 064040 (2019), YITP-19-01, [arXiv:1901.04658].

2. S. Passaglia, W. Hu, H. Motohashi,
"Primordial Black Holes and Local Non-Gaussianity in Canonical Inflation,"
Phys.Rev. D 99, 043536 (2019), YITP-18-128, [arXiv:1812.08243].

3. H. Motohashi, S. Mukohyama,
"Shape dependence of spontaneous scalarization,"
Phys.Rev. D 99, 044030 (2019), YITP-18-105, [arXiv:1810.12691].

4. M. Minamitsuji, H. Motohashi,
"Stealth Schwarzschild solution in shift symmetry breaking theories,"
Phys.Rev. D 98, 084027 (2018), YITP-18-104, [arXiv:1809.06611].

5. H. Motohashi, T. Suyama, M. Yamaguchi, "Ghost-free theories with arbitrary higher-order time derivatives," JHEP 1806 (2018) 133, YITP-18-32, [arXiv:1804.07990].

6. H. Motohashi, M. Minamitsuji, "General Relativity solutions in modified gravity," Phys.Lett. B781, 728-734 (2018), YITP-18-27, [arXiv:1804.01731].

7. H. Ramirez, S. Passaglia, H. Motohashi, W. Hu, O. Mena, "Reconciling tensor and scalar observables in G-inflation," JCAP 1804 (2018) 04, 039, YITP-18-26, [arXiv:1802.04290].

8. H. Motohashi, T. Suyama, M. Yamaguchi, "Ghost-free theory with third-order time derivatives," J.Phys.Soc.Jpn. 87, 063401 (2018), YITP-18-31, [arXiv:1711.08125].

Talks at International Conferences

1. "Constant-roll inflation in scalar-tensor theory", Accelerating Universe in the Dark, Kyoto University, Mar. 8, 2019.

2. "Shape dependence of spontaneous scalarization", "Gravitational wave physics and astronomy: Genesis" Area Workshop 2019 Winter and Group A Boot Camp, Nagaoka University of Technology, Feb. 19, 2019.

3. "Primordial black holes in canonical single field inflation", Asian-Pacific Winter School and Workshop on Gravitation and Cosmology, Kyoto University, Feb. 11, 2019.

4. "Shape dependence of spontaneous scalarization", The Second annual symposium of the innovative area "Gravitational Wave Physics and Astronomy: Genesis", Kyoto University, Nov. 26, 2018.

5. "Shape dependence of spontaneous scalarization", The 28th Workshop on General Relativity and Gravitation in Japan (JGRG28), Rikkyo University, Nov. 6, 2018.

6. "Constant-roll inflation", Invited, 5th Korea-Japan workshop on Dark Energy: Starobinsky's Universe, Korea Astronomy and Space Science Institute, Daejeon, South Korea, Aug. 6, 2018.

7. "Constant-roll inflation", 15th Marcel Grossmann Meeting, University of Rome "La Sapienza", Italy, July 3, 2018.

8. "General Relativity solutions in modified gravity", 15th Marcel Grossmann Meeting, University of Rome "La Sapienza", Italy, July 3, 2018.

9. "Primordial black holes and slow-roll violation", 15th Marcel Grossmann Meeting, University of Rome "La Sapienza", Italy, July 3, 2018.

10. "Constructing ghost-free theories with higher derivatives", 15th Marcel Grossmann Meeting, University of Rome "La Sapienza", Italy, July 2, 2018.

Invited Seminars (Overseas)

1. "Constructing degenerate higher-order theories", Laboratoire de Physique ThÃl'orique d'Orsay, France, June 28, 2018.

2. "Constructing degenerate higher-order theories", Institut d'Astrophysique de Paris (IAP), Universite Pierre et Marie Curie, France, June 18, 2018.

3. "Constructing degenerate higher-order theories", Astroparticle et Cosmologie (APC), Universite Paris Diderot-Paris 7, France, June 12, 2018.

4. “Constructing degenerate higher-order theories”,
   Institut de Physique Théorique, Saclay, France, May 23, 2018.
5. “General Relativity solution in modified gravity”,
   CENTRA, Instituto Superior Técnico, Lisbon, Portugal, May 17, 2018.

Invited Seminars (in Japan)

1. “Exact solutions in modified gravity with higher derivatives”,
   Colloquium at Rikkyo University, Jan. 15, 2019 (in Japanese).
2. “Modified gravity with higher derivatives”,
   YITP lunch seminar, July 18, 2018.

Masato Nozawa

Journal Papers

1. Masato Nozawa, Tetsuya Shiromizu, Keisuke Izumi and Sumio Yamada, “Divergence equations and uniqueness theorem of static black holes,” Classical and Quantum Gravity, **35**, 175009 (2018) [arXiv:1805.11385 [gr-qc]]

Talks at International Conferences

1. “Uniqueness theorems of black holes based on divergence equations,” XI Black Holes Workshop, Técnico, University of Lisbon, December 2018
2. “On the uniqueness of static black holes,” Invited Partial Differential Equation and General Relativity, Nagoya University, November 2018
3. “On the uniqueness of static black holes,” The 28th Workshop on General Relativity and Gravitation, Rikkyo University, November 2018

Nobuyuki Okuma

Journal Papers

1. N. Okuma, M. Sato and K. Shiozaki,
   “Topological classification under nonmagnetic and magnetic point group symmetry: Application of real-space Atiyah-Hirzebruch spectral sequence to higher-order topology,”
   Phys. Rev. B **99** (2019) 085127 (17 pages), arXiv:1810.12601.
2. N. Okuma,
   “Nonreciprocal superposition state in antiferromagnetic optospintronics,”
   Phys. Rev. B **99** (2019) 094401 (9 pages), arXiv:1805.08226.

Talks at International Conferences

1. “Application of Atiyah-Hirzebruch spectral sequence to real-space topological classification,” Invited,
   in “BEC2018X,” Tokyo, Japan,
   December 2018.

Invited Seminars (in Japan)

1. “Application of Orbifold in Topological Science,”
   Dept. of Phys., Tokyo institute of technology, June 2018 (in Japanese).
2. “Real-Space Topological Classification: Higher-order topology and Atiyah-Hirzebruch spectral sequence,”
   Dept. of Phys., Univ. of Tsukuba, December 2018 (in Japanese).

Michele Oliosi

Journal Papers

1. A. De Felice, F. Larrouturou, S. Mukohyama and M. Oliosi,
   “Black holes and stars in the minimal theory of massive gravity,”
   Phys. Rev. **D98** (2018) 104031 (6 pages), YITP-18-85, arXiv:1808.01403 [gr-qc].
2. K. Aoki, A. De Felice, C. Lin, S. Mukohyama and M. Oliosi,
   “Phenomenology in type-I minimally modified gravity,”
   JCAP **01** (2019) 017 (19 pages), YITP-18-108, arXiv:1810.01047 [gr-qc].
3. A. De Felice, S. Mukohyama and M. Oliosi,
   “Phenomenology of minimal theory of quasidilaton massive gravity,”
   Phys. Rev. **D99** (2019) 044055 (14 pages), YITP-18-45, arXiv:1806.00602 [hep-th].

Talks at International Conferences

1. "Black holes and stars in the minimal theory of massive gravity (MTMG),"
in "The 27th Workshop on General Relativity and Gravitation in Japan," Rikkyo University, Tokyo, Japan,
November 2018.

Shohei Saga

Journal Papers

1. S. Saga, A. Taruya and S. Colombi,
"Lagrangian cosmological perturbation theory at shell-crossing,"
Phys. Rev. Lett. **121**, 241302 (2018), YITP-18-49, arXiv:1805.08787 [astro-ph.CO].

2. S. Saga, H. Tashiro and S. Yokoyama,
"Limits on primordial magnetic fields from direct detection experiments of gravitational wave background,"
Phys. Rev. D **98**, 083518 (2018), YITP-18-72, RUP-18-20, arXiv:1807.00561 [astro-ph.CO].

Talks at International Conferences

1. Shell-crossing structure of cold dark matter with Lagrangian perturbation theory,
COSMO18, IBS, Daejeon,
08/27-08/31,

2. Lagrangian perturbation theory at shell-crossing,
CosKASI-ICG-NAOC-YITP joint workshop, NAOC, Beijing,
10/29-11/02,

3. Describing shell-crossing structure in cosmological Vlasov-Poisson dynamics,
8th KIAS workshop on Cosmology and Structure Formation, KIAS, Korea,
11/04-11/09,

Kazuya Takahashi

Journal Papers

1. H. Nagakura, K. Takahashi and Y. Yamamoto,
"On the importance of progenitor asymmetry to shock revival in core-collapse supernovae,"
Monthly Notices of the Royal Astronomical Society **483** (2018) 208-222, YITP-18-136, arXiv:1811.05515 [astro-ph].

2. K. Takahashi, K. Toma, M. Kino, M. Nakamura and K. Hada,
"Fast-spinning black holes inferred from symmetrically limb-brightened radio jets,"
The Astrophysical Journal **868** (2018) 82 (22 pages), YITP-18-137, arXiv:1802.00292 [astro-ph].

3. M. Nakamura, K. Asada, K. Hada, H.-Y. Pu, S. Noble, C. Tseng, K. Toma, M. Kino, H. Nagai, K. Takahashi, J.-C. Algaba, M. Orienti, K. Akiyama, A. Doi, G. Giovannini, M. Giroletti, M. Honma, S. Koyama, R. Lico, K. Niinuma and F. Tazaki,
"Parabolic jets from the spinning black hole in M87,"
The Astrophysical Journal **868** (2018) 146 (28 pages), YITP-18-138, arXiv:1810.09963 [astro-ph].

4. K. Sugiura, K. Takahashi and S. Yamada,
"Linear analysis of the shock instability in core-collapse supernovae: Influence of acoustic power and fluctuations of neutrino luminosity,"
The Astrophysical Journal **874** (2019) 28 (12 pages), arXiv:1903.00480 [astro-ph].

Talks at International Conferences

1. "Jet energy distribution inferred from afterglow light curves," Plenary,
in "Jet and Shock Breakouts in Cosmic Transients," Kyoto University, Kyoto, Japan,
May 2018.

2. "Inverse problem of reconstructing the jet energy distribution from afterglow light curves ," Plenary,
in "The second annual symposium of the innovative area "Gravitational Wave Physics and Astronomy: Genesis"," Kyoto University, Kyoto, Japan,
November 2018.

Koji Umemoto

Journal Papers

1. A. Bhattacharyya, T. Takayanagi and K. Umemoto,
"Entanglement of Purification in Free Scalar Field Theories,"
JHEP **1804** (2018) 132 (27 pages), YITP-18-12, arXiv:1802.09545 [hep-ph].

2. K. Umemoto and Y. Zhou,
"Entanglement of Purification for Multipartite States and its Holographic Dual,"
JHEP **1810** (2018) 152 (26 pages), YITP-18-41, arXiv:1805.02625 [hep-th].

3. T. Takayanagi, T. Ugajin and K. Umemoto,
"Towards an Entanglement Measure for Mixed States in CFTs Based on Relative Entropy,"
JHEP **1810** (2018) 166 (35 pages), YITP-18-78, arXiv:1807.09448 [hep-th].

4. P. Caputa, M. Miyaji, T. Takayanagi and K. Umemoto,
"Holographic Entanglement of Purification from Conformal Field Theories,"
Phys. Rev. Lett. **122**, 111601 (2019) (7 pages), YITP-18-125, arXiv:1812.05268 [hep-th].

Talks at International Conferences

1. "Holographic Entanglement of Purification," Plenary,
in "Strings 2018," OIST, Okinawa, Japan
June 2018.

2. "Holographic Entanglement of Purification and its multipartite generalization,"
in "Strings and Fields 2018," YITP, Kyoto, Japan
August 2018.

Invited Seminars (in Japan)

1. "Entanglement of Purification in Holography,"
Dept. of Phys., Hokkaido Univ. July 2018.

2. "Holographic Entanglement of Purification and its multipartite generalization,"
Dept. of Phys., Osaka Univ. October 2018.

3. "Holographic Entanglement of Purification and its multipartite generalization,"
Dept. of Phys., Tokyo Inst. of Technology, November 2018.

Marcus Werner

Journal Papers

1. H. P. Roesch and M. C. Werner,
"The isoperimetric problem in Riemannian optical geometry,"
Pure Appl. Math. Quart. (2019) subm. (17 pages), YITP-19-06, arXiv:1902.01927 [gr-qc, math-DG].

2. G. W. Gibbons and M. C. Werner,
"The gravitational magnetoelectric effect,"
Universe **5** (2019) 88 (15 pages), YITP-19-13, arXiv:1903.00223 [gr-qc].

3. S. Chanda, G. W. Gibbons, P. Guha, P. Maraner and M. C. Werner,
"Jacobi-Maupertuis Randers-Finsler metric for curved spaces and the gravitational magnetoelectric effect,"
J. Math. Phys. (2019) subm. (10 pages), YITP-19-23, arXiv:1903.11805 [gr-qc].

Books and Proceedings

1. M. C. Werner,
"New Developments in Optical Geometry,"
Proc. JGRG **28** (2018), 110908 (14 pages).

Talks at International Conferences

1. "Optical Geometry 101,"
in "AMS MRC The Mathematics of Gravity and Light," Whispering Pines RI, USA, June 2018.

2. "The Struble-Einstein correspondence,"
in "15th Marcel Grossmann Meeting," La Sapienza, Rome, Italy, July 2018.

3. "Gravitational lensing in area metric spacetimes,"
in "15th Marcel Grossmann Meeting," La Sapienza, Rome, Italy, July 2018.

4. "New Developments in Optical Geometry,"
in "AMS Joint Mathematics Meeting," Baltimore MD, USA, January 2019.

5. "Optical Geometry and the Isoperimetric Problem,"
in "AMS Joint Mathematics Meeting," Baltimore MD, USA, January 2019.

Invited Seminars (in Japan)

1. “New Developments in Optical Geometry," in “28th Workshop on General Relativity and Gravitation in Japan," Rikkyo University, Tokyo, November 2018.

Shuichi Yokoyama

Journal Papers

1. T. Nosaka, and S. Yokoyama,
“Index and duality of minimal N = 4 Chern-Simons-matter theories ,”
JHEP **1806** (2018) 028, YITP-18-29, arXiv:1804.04639 [hep-th].

2. S. Aoki, J. Balog, and S. Yokoyama,
“Holographic computation of quantum corrections to the bulk cosmological constant,”
To appear in PTEP, YITP-18-72, arXiv:1804.04636 [hep-th].

3. S. Aoki, S. Yokoyama, and K. Yoshida,
“Holographic geometry for non-relativistic systems emerging from generalized flow equations,”
YITP-19-04, arXiv:1902.02578 [hep-th].

Talks at International Conferences

1. “Aspects of minimal N=4 Chern-Simons theories,”
in "Non-perturbative Non-Perturbative Effects in Supersymmetric Field Theories", International Institute of Physics, Natal, Brazil, October 2018.

2. “Anomaly, regularization and partition function on lens space,”
in "String Theory and Quantum Field Theory", Fudan University, Shanghai, China, March 2019

Invited Seminars (Overseas)

1. “Flow equation, conformal symmetry and AdS geometries,”
KIAS, Korea, November 2018.

2. “Aspects of minimal N=4 Chern-Simons theories,”
Seoul Nantional University, Korea, November 2018.

Invited Seminars (in Japan)

1. “Flow equation, conformal symmetry and AdS geometries,”
Nihon University, May 2018.

2. “Flow equation, conformal symmetry and AdS geometries,”
Maskawa Institute of Science and Culture, Kyoto Sangyo University, July 2018.

3. “Flow equation, conformal symmetry and AdS geometries,”
Okinawa Institute of Science and Technology, Japan, December 2018.

4. “Holographic geometries for non-relativistic systems emerging from generalized flow equations,”
Okinawa Institute of Science and Technology, Japan, December 2018.

Yun-Long Zhang

Journal Papers

1. J. W. Chen, S. Sun and Y. L. Zhang,
“Bell inequality in the holographic EPR pair,”
Phys. Lett. B **791** (2019) 73 (7 pages) arXiv:1612.09513 [hep-th].

2. J. W. Chen, S. H. Dai, D. Maity, S. Sun and Y. L. Zhang,
“Towards Searching for Entangled Photons in the CMB Sky,”
Phys. Rev. D **99** (2019) 023507 (6 pages), arXiv:1701.03437 [quant-ph].

3. R. Narayanan, C. Park and Y. L. Zhang,
“Holographic Approach to Entanglement Entropy in Disordered Systems,”
Phys. Rev. D **99** (2019) 046019 (14 pages) arXiv:1803.01064 [hep-th].

Talks at International Conferences

1. “Holographic model of the dark fluid in late time universe”,
in “Testing Gravity 2019,” SFU Harbour Center, Vancouver, Canada,
January 2019.

Invited Seminars (in Japan)

1. “From Membrane Fluid to the Dark Fluid in the Late-time Universe,”

Nagaoka University of Technology, Nagaoka, Febuary 2019 (Group-A Camp and Area Workshop of Gravitational Wave Physics and Astronomy: Genesis).

2.2.4 Publications and Talks by Affiliate Professors and Affiliate Associate Professors

(April 2018– March 2019)

Yshai Avishai

Journal Papers

1. D. Ariad, Y. Avishai and E. Grosfeld,
"How vortex bound states affect the Hall conductivity of a chiral $p \pm ip$ superconductor,"
Phys. Rev. **B 98** (2018) 104511.

2. I. Kuzmenko, T. Kuzmenko, Y. Avishai and M. Sato,
"Spin-orbit coupling and topological states in an F=3/2 cold Fermi gas,"
Phys. Rev. **B 98** (2018) 165139.

3. Y. B. Band, Y. Avishai and A. Shnirman,
"The Dynamics of a Magnetic Needle in a Magnetic field,"
Phys. Rev. Lett. **121** (2018) 160801.

4. Y. B. Band and Y. Avishai,
"Three-level Landau-Zener dynamics,"
Phys. Rev. **A 99** (2018) 032112, arXiv:1812.05474.

Lectures

1. "Non-Abelian Aharonov Casher Phase Factor in Mesoscopic Systems,"
Colloquium, LPS UniversiteParis Sud, (July 2018).

2. "Non-Abelian Aharonov Casher Phase Factor in Mesoscopic Systems,"
Colloquium, UniversitePierre et Marie Cury, Paris, (July 2018).

3. "Non-Abelian Aharonov Casher Phase Factor in Mesoscopic Systems,"
Theoretical Condensed Matter Seminar, Ben Gurion University, (November 2018).

Nathalie Deruelle

Journal Papers

1. N. Deruelle, N. Merino, R. Olea,
"Einstein-Gauss-Bonnet theory of gravity: The Gauss-Bonnet-Katz boundary term,"
Phys. Rev. **D97** (2018), 104009 (12 pages), arXiv:1709.06478 [gr-qc].

2. M. Cárdenas, F. L. Julié, N. Deruelle,
"Thermodynamics sheds light on black hole dynamics,"
Phys. Rev. **D97** (2018), 124021 (9 pages), arXiv:1712.02672 [gr-qc].

3. N. Deruelle, N. Merino, R. Olea,
"Chern-Weil theorem, Lovelock Lagrangians in critical dimensions and boundary terms in gravity actions,"
Phys. Rev. **D98** (2018), 044031 (12 pages), arXiv:1803.04741 [gr- qc].

Books and Proceedings

1. N. Deruelle, J. -P, Lasota,
"Les ondes gravitationnelles," Odile Jacob Edt, Paris, April 2018

Talks at International Conferences

1. "The problem of motion in gravity theories", Invitedm
in "Ecole des Houches on gravitational waves", France,
July 2018

Invited Seminars (Overseas)

1. "Les ondes gravitationnelles",
Université of Caen, France, May 2018

2. "Binary black hole coalescence in EMD theories"m
Moscow Universitym Russia, September 2018

Shinji Hirano

Journal Papers

1. P. Caputa, S. Hirano,
"Airy function and 4d quantum gravity,"
JHEP 1806 (2018) 106, YITP-18-24, arXiv:1804.00942 [hep-th].

2. S. Hirano,
"Brown-Teitelboim instantons and thermodynamics of de Sitter and anti-de Sitter space,"
Phys. Rev. **D98** (2018) no.4, 046020, arXiv:1804.09985 [hep-th].

Talks at International Conferences

1. "Airy function and 4d quantum gravity,"
in Post-Strings Workshop "New Frontiers in String Theory," Yukawa Institute for Theoretical Physics, Kyoto, Japan
July 2018.

2. "Airy function and 4d quantum gravity,"
in "10th Joburg Workshop on String Theory, Aspects of Holography," University of the Witwatersrand (Rural Facility), Johannesburg/KNP, South Africa
Sep 2018.

Invited Seminars (in Japan)

1. "Airy function and 4d quantum gravity,"
Dept. of Phys., Osaka University, July 2018.

2. "Airy function and 4d quantum gravity,"
Dept. of Math., Nagoya University, July 2018.

3. "Airy function and 4d quantum gravity (follow-up),"
Dept. of Math., Nagoya University, Jan 2019.

Hideo Kodama

Journal Papers

1. H. Kodama and H. Yoshino,
"Quest for the Ultimate Theory by Gravitational Wave Observations (in Japanese),"
Butsuri **73** (2018) 752 (10 pages).

Books and Proceedings

1. J. Kishine and T. Matsui, eds.:
"Physics of Force and Motion (in Japanese)," chap. 11 through chap. 14 (77 pages) (Institute for Promotion of Education, The Open University Japan, 20 March 2019) ISBM978-4-595-31965-5.

2. J. Kishine and T. Matsui, eds.:
"Perspective of Modern Physics (in Japanese)," chap. 3, chap. 10, and chap. 15 (55 pages) (Institute for Promotion of Education, The Open University Japan, 20 March 2019) ISBM978-4-595-14121-8.

Invited Seminars (in Japan)

1. "Supergravity theories in diverse dimensions and their applications (Special Lecture),"
Dept. of Phys., Hokkaido Univ., November 13-15, 2018.

2. "Quest for the Ultimate Theory by Gravitational Wave Observations,"
Dept. of Phys., Hokkaido Univ., November 15, 2018.

Kohta Murase

Journal Papers

1. V. A. Acciari et al., for the MAGIC Collaboration,
"Constraining very-high-energy and optical emission from FRB 121102 with the MAGIC telescopes,"
Monthly Notices of the Royal Astronomical Society 481 (2018) 2479.

2. K. Abe et al., for the Hyper-Kamiokande Proto-Collaboration,
"Physics potentials with the second Hyper-Kamiokande detector in Korea,"
Progress of Theoretical and Experimental Physics, 063C01 (2018).

3. S. S. Kimura, K. Tomida, and K. Murase,
"Acceleration and escape processes of high-energy particles in turbulence inside hot accretion flows,"
Monthly Notices of the Royal Astronomical Astronomy 485 (2019) 163.

4. C. M. B. Omand, K. Kashiyama, and K. Murase,
"Dust formation in embryonic pulsar-aided supernova remnants,"
Monthly Notices of the Royal Astronomical Astronomy 484 (2019) 5468.

5. K. Murase and M. Fukugita,
"Energetics of high-energy cosmic radiations,"
Physical Review D 99 (2019) 063012.

6. K. Murase, A. Franckowiak, K. Maeda, R. Margutti, and J. F. Beacom,
"High-Energy Emission from Interacting Supernovae: New Constraints on Cosmic-Ray Acceleration in Dense Circumstellar Environments,"
Astrophysical Journal 874 (2019) 80.

7. A. Esmaili and K. Murase,
"Constraining high-energy neutrinos from choked-jet supernovae with IceCube high-energy starting events,"
Journal of Cosmology and Astroparticle Physics 12 (2018) 008.

8. S. S. Kimura, K. Murase, and P. Meszaros,
"Super-knee Cosmic Rays from Galactic Neutron Star Merger Remnants,"
Astrophysical Journal 866 (2018) 51.

9. K. Murase, F. Oikonomou, and M. Petropoulou,
"Blazar Flares as an Origin of High-energy Cosmic Neutrinos?,"
Astrophysical Journal 865 (2018) 124.

10. A. Keivani K. Murase, M. Petropoulou, D. B. Fox et al.,
"A Multimessenger Picture of the Flaring Blazar TXS 0506+056: Implications for High-energy Neutrino Emission and Cosmic-Ray Acceleration,"
Astrophysical Journal 864 (2018) 84.

11. C. Guepin, K. Kotera, E. Barausse, K. Fang, and K. Murase,
"Ultra-High Energy Cosmic Rays and Neutrinos from Tidal Disruptions by Massive Black Holes,"
Astronomy & Astrophysics 616 (2018) A179.

12. S. S. Kimura, K. Murase, I. Bartos, K. Ioka, I. S. Heng and P. Meszaros,
"Transejecta high-energy neutrino emission from binary neutron star mergers,"
Physical Review D 98 (2018) 043020.

13. K. Kashiyama, K. Hotokezaka, and K. Murase,
"Radio transients from newborn black holes,"
Monthly Notices of the Royal Astronomical Astronomy 478 (2018) 2281.

14. C. F. Turley, D. B. Fox, A. Keivani, J. J. DeLaunay, D. F. Cowen, M. Mostafa, H. A. Ayala Solares, and K. Murase,
"A Coincidence Search for Cosmic Neutrino and Gamma-Ray Emitting Sources Using IceCube and Fermi-LAT Public Data,"
Astrophysical Journal 863 (2018) 64.

15. R.-Y. Liu, K. Murase, S. Inoue, C. Ge, and X.-Y. Wang,
"Can Winds Driven by Active Galactic Nuclei Account for the Extragalactic Gamma-Ray and Neutrino Backgrounds?,"
Astrophysical Journal 858 (2018) 9.

16. I. M. Shoemaker and K. Murase,
"Constraints from the time lag between gravitational waves and gamma rays: Implications of GW170817 and GRB 170817A,"
Physical Review D 97 (2018) 083013.

17. B. T. Zhang, K. Murase, S. S. Kimura, S. Horiuchi, and P. Meszaros,
"Low-luminosity gamma-ray bursts as the sources of ultrahigh-energy cosmic-ray nuclei,"
Physical Review D 97 (2018) 083010.

18. K. Murase,
"New prospects for detecting high-energy neutrinos from nearby supernovae,"
Physical Review D Rapid Communication 97 (2018) 081301.

19. K. Fang and K. Murase,
"Linking high-energy cosmic particles by black hole jets embedded in large-scale structures,"
Nature Physics, 14, 396 (2018).

20. C. Yuan, P. Meszaros, K. Murase, and D. Jeong,
"Cumulative Neutrino and Gamma-Ray Backgrounds from Halo and Galaxy Mergers,"
Astrophysical Journal 857 (2018) 50.

21. C. M. B. Omand, K. Kashiyama, and K. Murase,

"Radio emission from embryonic superluminous supernova remnants,"
Monthly Notices of the Royal Astronomical Astronomy 474 (2018) 573.

22. K. Murase, M. W. Toomey, K. Fang, F. Oikonomou, S. S. Kimura, K. Hotokezaka, K. Kashiyama, K. Ioka, and P. Meszaros,
"Double Neutron Star Mergers and Short Gamma-Ray Bursts: Long-Lasting High-Energy Signatures and Remnant Dichotomy,"
Astrophysical Journal 854 (2018) 60.

23. S. S. Kimura, K. Murase, and B. T. Zhang,
"Ultrahigh-Energy Cosmic-Ray Nuclei from Black Hole Jets: Recycling Galactic Cosmic Rays through Shear Acceleration,"
Physical Review D 97 (2018) 023026.

24. N. Hiroshima, R. Kitano, K. Kohri, and K. Murase,
"High-energy Neutrinos from Multi-body Decaying Dark Matter,"
Physical Review D 97 (2018) 023006.

25. N. Senno, K. Murase, and P. Meszaros,
"Constraining high-energy neutrino emission from choked jets in stripped-envelope supernovae,"
Journal of Cosmology and Astroparticle Physics 01 (2018) 025.

Books and Proceedings

1. F. Oikonomou, K. Murase, and M. Petropoulou,
"High-Energy Neutrinos from Blazar Flares and Implications of TXS 0506+056,"
EPJ Web of Conferences 210 (2019) 03006.

2. P. Meszaros, K. Murase, K. Asano, N. Senno, and D. Xiao,
"Multi-Messenger Signatures of PeV-ZeV Cosmic Ray Sources,"
Nuclear and Particle Physics Proceedings 217 (2018) 291.

Talks at International Conferences

1. "High-Energy Neutrinos and Multi-Messenger Implications," Invited, Plenary,
in "VHEPA 2019," Kashiwa, Japan,
February 2019.

2. "High-Energy Neutrinos and Gamma-Ray Connections of Cosmic-Ray Sources," Invited,
in "American Astronomical Society Splinter Meeting," Seattle, USA,
January 2019.

3. "Ultrahigh-Energy Cosmic-Ray Astrophysics in the Multi-Messenger Era," Invited, Plenary,
in "Telescope Array 10th Anniversary Symposium," Kashiwa, Japan,
December 2018.

4. "High-Energy Neutrinos and Cosmic Rays from Active Galactic Nuclei," Invited, Plenary,
in "TeV Particle Astrophysics (TeVPA) 2018," Berlin, Germany,
August 2018.

5. "Multi-Messenger Implications of Blazar Neutrinos: Questions and Challenges," Invited,
in "TeV Particle Astrophysics (TeVPA) 2018 Special Workshop," Zeuthen, Germany,
August 2018.

6. "GRAND-300 Science Cases," Invited,
in "GRAND Workshop 2018," Paris, France,
August 2018.

7. "Counterparts of Fast Radio Bursts," Invited,
in "COSPAR 2018," Pasadena, USA,
July 2018.

8. "PeV Neutrinos and Beyond," Invited,
in "ARENA 2018," Catania, Italy,
June 2018.

9. "Multi-Messenger Emission from Interacting Supernova," Invited, Plenary
in "Shocking Supernovae," Stockholm, Sweden,
May 2018.

Invited Seminars(Overseas)

1. "Theoretical Implications of the Latest IceCube and ANITA Results,"
LHC Results Forum, Online Seminar Series, January 2019

2. "High-Energy Cosmic Particle Mysteries," Florida State University, USA, November 2018.

3. "High-Energy Cosmic Particle Mysteries," University of Florida, USA, April 2018.

Invited Seminars(in Japan)

1. "High-Energy Cosmic Particle Mysteries," Nagoya University, December 2018.

2. "High-Energy Neutrinos and Cosmic Rays from Active Galactic Nuclei," YITP, Kyoto University, July 2018.

3. "High-Energy Cosmic Particle Mysteries," Tokyo Institute of Technology, June 2018.

Takashi Nakamura

Journal Papers

1. Shota Kisaka, Kunihito Ioka, Kazumi Kashayama and Takashi Nakamura, "Scattered Short Gamma-Ray Bursts as Electromagnetic Counterparts to Gravitational Waves and Implications of GW170817 and GRB 170817A," Astrophysical Journal, Volume 867, Issue 1, article id. 39, 11 pp. (2018).

2. Soichiro Isoyama, Hroyuki Nakano and Takashi Nakamura, "Multiband gravitational-wave astronomy: Observing binary inspirals with a decihertz detector, B-DECIGO," Progress of Theoretical and Experimental Physics, Volume 2018, Issue 7, id.073E01.

3. Kunihito Ioka and Takashi Nakamura , Can an off-axis gamma-ray burst jet in GW170817 explain all the electromagnetic counterparts?, Progress of Theoretical and Experimental Physics, Volume 2018, Issue 4, id.043E02.

Misao Sasaki

Journal Papers

1. C. Han, S. Pi and M. Sasaki, "Quintessence Saves Higgs Instability," Phys. Lett. B **791**, 314 (2019) doi:10.1016/j.physletb.2019.02.037 [arXiv:1809.05507 [hep-ph]].

2. A. A. Abolhasani and M. Sasaki, "Single-field consistency relation and δN-formalism," JCAP **1808**, no. 08, 025 (2018) doi:10.1088/1475-7516/2018/08/025 [arXiv:1805.11298 [astro-ph.CO]]. YITP-18-57.

3. T. Hiramatsu, E. Komatsu, M. Hazumi and M. Sasaki, "Reconstruction of primordial tensor power spectra from B-mode polarization of the cosmic microwave background," Phys. Rev. D **97**, no. 12, 123511 (2018) doi:10.1103/PhysRevD.97.123511 [arXiv:1803.00176 [astro-ph.CO]]. YITP-18-13.

4. A. Albrecht, S. Kanno and M. Sasaki, "Quantum entanglement in de Sitter space with a wall, and the decoherence of bubble universes," Phys. Rev. D **97**, no. 8, 083520 (2018) doi:10.1103/PhysRevD.97.083520 [arXiv:1802.08794 [hep-th]]. YITP-18-03.

5. M. Sasaki, T. Suyama, T. Tanaka and S. Yokoyama, "Primordial black holes 宴廃 erspectives in gravitational wave astronomy," Class. Quant. Grav. **35**, no. 6, 063001 (2018) doi:10.1088/1361-6382/aaa7b4 [arXiv:1801.05235 [astro-ph.CO]].

6. Y. F. Cai, X. Chen, M. H. Namjoo, M. Sasaki, D. G. Wang and Z. Wang, "Revisiting non-Gaussianity from non-attractor inflation models," JCAP **1805**, no. 05, 012 (2018) doi:10.1088/1475-7516/2018/05/012 [arXiv:1712.09998 [astro-ph.CO]]. YITP-17-133.

Books and Proceedings

1. Ali Akbar Abolhasani, Hassan Firouzjahi, Atsushi Naruko, and Misao Sasaki, "Delta N Formalism in Cosmological Perturbation Theory" World Scientific, ISBN-978-981-3238-75-6, doi.org/10.1142/10953, January 2019.

Talks at International Conferences

1. "Primordial Black Holes", Plenary, in "Dark Side of the Universe 2018", Annecy, France, June 2018.

2. “Scalaron as a heavy field and PBH formation”, Pleanary, in “String Phenomenology 2018”, Warsaw, Poland, July 2018.

3. “Relativistic Cosmology”, Lectures, in “Vietnam School of Astrophysics (VSOA2018)”, Qui Nhon, Vietnam, July-August 2018.

4. “Scalaron as a heavy field and PBH formation”, Plenary, in “5th Korea-Japan Workshop on Dark Energy”, KASI, Korea, August 2018.

5. “Scalaron as a heavy field and PBH formation”, Invited, in “Cosmology Frontier in Particle Physics”, NTU, Taiwan, September 2018.

6. “Primordial Black Holes as CDM",Keynote, in “The 4th CosKASI-ICG-NAOC-YITP Joint Workshop on Frontier of Cosmology”, NAOC, Beijing, China, October 2018.

7. “Inflationary Scenario for PBHs as CDM”, Plenary, in “International Symposium on Cosmology and Particle Astrophysics (CosPA 2018)”, Yangzhou, China, November 2018.

8. “PBHs from inflation and GWs”, Invited, in “Testing Gravity 2019”, Vancouver, Canada, January 2019.

9. “Inflationary cosmology and Primoridal Black Holes”, Lectures, in “Lectures in Cosmology”, KIAS, Korea, March 2019.

Invited Seminars (Overseas)

1. “Scalaron as a heavy field and PBH formation”, ASC LMU, Munich, Germany, August 2018.

2. “Gravitational Wave Cosmology”, ASIAA Colloquium, ASIAA, Taipei, Taiwan, October 2019.

3. “Induced GWs and PBHs from large scalar curvature perturbation”, ASC LMU, Munich, Germany, February 2019.

Masaki Shigemori

Journal Papers

1. K. Fukushima, F. Gelis and T. Lappi, “Multiparticle correlations in the Schwinger mechanism,” Nucl. Phys. **A831** (2009) 184 (31 pages), YITP-09-45, arXiv:0907.4793 [hep-ph].

2. N. Čeplak, R. Russo and M. Shigemori, “Supercharging Superstrata,” JHEP **03** (2019) 095 (55 pages), YITP-18-134, arXiv: 1812.08761 [hep-th].

Talks at International Conferences

1. “Supercharging Superstrata,” Invited, in “International Symposium RIKKYO MathPhys 2019,” Rikkyo University, Japan, January 2019.

Invited Seminars (in Japan)

1. “Black Hole Microstates,” High Energy Accelerator Research Organization (KEK), Japan, May, 2018 (in Japanese).

2. “Black Hole Microstates,” Nagoya University, Japan, May, 2018 (in Japanese).

Takahiro Tanaka

Journal Papers

1. H. Nakano *et al.*, “Comparison of various methods to extract ringdown frequency from gravitational wave data,” arXiv:1811.06443 [gr-qc], Phys. Rev. D, to be published

2. S. Isoyama, R. Fujita, H. Nakano, N. Sago and T. Tanaka, “宴麻 lux-balance formulae 宴İ for extreme mass-ratio inspirals,” PTEP **2019**, no. 1, 013E01 (2019) doi:10.1093/ptep/pty136, YITP-18-96, [arXiv:1809.11118 [gr-qc]].

3. M. Kimura and T. Tanaka, “Stability analysis of black holes by the *S*-deformation method for coupled systems,” Class. Quant. Grav. **36**, no. 5, 055005 (2019) doi:10.1088/1361-6382/ab0193, YITP-18-97, [arXiv:1809.00795 [gr-qc]].

4. N. Loutrel, T. Tanaka and N. Yunes,
"Spin-Precessing Black Hole Binaries in Dynamical Chern-Simons Gravity,"
Phys. Rev. D **98**, no. 6, 064020 (2018) doi:10.1103/PhysRevD.98.064020, YITP-18-61, [arXiv:1806.07431 [gr-qc]].

5. N. Loutrel, T. Tanaka and N. Yunes,
"Scalar Tops and Perturbed Quadrupoles: Probing Fundamental Physics with Spin-Precessing Binaries,"
Class. Quant. Grav. **36**, no. 10, 10LT02 (2019) doi:10.1088/1361-6382/ab15fa, YITP-18-96, [arXiv:1806.07425 [gr-qc]].

6. J. Tokuda and T. Tanaka,
"Can all the infrared secular growth really be understood as increase of classical statistical variance?,"
JCAP **1811**, no. 11, 022 (2018) doi:10.1088/1475-7516/2018/11/022, YITP-18-70, [arXiv:1806.03262 [hep-th]].

7. M. Kimura and T. Tanaka,
"Robustness of the *S*-deformation method for black hole stability analysis,"
Class. Quant. Grav. **35**, no. 19, 195008 (2018) doi:10.1088/1361-6382/aadc13, YITP-18-52, [arXiv:1805.08625 [gr-qc]].

8. R. Nair and T. Tanaka,
"Synergy between ground and space based gravitational wave detectors. Part II: Localisation,"
JCAP **1808**, no. 08, 033 (2018) Erratum: [JCAP **1811**, no. 11, E01 (2018)] doi:10.1088/1475-7516/2018/08/033, 10.1088/1475-7516/2018/11/E01, YITP-18-53, [arXiv:1805.08070 [gr-qc]].

9. M. Sasaki, T. Suyama, T. Tanaka and S. Yokoyama,
"Primordial black holes 寰廃 erspectives in gravitational wave astronomy,"
Class. Quant. Grav. **35**, no. 6, 063001 (2018) doi:10.1088/1361-6382/aaa7b4, YITP-18-04, [arXiv:1801.05235 [astro-ph.CO]].

10. T. Fujita, I. Obata, T. Tanaka and S. Yokoyama,
"Statistically Anisotropic Tensor Modes from Inflation,"
JCAP **1807**, 023 (2018) doi:10.1088/1475-7516/2018/07/023 [arXiv:1801.02778 [astro-ph.CO]].

Talks at International Conferences

1. "Testing gravity theory using gravitational waves " Invited, Plenary,
2018 Second international workshop "Particles, Gravitation and the Universe"(PGU 2018)

2. "Takahiro Tanaka Testing gravity theory using gravitational waves " Invited, Plenary,
IBS Workshop on Prospects of Particle Physics and Cosmology

3. "Testing gravity theory using gravitational waves " Invited, Plenary,
5th Korea-Japan Workshop on Dark Energy: Starobinsky's Universe

4. "Gravitational waves from BH mergers as a new probe of physics " Invited, Plenary,
AVENUES OF QUANTUM FIELD THEORY IN CURVED SPACETIME

5. "What is the next step of A01?,"
Area workshop of innovative area "GW Genesis"

6. "A01 Status Report Second Area Symposiu of innovative area "GW Genesis,"

2.3 Seminars, Colloquia and Lectures

▷ 2018.4.1 — 2019.3.31

4/5 Piljin Yi (KIAS) Holonomy Saddles

4/11 Takuya Ohmura (Kyoto University) Near-wall Dynamics of Passive and Active Particles at Low Reynolds Number

4/12 Gediminas Juzeliunas (Vilnius University) YITP Colloquium: Synthetic spin-orbit coupling for ultracold atoms

4/13 Berndt Mueller (Duke U. / Brookhaven National Laboratory) Hot Spaghetti: Viscous Gravitational Collapse

4/13 Min-Hsiu Hsieh (University of Technology Sydney) Noisy quantum state redistribution with promise and the Alpha-bit

4/13 Yair Mulian (CEA Saclay) Multi particle production in proton-nucleus collisions at high-energy

4/16 Fabian Schmidt (Max Planck Institute for Astrophysics) Galaxy clustering: an effective field theory approach

4/16 Paul Wiegmann (The University of Chicago) Geometric transport in Quantum Hall Effect

4/20 Chris Halcrow (Inst. of Modern Physics, Chinese Academy of Sciences) Unbinding Skyrmions

4/23 Aleksander Kusina (Institute of nuclear physics, Cracow) Nuclear parton distributions

4/24 Katsuhisa Taguchi (YITP, Kyoto University) Valley Edelstein effect in monolayer transition metal dichalcogenides

4/25 Ryohei Seto (Kyoto University) Rheology and fluid mechanics of dense suspensions

4/27 Luca Lionni (YITP, Kyoto University) Random geometry, tensor models, and some applications

5/1 Nobuyuki Okuma (YITP, Kyoto University) Magnon Spin-Momentum Locking: From Definition to Application in Opto- Spintronics

5/10 Tomoyuki Morimae (YITP, Kyoto University) YITP Colloquium: Basics of quantum computing and very recent results

5/11 Paolo Gondolo (University of Utah) Dark Energy Stars

5/14 Takuya Hatomura (University of Tokyo) Shortcuts to adiabatic cat-state generation in bosonic Josephson junctions

5/15 Yohei Fuji (RIKEN) Quantum Hall hierarchy and duality from coupled wires

5/16 Michio Otsuki (Osaka University) Shear Jamming of Granular Materials under Oscillatory Shear

5/16 Seunghoan Song (Nagoya University) Secure Quantum Network Code without Classical Communication

5/25 Dong-Jing Yang (National Taiwan Normal University) Quark and gluon fragmentation functions in model calculation

5/25 Hirotaka Hayashi (Tokai University) 5-brane webs and 5d N=1 rank 2 theories

5/31 Stephane Dartois (University of Melbourne) Introduction to the topological recursion

6/1 Ryosuke Yoshii (Chuo University) New solutions of Gross-Neveu and CP(N) models in large N

6/8 Kotaro Tamaoka (Osaka University) Conformal Blocks from AdS geodesics

6/22 Masataka Watanabe (Kavli IPMU, Univ. of Tokyo) The Large Charge Expansion and the Universal Correlation Functions in Rank-1 SCFT

7/6 Kohta Murase (Pennsylvania State U. / YITP, Kyoto University) Active Galactic Nuclei as the Sources of High-Energy Neutrinos and Ultrahigh-Energy Cosmic Rays

7/11 Takashi Ishii (University of Tokyo) Heating in integrable time-periodic systems

7/12 Seiseki Akibue (NTT Communication Science Laboratories) Bipartite discrimination of independently prepared quantum states as a counterexample of a parallel repetition conjecture

7/12 Tomoya Takiwaki (National Astronomical Observatory of Japan) Chiral Magnetic Effect in Proto-Neutron Star

7/18 Luca Buoninfante (Groningen University, The Netherlands / Salerno University, Italy) Towards non-singular metric solutions in ghost-free infinite derivative theories of gravity

7/19 Scott Melville (Imperial College London) To UV, or Not To UV: Constraining Effective Field Theories for Cosmology and Gravity

7/24 Camilia Demidem (Astroparticle and Cosmology Laboratory, Paris) Numerical simulations of shocks, turbulence & particle acceleration in relativistic MHD

7/24 Wayne Hu (Kavli Institute for Cosmological Physics, U. of Chicago) Generalized Slow Roll in the Effective Field Theory of Inflation

7/26 Andrew Coates (Theoretical Astrophysics, IAAT, University of Tubingen) The Weak Equivalence Principle Beyond Weak Gravity

8/17 Re'em Sari (Hebrew University of Jerusalem) Dynamical processes in the Galactic Center

8/24 Michal P. Heller (the Albert Einstein Institute) Complexity, entanglement entropy and free thermofield double states

8/24 Shinya Wanajo (Sophia University) Radioactive Isotopes that powered the Kilonova Associated with a Neutron-star Merger GW170817

9/5 Nigel Goldenfeld (NASA Astrobiology Institute for Universal Biology at UIUC) The emergence of collective modes, ecological collapse and directed percolation at the laminar-turbulence transition in pipe flow

9/5 Sebastian Garcia-Saenz (Institute of Astrophysics in Paris) Deforming massive theories

9/7 Tommi Tenkanen (Queen Mary University of London) Inflationary attractors in different theories of gravity

9/10 Cyril Lagger (The University of Sydney) Gravitational waves as a probe of fundamental physics

9/11 Chen Heinrich (Jet Propulsion Laboratory, California Institute of Technology) WFIRST High Latitude Survey and Synergies with Ground- based Surveys

9/12 Evangelos Sfakianakis (Nikhef / University of Leiden(Joint Position) Multi-field effects in α-attractors: inflation and preheating

9/13 Anastasia Fialkov (Inst. for Theory and Computation (ITC), Harvard Univ.) Shining Light Into Cosmic Dark Ages

9/14 Alexander Jahn (Free University of Berlin / YITP, Kyoto University) Matchgate tensor networks and holography

9/14 Joan Simon (The University of Edinburgh) Correlations vs connectivity in R-charge

10/5 Anatoli Afanasjev (Mississippi State Univ. / YITP, Kyoto Univ.) YITP Colloquium: Covariant density functional theory: from light to hyperheavy nuclei

10/5 Kazumi Okuyama (Shinshu University) Resurgence analysis of 2d Yang-Mills theory on a torus

10/9 Yoshio Kikukawa (the University of Tokyo) On the gauge-invariant path-integral measure for the overlap Weyl fermions in 16 of SO(10)

10/18 Nishanth Gudapati (Harvard University) On the notion of energy in the perturbative theory of black holes

10/19 Arnab Sen (Indian Association for the Cultivation of Science) Understanding disorder-induced phases in dipolar spin ice

10/29 Koutarou Kyutoku (KEK) Mergers of black hole-neutron star binaries in the era of multi-messenger

10/30 Toby Wiseman (Imperial College London) What spatial geometry does the (2+1)-d QFT vacuum prefer?

10/31 Kazuki Yamaga (Kyoto University) The 2nd law-type work relation in non-equilibrium steady states in infinite quantum systems

11/1 José M.M. Senovilla (Basque University, Bilbao) Area deficits and gravitational energy

11/2 Di-Lun Yang (YITP, Kyoto University) chiral kinetic theory and quantum transport of chiral fluids

11/5 Jorrit C. de Boer (University of Twente) Combining superconductivity and topological materials

11/5 Ken Shiozaki (YITP, Kyoto University) YITP Colloquium: Symmetry Protected Topological Phases and Homology

11/6 Avraham Gal (Racah Institute of Physics, Hebrew University) $\Lambda^*(1405)$-matter: stable or unstable?

11/7 Tomohiko Sano (Ritsumeikan University) Twist-induced snapping in a bent elastic ribbon

11/9 Koji Tsumura (Kyoto University) Towards Neutrino Mass Spectroscopy

11/13 Rafael Alexander (University of New Mexico) Walks, tiles, and zippers: exact holographic tensor networks for Motzkin spin chains

11/13 Razvan Gurau (The center for Theoretical Physics (CPHT) at Ecole Polytechnique) Introduction to random tensors and tensor field theory

11/14 Jean-Philippe Uzan (Institut d'Astrophysique de Paris) Fundamental constants - The new SI and general relativity

11/15 David Mota (University of Oslo) Universal predictions of screened modified gravity and cosmological probes using galaxy clusters

11/22 Satoshi Yamaguchi (Osaka University) 't Hooft anomaly matching condition and chiral symmetry breaking without fermion bilinear condensate

11/27 Tomoki Ozawa (iTHEMS, RIKEN) Quantum Hall effects in driven-dissipative systems: from photonic cavity arrays to classical mechanical oscillators

11/28 Krzysztof Meissner (University of Warsaw) Conformal Standard Model

11/30 Akihiko Monnai (KEK) Exploring finite-density QCD matter in nuclear collisions

11/30 Holger Bech Nielsen (Niels Bohr Institute) Novel string field theory, strings composed of non-interacting constituents, objects

11/30 Tomohiko Takahashi (Nara Women's University) Closed string symmetries in open string field theory

12/3 Raul Monsalve (McGill University) Constraining Cosmic Dawn and Reionization with the Global 21-cm Signal

12/10 Masahiro Nozaki (iTHEMS, RIKEN) Signature of quantum chaos in operator entanglement in 2d CFTs

12/10 Takuya Furusawa (Tokyo Institute of Technology) Boson-fermion duality in (3+1) dimensions

12/13 Yu-tin Huang (National Taiwan University) YITP Colloquium: The positivity of physics

12/14 Max Riegler (Université libre de Bruxelles) Flat Space Holography and the Quantum Null Energy Condition

12/18 Chong Qi (Royal Institute of Technology, Stockholm) Isovector and isoscalar pairing correlations and clustering in heavy nuclei

12/18 Patrick Copinger (University of Tokyo) Chirality Production with Mass Effects - Schwinger Pair Production and the Axial Ward Identity

12/19 Lorenzo Contessi (the Hebrew University of Jerusalem) ${}^{5}_{\Lambda}He$ from short range effective theories

12/20 Ludovic Jaubert (University of Bordeaux) Neutron scattering signatures of pyrochlore spin liquids and nematic phases

1/7 Haoxiang Lin (University of Tokyo) Nonthermal afterglow of GW170817: a more natural modeling of electron energy distribution leads to a qualitatively different new solution

1/10 Kazumi Kashiyama (RESCEU, University of Tokyo) The Hertz spinning object (HeSO) survey with Tomo-e Gozen

1/11 Gabi Zafrir (Kavli IPMU, U. of Tokyo) Compactifications of 6d N=(1,0) SCFTs with non-trivial Stiefel-Whitney classes

1/17 Thors Hans Hansson (Stockholm University/ YITP, Kyoto University) QUANTUM HALL HIERARCHIES - how to make sense of the QH zoo

1/23 Yoshitaka Hatta (Brookhaven National Laboratory) The science of the Electron-Ion Collider

1/29 Takahiro Sudoh (Department of Astronomy, University of Tokyo) High-energy gamma-ray and neutrino production in star- forming galaxies

1/30 Akihiro Tanabe (Meiji Institute for Advanced Study of Mathematical Sciences, Meiji U.) Interaction between two intruders in granular flow

2/7 Yoshi Kamiya (Shanghai Jiao Tong University (SJTU)) Non-semiclassical spin dynamics in the triangular lattice quantum antiferromagnet

2/8 Thors Hans Hansson (Stockholm University/ YITP, Kyoto University) YITP Colloquium: Geometry and Topology in two-dimensional Chiral Liquids

2/13 Kuniyasu Saitoh (AIMR, Tohoku University) Stress relaxation above and below the jamming transition

2/13 Norihiro Oyama (AIST-Tohoku Univ. Mathematics for Advanced Materials-Open Innovation Laboratory) Avalanche Interpretation of the Power-Law Energy Spectrum in Three-Dimensional Dense Granular Flow

2/13 Satoshi Takada (Earthquake Research Institute, U. of Tokyo) Particle flows around a spherical intruder

2/15 Nozomu Kobayashi (Kavli IPMU, U. of Tokyo) Towards a C-theorem in defect CFT

2/21 Kazuya Yonekura (Kyushu University) Anomaly matching in QCD thermal phase transition

2/21 Yu Jia (Institute of High Energy Physics, Beijing) Schrodinger, Klein-Gordon and Dirac equations, atomic wave functions and operator product expansion

3/1 Soumangsu Bhusan Chakraborty (Hebrew University of Jerusalem) JTbar deformed CFT_2 and string theory

3/4 Kei-Ichi Kondo (Chiba University) Reflection positivity and complex analysis of the Yang-Mills theory from a viewpoint of gluon confinement

3/8 Ryusuke Hamazaki (University of Tokyo) Non-Hermitian Many-Body Localization

3/8 Valentin Bonzom (LIPN, Paris 13) Tensor models and combinatorics of triangulations in dimensions d>2

3/18 Daisuke Nomura (IPNS, KEK) Muon g-2: A new data-based analysis

3/18 Mikhail Volkov (University of Tours) Varying the Horndeski Lagrangian within the Palatini approach

3/20 Hiromichi Nishimura (RIKEN-BNL Research Center) Effective potential for the Polyakov loop at higher loop order

3/26 Yutaka Akagi (University of Tokyo) Topological Invariant for Magnon Hall Systems with Disorder

3/29 Janos Balog (Wigner Research Centre, Budapest) Effective potential for relativistic scattering

3/29 Stephen Angus (Ewha Woman's University) Stringy completion of the Friedmann equations

2.4 Visitors (April 2018 – March 2019)

Atom-type Visitors

Ishii, Takashi (C)
Graduate School of Science, The University of Tokyo
2018-07-09 – 2018-08-10

Nakamura, Shintaro (A)
Tokyo University of Science
2018-08-31 – 2018-09-30

Mochizuki, Ken (C)
Hokkaido University
2019-01-31 – 2019-03-01

Ota, Toshihiro (E)
Osaka University
2019-02-04 – 2019-03-01

Akagi, Satoshi (A)
Nagoya University
2019-02-04 – 2019-02-17

Akitsu, Kazuyuki (A)
Kavli IPMU, Univ. of Tokyo
2019-02-15 – 2019-03-18

Visitors

Martinez Magan, Javier (E)
Balseiro Institute
2018-03-13 – 2018-04-19

Seye Alioune (A)
Ecole Normale Superieure
2018-03-26 – 2018-08-03

Bose, Benjamin (A)
ICG, University of Portsmouth
2018-03-29 – 2018-09-28

Franzmann, Guilherme (A)
McGill University
2018-03-31 – 2018-07-30

Jahn, Alexander (A)
Free University of Berlin
2018-04-01 – 2018-09-30

Yi, Piljin (E)
KIAS
2018-04-04 – 2018-04-06

Eckardt, Andre (C)
Max Planck Institute for the Physics of Complex Systems
2018-04-09 – 2018-04-21

Anisimovas, Egidijus (C)
Vilnius University
2018-04-09 – 2018-04-18

Juzeliunas, Gediminas (C)
Vilnius University
2018-04-09 – 2018-04-18

Oka, Takashi (C)
Max Planck Institute for the Physics of Complex Systems
2018-04-09 – 2018-04-21

Mulian, Yair (N)
CEA Saclay
2018-04-12 – 2018-04-14

Mueller, Berndt (N)
Duke U. / Brookhaven National Laboratory
2018-04-12 – 2018-04-14

Schmidt, Fabian (A)
MPA, Garching
2018-04-14 – 2018-04-17

Wiegmann, Paul (C)
University of Chicago
2018-04-15 – 2018-04-18

Akitsu, Kazuyuki (A)
Kavli IPMU, Univ. of Tokyo
2018-04-16 – 2018-04-17

Chris Halcrow (C)
Inst. of Modern Physics, Chinese Academy of Sciences
2018-04-19 – 2018-04-20

Kusina, Aleksander (N)
Institute of nuclear physics, Cracow
2018-04-22 – 2018-04-24

Seto, Ryohei (C)
Kyoto University
2018-04-25 – 2018-04-25

Kuroyanagi, Sachiko (A)
Nagoya University
2018-04-26 – 2018-04-26

Deruelle, Nathalie (A)
APC, University Paris 7
2018-05-02 – 2018-06-01

Yan, Han (E)
Okinawa Institute of Science and Technology
2018-05-07 – 2018-05-11

Gondolo, Paolo (E)
University of Utah
2018-05-07 – 2018-05-18

Wu, Tianwei (N)
Beihang University
2018-05-08 – 2018-05-14

Hiramatsu, Takashi (A)
Rikkyo Univ.
2018-05-11 – 2018-05-16

Takada, Masahiro (A)
Univ. of Tokyo
2018-05-11 – 2018-05-12

Hatomura, Takuya (C)
University of Tokyo
2018-05-13 – 2018-05-15

Sendouda, Yuuiti (A)
Hirosaki University
2018-05-13 – 2018-05-16

Niiyama, Yuki (A)
Hirosaki University
2018-05-13 – 2018-05-16

Kobayashi, Shingo (C)
Nagoya University
2018-05-14 – 2018-05-18

Fuji, Yohei (C)
RIKEN
2018-05-14 – 2018-05-19

Colombi, Stephane (A)
Institut d'Astrophysique de Paris
2018-05-14 – 2018-05-29

Ugajin, Tomonori (E)
Okinawa Institute of Science and Technology
2018-05-15 – 2018-05-16

Otsuki, Michio (C)
Osaka University
2018-05-16 – 2018-05-16

Song, Seunghoan (Q)
Nagoya University
2018-05-16 – 2018-05-16

Avishai, Yshai (C)
Ben Gurion University of the Negev
2018-05-17 – 2018-05-23

Momose, Takamasa (E)
University of British Columbia
2018-05-18 – 2018-05-19

Fukuyama, Takeshi (E)
RCNP, Osaka University
2018-05-18 – 2018-05-19

Nomura, Daisuke (E)
KEK
2018-05-18 – 2018-05-19

Matsuura, Shunji (E)
1QB Information Technologies (1QBit)
2018-05-18 – 2018-05-25

Ito, Hirotaka (A)
RIKEN
2018-05-19 – 2018-06-11

Imaeda, Tatsushi (C)
Nagoya University
2018-05-23 – 2018-05-24

Hayashi, Hirotaka (E)
Tokai University
2018-05-25 – 2018-05-26

Dartois, Stephane (E)
University of Melbourne
2018-05-26 – 2018-06-03

Darmawan, Andrew (E)
The University of Tokyo
2018-05-28 – 2018-05-31

Yoshii, Ryosuke (E)
Chuo University
2018-06-01 – 2018-06-01

Shiozaki, Ken (C)
RIKEN
2018-06-04 – 2018-06-05

Garzo, Vicente (C)
University of Extremadura
2018-06-10 – 2018-06-30

Naito, Tomoya (N)
University of Tokyo
2018-06-12 – 2018-06-25

Aoyama, Shohei (A)
Academia Sinica, Institute of Astronomy and Astrophysics
2018-06-14 – 2018-06-15

Hirabayashi, Yoshiharu (N)
Hokkaido Univ.
2018-06-18 – 2018-06-18

Watanabe, Masataka (E)
Kavli IPMU, U. of Tokyo
2018-06-21 – 2018-06-23

Suzuki, Yasuyuki (N)
Niigata University
2018-06-25 – 2018-06-30

Kisaka, Shota (A)
Aoyama Gakuin Univ.
2018-06-25 – 2018-07-24

Murase, Kohta (A)
The Pennsylvania State University
2018-07-02 – 2018-07-15

Nishimichi, Takahiro (A)
Kavli IPMU, U. of Tokyo
2018-07-05 – 2018-07-06

Jeong, Donghui (A)
Pennsylvania State University
2018-07-05 – 2018-07-07

Giacomello, Francesco (A)
universities of Trieste and Udine
2018-07-07 – 2018-08-20

Melville, Scott (A)
Imperial College London
2018-07-09 – 2018-08-03

Akibue, Seiseki (Q)
NTT Communication Science Laboratories
2018-07-12 – 2018-07-12

Takiwaki, Tomoya (A)
National Astronomical Observatory of Japan
2018-07-12 – 2018-07-12

Buoninfante, Luca (A)
Groningen University / Salerno University
2018-07-18 – 2018-07-19

Hu, Wayne (A)
University of Chicago
2018-07-23 – 2018-07-27

Cleve, Richard (Q)
University of Waterloo
2018-07-23 – 2018-07-24

Demidem, Camilia (A)
Astroparticle and Cosmology Laboratory, Paris
2018-07-24 – 2018-07-25

Coates, Andrew (A)
Theoretical Astrophysics, IAAT, University of Tubingen
2018-07-25 – 2018-07-31

Calcagni, Gianluca (A)
Instituto de Estructura de la Materia
2018-07-26 – 2018-07-27

Levinson, Amir (A)
Tel Aviv University
2018-08-01 – 2018-08-29

Yamanaka, Masato (E)
Kyushu Sangyo University
2018-08-08 – 2018-08-08

Sari, Re ' em (A)
The Hebrew University of Jerusalem
2018-08-17 – 2018-08-19

Heller, Michal P. (E)
the Albert Einstein Institute
2018-08-21 – 2018-08-28

Ito, Hirotaka (A)
RIKEN
2018-08-21 – 2018-08-27

Wanajo, Shinya (A)
Sophia University
2018-08-23 – 2018-08-25

Okumura, Teppei (A)
Academia Sinica Institute of Astronomy and Astrophysics
2018-08-28 – 2018-08-31

Sago, Norichika (A)
Kyushu University
2018-08-28 – 2018-09-07

Tsujikawa, Shinji (A)
Tokyo Rika Daigaku
2018-09-01 – 2018-09-14

Akal, Ibrahim (E)
University of Hamburg
2018-09-01 – 2018-09-18

Sperhake, Ulrich (A)
Univ. of Cambridge
2018-09-01 – 2018-09-14

Herdeiro, Carlos (A)
Univ. of Aveiro
2018-09-01 – 2018-09-14

Simon, Joan (E)
University of Edinburgh
2018-09-02 – 2018-09-22

Tenkanen, Tommi (A)
Queen Mary University of London
2018-09-03 – 2018-09-07

Garcia-Saenz, Sebastian (A)
Institute of Astrophysics in Paris
2018-09-03 – 2018-09-06

Aoki, Katsuki (A)
Waseda University
2018-09-03 – 2018-09-06

Ishibashi, Akihiro (A)
Kindai Univ.
2018-09-03 – 2018-09-14

Umeya, Atsushi (N)
Nippn Institute of Technology
2018-09-04 – 2018-09-05

Himemoto, Yoshiaki (A)
Nihon Univ.
2018-09-05 – 2018-09-07

Goldenfeld, Nigel (C)
NASA Astrobiology Institute for Universal Biology at UIUC
2018-09-05 – 2018-09-07

Cardoso, Vitor (A)
CENTRA/IST, Univ. of Lisbon
2018-09-05 – 2018-09-19

Lagger, Cyril (A)
The University of Sydney
2018-09-08 – 2018-09-11

Sfakianakis, Evangelos (A)
Nikhef
2018-09-09 – 2018-09-14

Heinrich, Chen (A)
Jet Propulsion Laboratory, California Institute of Technology
2018-09-11 – 2018-09-14

Fialkov, Anastasia (A)
Inst. for heory and Computation (ITC), Harvard Univ.
2018-09-13 – 2018-09-14

Nishimichi, Takahiro (A)
Kavli IPMU, U. of Tokyo
2018-09-27 – 2018-09-28

Kobayashi, Ryohei (C)
The Institute for Solid State Physics, The University of Tokyo
2018-10-01 – 2018-10-31

Okuyama, Kazumi (E)
Shinshu University
2018-10-05 – 2018-10-06

Hohenegger, Johann (C)
University of Vienna
2018-10-08 – 2018-11-25

Rijken, Thomas A. (N)
Radboud University of Nijmegen
2018-10-08 – 2018-10-17

Shimada, Keigo (A)
Waseda University
2018-10-09 – 2018-10-10

Gudapati, Nishanth (A)
Yale University
2018-10-13 – 2018-10-23

Mazumdar, Anupam (A)
University of Groningen
2018-10-15 – 2018-10-16

Senovilla, Jose M. M. (A)
The University of the Basque Country, Bilbao
2018-10-28 – 2018-11-02

Wiseman, Toby (A)
Imperial College of London
2018-10-28 – 2018-11-02

Kyutoku, Koutarou (A)
KEK
2018-10-28 – 2018-10-30

de Boer, Jorrit (C)
University of Twente
2018-11-01 – 2018-11-17

Kawaguchi, Kyohei (A)
Univ. of Tokyo
2018-11-01 – 2018-11-02

Gal, Avraham (N)
Racah Institute of Physics, Hebrew University
2018-11-05 – 2018-11-10

Arumugam, Paramasivan (N)
Indian Institute of Technology Roorkee
2018-11-06 – 2018-11-15

Mota, David F. (A)
University of Oslo
2018-11-09 – 2018-11-15

Uzan, Jean-Philippe (A)
Institut d ' Astrophysique de Paris
2018-11-09 – 2018-11-15

Roesch, Henri (A)
Columbia University
2018-11-10 – 2018-11-20

Alexander, Rafael (Q)
University of New Mexico
2018-11-11 – 2018-11-18

Nozaki, Masahiro (E)
RIKEN
2018-11-18 – 2018-12-16

Nielsen, Holger Bech (E)
Niels Bohr Institute
2018-11-26 – 2018-12-10

Kawabata, Kohei (C)
University of Tokyo
2018-11-26 – 2018-11-30

Vretenar, Dario (N)
Zagreb University
2018-11-28 – 2018-12-03

Creminelli, Paolo (A)
ICTP, Trieste
2018-11-28 – 2018-11-30

Meissner, Krzysztof (A)
University of Warsaw
2018-11-28 – 2018-11-28

Monnai, Akihiko (N)
KEK
2018-11-29 – 2018-11-30

Monsalve, Raul (A)
McGill University
2018-12-01 – 2018-12-03

Riegler, Max (E)
UniversitÃl' libre de Bruxelles
2018-12-07 – 2018-12-14

Furusawa, Takuya (C)
Tokyo Institute of Technology
2018-12-09 – 2018-12-14

Huang, Yu-tin (E)
National Taiwan University
2018-12-10 – 2018-12-14

Copinger, Patrick (N)
University of Tokyo
2018-12-17 – 2018-12-19

Wanajo, Shinya (A)
Max Planck Institute for Gravitational Physics
2018-12-17 – 2018-12-28

Qi, Chong (N)
Royal Institute of Technology (KTH)
2018-12-18 – 2019-01-09

Fujibayashi, Sho (A)
Max Planck Institute for Gravitational Physics
2018-12-18 – 2019-01-10

Contessi, Lorenzo (N)
the Hebrew University of Jerusalem
2018-12-19 – 2018-12-21

Jaubert, Ludovic (C)
University of Bordeaux
2018-12-20 – 2018-12-21

Mai, Zhanfeng (A)
Tianjin University
2018-12-25 – 2018-12-30

Descouvemont, Pierre (N)
Universite Libre de Bruxelles
2018-12-28 – 2019-04-13

Kiuchi,Kenta (A)
Max Planck Institute for Gravitational Physics (Albert Einstein Instuiture)
2019-01-01 – 2019-03-31

Hatta, Yoshitaka (N)
Brookhaven National Laboratory (BNL)
2019-01-04 – 2019-01-23

Lin, Haoxiang (A)
University of Tokyo
2019-01-06 – 2019-01-08

Namba, Ryo (A)
McGill University
2019-01-07 – 2019-01-09

Namikawa, Toshiya (A)
LeCoSPA, National Taiwan Univ.
2019-01-07 – 2019-01-11

Kashiyama, Kazumi (A)
RESCEU, University of Tokyo
2019-01-10 – 2019-01-12

Zafrir, Gabi (E)
Kavli IPMU, U. of Tokyo
2019-01-10 – 2019-01-12

Moon, Eun-Gook (C)
KAIST
2019-01-15 – 2019-01-16

Kulkarni, Shri (A)
California Institute of Technology
2019-01-17 – 2019-01-17

Hirano, Shinji (E)
University of the Witwatersrand
2019-01-21 – 2019-01-24

Mezey, Pal G. (C)
Memorial University of New Foundland
2019-01-21 – 2019-02-28

Chung, Ming-Chiang (C)
National Chung Hsing University
2019-01-27 – 2019-02-01

Sudoh, Takahiro (A)
University of Tokyo
2019-01-28 – 2019-01-30

Tanabe, Takahiro (C)
Meiji Institute for Advanced Study of Mathematical Sciences, Meiji U.
2019-01-28 – 2019-02-01

Tsujimoto, Takuji (A)
NAOJ
2019-01-28 – 2019-02-01

Gong, Zongping (C)
University of Tokyo
2019-01-30 – 2019-02-01

Camargo, Hugo A. (E)
Max Planck Institute for Gravitational Physics (Albert Einstein Institute)
2019-02-02 – 2019-02-23

Kawabata, Kohei (C)
University of Tokyo
2019-02-04 – 2019-02-28

Takada, Satoshi (C)
Earthquake Research Inst., U. of Tokyo
2019-02-08 – 2019-02-20

Trevisan, Cynthia (C)
California State University, Maritime Academy
2019-02-11 – 2019-02-16

Guo, Feng-Kun (N)
Institute of Theoretical Physics, CAS
2019-02-12 – 2019-02-15

Lee, Jae Woo (C)
Inha University
2019-02-12 – 2019-02-16

Saitoh, Kuniyasu (C)
Tohoku University
2019-02-12 – 2019-02-22

Oyama, Norihiro (C)
AIST-TohokuU Mathematics for Advanced Materials-Open Innovation Laboratory
2019-02-12 – 2019-02-15

Kobayashi, Nozomu (E)
Kavli IPMU, U. of Tokyo
2019-02-13 – 2019-02-15

Kobayashi, Ryohei (C)
ISSP, The University of Tokyo
2019-02-18 – 2019-02-28

Osato, Ken (A)
University of Tokyo
2019-02-19 – 2019-02-21

Kashiwa, Kouji (N)
Fukuoka Institute of Technology
2019-02-19 – 2019-02-21

Rasera, Yann (A)
Paris Diderot-Paris 7 University
2019-02-20 – 2019-03-01

Breton, Michel-Andes (A)
Laboratoire d'Astrophysique de Marseille
2019-02-20 – 2019-03-01

Jia, Yu (A)
Institute of High Energy Physics, CAS
2019-02-20 – 2019-02-22

Hidaka, Yoshimasa (N)
RIKEN
2019-02-21 – 2019-02-27

Takahashi, Toru (N)
National Institute of Technology, Gunma College
2019-02-22 – 2019-02-22

Chakraborty, Soumangsu Bhusan (E)
Hebrew University of Jerusalem
2019-02-28 – 2019-03-02

Sferrazza, Michele (N)
Universite Libre de Bruxelles
2019-02-28 – 2019-03-01

Volkov, Mikhail (A)
University of Tours
2019-03-01 – 2019-03-25

Kondo, Kei-Ichi (E)
Chiba University
2019-03-01 – 2019-03-09

Riegler, Robert Max (E)
UniversitÃl' libre de Bruxelles
2019-03-01 – 2019-04-25

Bonzom, Valentin (E)
UniversitÃl' Paris 13
2019-03-03 – 2019-03-13

Hamazaki, Ryusuke (C)
University of Tokyo
2019-03-07 – 2019-03-11

Hotokezaka, Kenta (A)
Princeton University
2019-03-11 – 2019-03-22

Sato, Naomiki (C)

2019-03-12 – 2019-03-15

Balog, János (E)
Wigner Research Centre for Physics
2019-03-15 – 2019-03-31

Gheorghiu, Alexandru (Q)
California Institute of Technology
2019-03-16 – 2019-03-23

Kato, Kohtaro (Q)
California Institute of Technology
2019-03-16 – 2019-03-22

Wu, Meng-Ru (A)
Institute of Physics, Academia Sinica
2019-03-17 – 2019-03-30

Hsieh, Min-Hsiu (Q)
University of Technology Sydney
2019-03-17 – 2019-03-23

Salehian, Borna (Q)
Institute for Research in Fundamental Science, Tehran
2019-03-17 – 2019-04-16

Masuda, Kento (A)
Princeton University
2019-03-18 – 2019-03-23

Aoki, Katsuki (A)
Waseda University
2019-03-18 – 2019-03-31

Lee, Su Houng (N)
Yonsei University
2019-03-24 – 2019-04-06

Angus, Stephen (A)
Ewha Woman ' s University
2019-03-25 – 2019-03-30

Akagi, Yutaka (C)
University of Tokyo
2019-03-25 – 2019-03-29

Kobayashi, Yosuke (A)
Kavli IPMU, University of Tokyo
2019-03-25 – 2019-03-29

Kurita, Toshiki (A)
Kavli IPMU, University of Tokyo
2019-03-25 – 2019-03-29

Masaki, Shogo (A)
National Institute of Technology, Suzuka College
2019-03-27 – 2019-03-28

Kobayashi, Yosuke (A)
Kavli IPMU, University of Tokyo
2019-03-29 – 2019-04-26

2.5 Highlighted Papers

1. Selected Researches in Annual Meeting 2018 of the Japan Society of Fluid Mechanics.
   "Shear jamming, discontinuous shear thickening, and fragile state in dry granularmaterials under oscillatory shear"
   Otsuki, M. & Hayakawa, H
   arXiv:1810.03846

2.6 Awards

1. Prof. Hiroshi Kunitomo was awarded 1st "Physics Academy Award of Tokyo University of Science" for his paper "Complete action for open superstring field theory" .

2. Prof. Yuichiro Sekiguchi (Toho Univ./CGP at YITP/ex-Research Assistant Professor at YITP) has been selected as the winner of the Yukawa-Kimura Prize 2018 for his achievement on "Numerical-relativity simulation of binary neutron star mergers with realistic microphysics".

3. Dr. Kenta Hotokezaka, Dr. Hiroaki Matsunaga, Dr. Takashi Okada, Dr. Tomonori Ugajin and Dr. Tomohiko Sano won the Young Scientist Award of the Physical Society of Japan 2019.

   *Dr. Kenta Hotokezaka
   "Theoretical studies on electromagnetic counterparts to binary neutron star mergers"

   *Hiroaki Matsunaga
   "Proposals of string field theory for the NS-NS sector in type II superstring theory"

   *Takashi Okada
   "Discovery of the buffer structures of chemical-reaction networks based on their topology and applications to biological networks"

   *Tomonori Ugajin
   "Studies on relative entropy of excited states and modular Hamiltonians in conformal field theories"

   *Tomohiko Sano
   "Theoretical and experimental studies on litheness of a structure -friction, buckling and snap-through buckling"

4. Prof. Masaru Shibata was awarded the 2018 Nishina Memorial Prize for "Study of binary neutron star mergers by numerical relativity simulations".

5. Tomoyuki Morimae was awarded the 2018 Okawa publications prize.

6. Prof. Hisao Hayakawa has been selected to PTEP Special Award.

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 2018.

Yukawa International Seminar (YKIS2018b)

YKIS2018b : Recent Developments in Quark-Hadron Sciences

June 11 - June 15, 2018, Chaired by Akira OhnishiShinji Mukohyama, 99 participants (39 from abroad)

For details, see http://www2.yukawa.kyoto-u.ac.jp/˜nfqcd2018/YKIS/index.php

Nishinomiya-Yukawa Symposium 2018

Long-term and Nishinomiya-Yukawa Memorial International Workshop on "New Frontiers in String Theory 2018"

June 2 - August 3, 2018, Chaired by Shigeki Sugimoto, 217 participants (96 from abroad)

For details, see http://www2.yukawa.kyoto-u.ac.jp/˜nfst2018/index.php

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.

▷ 2018.4.1 — 2019.3.31

Here is the list of workshops with the dates, the names of organizers, the number of participants.

YITP-W-18-01
Novel order phases and superconductivity driven by strongly correlation: topology, liquid crystal states, and dynamics , May 7 - May 9
H.Kontani, Y.Yanase, M.Sato, H.Ikeda, Y.Ono, R.Arita, K.Kuroki, T.Tohyama, Y.Matsuda. *91-participants*

YITP-W-18-02
The 48th Summer School on Astronomy and Astrophysics , Jul.22 - Jul.25
T.Okumura, K.Higuchi, M.Kawabata, N.Koide, T.Omura, T.Tanaka, T.Nakaoka, K.Kurahara, M.Nashimoto, H.Sakemi, Y.Matsushita, T.Ogihara, R.Matsukoba. *324-participants*

YITP-W-18-03
63rd Condensed Matter Physics Summer School, Jul.24 - Jul.28
K.Shibata, K.K.Huguenin, M.Tokunaga, H.Koushiro, S.Nakade, K.Kubo, Y.Nakahira, S.Shimono, J.Tsutsumi, T.Ichimura, K.Kawaguchi, T.Maruishi, K.Miura. *202-participants*

YITP-W-18-04
YONUPA Summer School, Aug.6 - Aug.11
N.Kan, K.Ikeda, K.Hatakeyama, M.Honda, T.Kaneko, K.Hasegawa, I.Ueba, H.Matsuda, K.Matsuura, S.Imanish. *246-participants*

YITP-W-18-05
Progress in Particle Physics 2018, Aug.6 - Aug.10
M.Ibe, Y.Omura, M.Senami, F.Takayama, KTsumura, K.Nakayama, T.Higaki, H.Fukaya, S.Matsuzaki, S.Mishima. *113-participants*

YITP-W-18-06
The 58th Summer School of Young Researchers Society for Biophysics, Aug.27 - Aug.30
M.Yamauchi, M.Shimizu, T.Iida, T.Hayashi, R.Yogo, M.Mitsumoto, Y.Yamauchi, M.Tomida. *95-participants*

YITP-W-18-07
AQIS satellite workshop on quantum computing, Sep.13
T.Morimae, K.Fujii, M.Negoro. *38-participants*

YITP-W-18-08
Threshold Rule 50, Oct.3 - Oct.5
N.Itagaki, Y.Kanada-En'yo, K.Ogata, M.Kimura, T.Nakamura, K.Hagino, E.Hiyama, T.Hyodo, T.Myo. *50-participants*

YITP-W-18-09
Frontiers in Physics of Spin Systems, Oct.31 - Nov.2
T.Sakai, K.Totsuka, M.Oshikawa, N.Kawashima, H.Tanaka, H.Tsunetsugu, S.Todo, H.Nojiri, Z.Hiroi, Y.Motome, T.Momoi . *112-participants*

YITP-W-18-10
The 31st Rironkon symposium on "Standard model in astrophysics: reconsideration for the future", Dec.19 - Dec.21
Y.Sendouda, K.Toma, K.Ohsuga, T.Takiwaki, K.Asano, T.Suzuki, H.Saida, T.Inoue, K.Ichiki, Y.Suwa, R.Fujita, K.Kiuchi, S.Saga, K.Takahashi, A.Taruya, N.Nishimura. *166-participants*

YITP-W-18-11
Jet and Shock Breakouts in Cosmic Transients, May 14 - May 18
K.Ioka, K.Takahashi, M.Shibata, K.Kiuchi, Y.Suwa, T.Tanaka. *38-participants*

YITP-W-18-12
The Second annual symposium of the innovative area "Gravitational Wave Physics and Astronomy: Genesis", Nov.26 - Nov.28
K.Ioka, K.Omukai, N.Kawai, K.Kiuchi, K.Kotake, H.Tagoshi, T.Tanaka, M.Vagins, T.Hosokawa, S.Mukohyama, M.Yoshida. *121-participants*

YITP-W-18-13
Physics of Nonequilibrium Systems − Hierarchy and Universality −, Dec.26 - Dec.28
M.Hongo,Y.Hidaka, K.Saito. *103-participants*

YITP-W-18-14
Recent advances in nuclear structure physics 2018 (RANSP2018), Nov.29 - Dec.3
T.Abe, N.Hinohara, W.Horiuchi, N.Itagaki, K.Yoshida. *42-participants*

YITP-W-18-15
The 3rd Workshop on Gravity and Cosmology by Young Researchers , Feb.27 - Mar.1
K.Ogasawara, R.Kase, T.Takiwaki, K.Yamada. *41-participants*

YITP-W-18-16
Accelerating Universe in the Dark , Mar.3 - Mar 8
N.Sugiyama, S.Nojiri, K.Ichiki, M.Takada, H.Murayama, M.Sasaki, T.Sunayama, S.Yokoyama, A.Taruya, S.Mukohyama. *157-participants*

YITP-W-18-17
Physics of Jammed Matter , Oct.26 - Oct.27
H.Hayakawa, M.Otsuki, K.Saitoh, T.Kawasaki, S.Takada. *32-participants*

3.3 Regional Schools supported by YITP

▷ 2018.4.1—2019.3.31

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-18-01
46th Hokuriku Spring School, Sep.22 - Sep.24, K.Tsumura (Kyoto Univ.), M.Sato (Kyoto Univ.).
Niigata Univ., Kanazawa Univ., Kinjo Univ., Fukui Univ., Jouetsu Univ. of Edu., Shishu Univ

YITP-S-18-02
Chubu Summer School 2018, Sep.5 - Sep.8, M.Hongo (RIKEN).
Tokai Univ., Shizuoka Univ.,Shinshu Univ., Univ. of Shizuoka

YITP-S-18-03
The 23rd Niigata-Yamagata joint school, Oct. 19 - Oct.21, S.Takeda (Kanazawa Univ.).
Niigata Univ., Yamagata Univ., Akita Univ., Tohoku Univ.

YITP-S-18-04
Nuclear Theory Group Workshop in Hokkaido Region, Nov. 19 - Nov.21, T.Fukahori (JAEA), N.Iwamoto (JAEA), S.Chiba (TITech), H.Masui (Kitami IT).
Hokkaido Univ., Kitami IT, Hokusei Gakuen Univ.

YITP-S-18-05
The 41st Shikoku-seminar on Particle and Nuclear Physics, Dec.1 - Dec.2, Y. Kikukawa (Tokyo Univ.).
Ehime Univ., Kochi Univ., Anan Col.

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

October 21, 2018
Physics and the Universe VI,

Mikio Kurita (DPA)
"3.8-meter Telescope SEIMEI –First Segmented Mirror Telescope in Japan–" [1]
Masafumi Fukuma(DPA)
"What is "Quantization of Gravity" – An Unsolved Problem in Theoretical Particle Physics –" [1]
Koichiro Tanaka (DPA)
"Exploring Condensed Matters with Spectroscopes. -Frontiers in Optical Sciences-", [1]

4.2 Other outreach activities

August 24, 2018
Prof. Kenta Kiuchi in our institute gave a lecture talk at Japan Association of Chemical Sensors Meeting 2018.

December 23, 2018
Prof. Tadashi Takayanagi gave a public lecture at JPS Osaka Symposium "Chasing Stephen Hawking's Dream''.

[1] The original titles of these lectures are given in Japanese. They are translated in English by our responsibility.