



2016 NCTS *Physics* ANNUAL REPORT



National Center for Theoretical Sciences

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ABOUT

The National Center for Theoretical Sciences was established on August 1997 by the National Science Council, NCS (NCS became Ministry of Science and Technology, MoST, since March 2014), with strong endorsement from some of the eminent scholars, including Professors Chen Ning Yang and Shing-Tung Yau. It is hosted on the campus of the National Tsing Hua University, Hsinchu, with National Tsing Hua University and the adjacent National Chiao Tung University acted as co-host in the last 18 years. The Center consists of two divisions: Mathematics and Theoretical Physics.

The Physics Division, are committed to contribute to the advancement of frontier research in physics.

Missions

To act as an effective platform to stimulate and to enhance the interaction and collaboration among researchers.

To empower talented students and postdoctoral researchers to make significant contributions in the frontier of research subjects.

To serve as an efficacious channel to network the home researchers with other scholars and preeminent institutions abroad.

To explore new frontiers in physics research and innovation

To enhance the extent and breadth of interdisciplinary researches as well as the collaboration with scientists in the experimental fields.



Forward

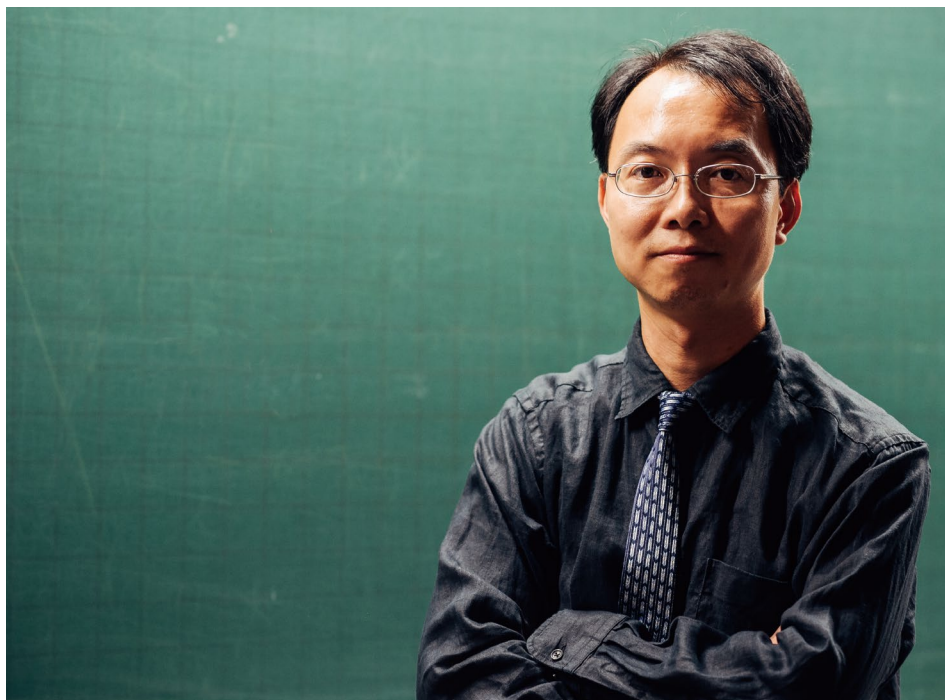
NCTS was founded in 1997 with the mission to contribute to the advancement of frontier research in mathematics, physics and interdisciplinary subjects. A new structure and operation of the center was launched in 2015 and it is hard to believe that two years have already past. In the last two years, the Physics division of NCTS has been operating its academic programs and activities with the goals to act as an effective platform to stimulate and to enhance the interaction and collaboration among researchers; to empower talented students and postdoctoral researchers to make significant contributions in the frontier of research subjects; to serve as an efficacious channel to network the home researchers with other scholars and preeminent institutions abroad; and to explore new frontiers in physics research and innovation, and to enhance the extent and breadth of interdisciplinary researches as well as the collaboration with scientists in the experimental fields.

NCTS published over 100 papers in 2016, with some high impacts results appearing in prestigious journals such as nano Letters, Nature Communications, Physical Review Letters, 2d Materials etc. NCTS scientists have made significant contribution in areas from such as pentaquark, 750 GeV diboson anomaly, core-cusp problem of the dark matter, holography of de Sitter space, unconventional soft limits for spacetime symmetry breaking in high energy physics, to quantum quenches in Luttinger model, emergence of Dirac semi-metallic phase at finite temperature, lattice instabilities and conductive interface, metallic quantum solid in system of cold atoms in condensed matter physics, as well as quantum steering and measurement characterization in quantum information theory and abnormal polymer transport in crowded media in soft matters and complex system.

NCTS has played active role in promoting interaction and collaboration within the Taiwanese physics community and with researchers worldwide. We have hosted 291 visiting scientists from abroad, 25 international conferences and workshops, with six joint meetings with institutions from other countries. Particularly worth mentioning is the organization of the NCTS Annual Meeting, with a component in high energy physics and a component in condensed matter theory. Last year, a special open forum on the Future Experiments in High Energy Physics was organized within the annual meeting. The panel speakers include Nima Arkani-Hamed, Kam-Biu Luk, Komamiya Sachio, chair of the linear collider board and Yifang Wang, leader of the China's CEPC-SppC experiment. This year, a Public Talk "What is Nonlocality" by Sandu Popescu, on Quantum Information is planned.

The body of research fellows of NCTS has grown significantly. It has now a body of 21 research staffs consisting of 5 assistant research scholars. All of them were hired anew since 2015. The quality of the hires is good: two of the earliest we hired have already secured job after their term at NCTS. Dr Chung-Chi Lee will join the cosmology group at DAMTP, Cambridge as a Newton International Fellow in 2017 spring, and Dr Carlos Cardona will join Niels Bohr in Copenhagen in 2017 summer. We wish them a bright future.

NCTS has continued in developing new bilateral agreements with other international institutions in order to foster scientific collaboration. We have built since 2015 new bilateral agreements with the Institute of Basic Science - Center for Theoretical Physics of the Universe, Korea; the



Institute of High Energy Physics, the Chinese Academy of Sciences, Beijing; the Donostia International Physics Center, San Sebastian, Spain; Vilnius University, Lithuania, with plans to organize joint conferences and to work together on collaborative research projects. NCTS has joined the research network, Fundamental Interaction SpaceTime (FIST). FIST is a High Physics network formed by Research Institutions (primarily) in Asia in order to help building up and strengthening transnational research partnership and cooperation among researchers across Asia. NCTS has also joined the EU network Cooperation in Science and Technology (COST) on "Quantum structure of spacetime (QSPACE)". On personal side, I would like to congratulate Professor Kingman Cheung for receiving the Outstanding Research Award of the year 2015 from the Ministry of Science and Technology and Professor Xiao-Gang He for being elected Fellow of the American Physical Society.

NCTS will be 20 years old next year August. In the past 20 years, NCTS has made significant contribution in shaping the research of theoretical physics and building up of the community in Taiwan. It has also served as an effective network the home researchers with scholars and preeminent institutions abroad. We are planning to have a number of activities throughout the year to celebrate the anniversary. In particular there will be a 20th anniversary celebration meeting of NCTS on August 2-3, 2017. We cordially invite you to participate and help to make it a memorable event.

Chu Chong Sun

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2016

Structure and Governance

Operation and Management

The center director is responsible for all the decisions of the Center. The director leads the Academic Executive Committee, and is responsible for the decision making for the operation inside the division. The Executive Director is appointed by the Director to assist him/her in implementing policies and operations of the Center. As an academic, he/she also held a vital role in helping to push the center's academic programs and initiatives. The center routine and daily operation is carried out by the center administrative team which consists of six administrative staff, an accountant and an IT staff. The center submits an annual report, with financial statements to the Ministry of Science and Technology (MoST), usually in October of the year. A grant midterm review is conducted in

MoST in December to discuss the annual budget for the following year.

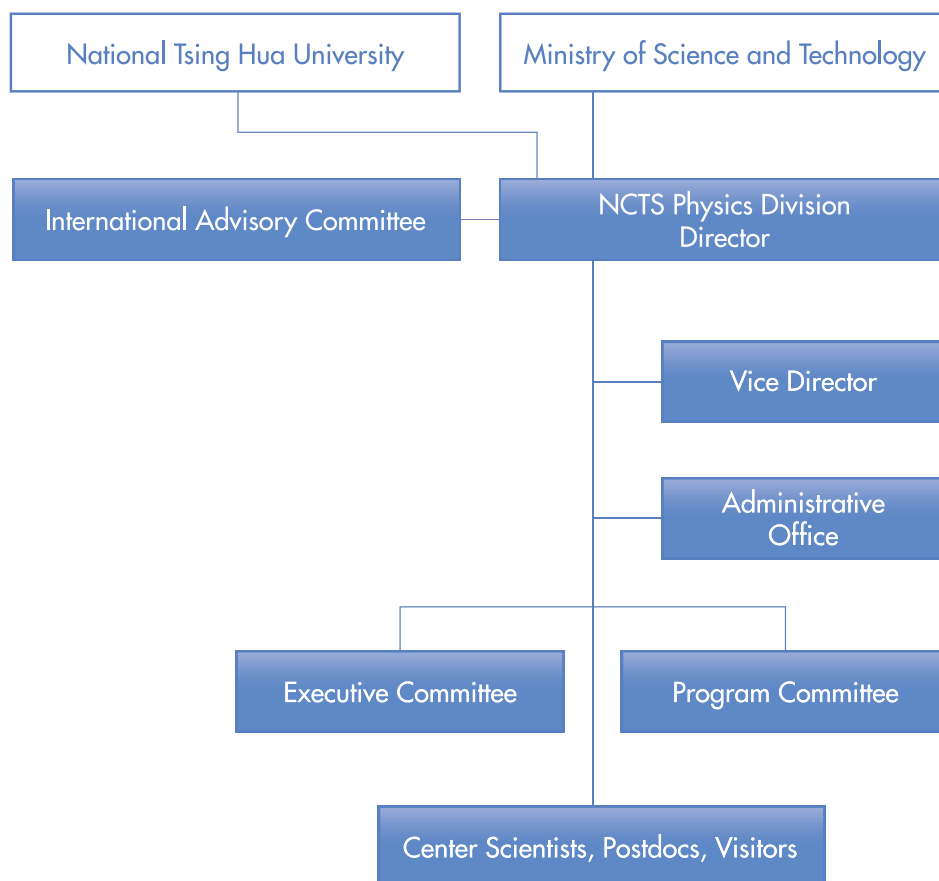
The Center Academic Executive Committee is set up by the Director to help the Director to make decision on the scientific personnel and academic matters. For example, to give advice on the general policies and guidelines for the NCTS scientific activities and financial affairs, and to give recommendations to the director on the appointment of the NCTS scientific personnel. The committee meets four times a year. The Program Committee is comprised of the coordinators of the academic research groups (Thematic research groups, Experimental collaboration group, interdisciplinary research groups) advanced by the center.

International Advisory Committee

Carlo Beenakker	Instituut-Lorentz for Theoretical Physics, Leiden University, Netherlands
Tohru Eguchi	Department of Physics and Institute of Theoretical Physics, Rikkyo University, Tokyo; Former director of the Yukawa Institute for Theoretical Physics, Japan
Antoine Georges	Director of the Simons Center for Computational Quantum Physics, USA
Tao Han	Director of the Pittsburgh Particle Physics, Astrophysics, and Cosmology Center, University of Pittsburgh, USA
Steven G. Louie	University of California at Berkeley USA
Allan H. Macdonald	Sid W. Richardson Foundation Regents Chair; Professor of Physics, University of Texas, Austin, USA
Henry Tye	Former director of the Institute for Advanced Study, Hong Kong University of Science and Technology, Hong Kong



Organization



Group picture of NCTS Annual Theory Meeting 2016: Particles, Cosmology and String, December 6-9, 2016

Major Academic Program

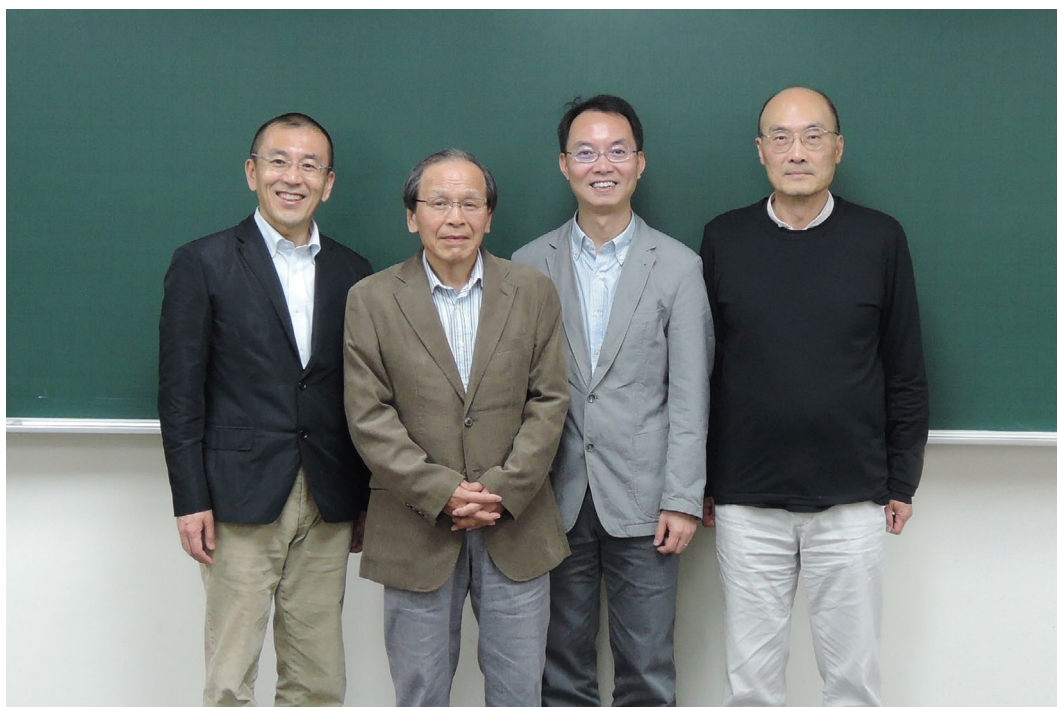
Thematic Groups Research Program

The research program of Thematic Groups (TG) aims to encourage and enhance the collaboration and innovation of the larger community. The primary goal of TG is to generate an effective collaborative environment in the community. An open call of proposals was made in January 2015. Fourteen applications were received. Nine TGs were selected by the EC and an annual budget of about 9M NTD were allocated. The subject theme of the TGs as well as their coordinators are listed in the table below.

Experimental Collaboration and InterDisciplinary Research Program

The Experimental Collaboration Program (ECP) and the InterDisciplinary Research Program (IDP) were introduced in the Phase IV operation of NCTS. In these programs, the role of NCTS is to act as an effective platform to bring together researchers with complementary scientific approaches and backgrounds so that a closer cooperation and collaboration of researchers could be fostered.

The choice of topics was made following the consensus reached after a community wide consultation conducted in April 2014, and the groups were invited by the director, after taken into accounts of suggestions from the EC and from the community. The groups supported in the year 2015 and 2016 are listed in the tables below.



NCTS Distinguished Lecturer Series.

(From left) Director Hiroshi Ooguri (Walter Burke Institute for theoretical Physics), Professor Takeo Inami (NTU), Director Chong-Sun Chu (NCTS), Prof Bei-Lok Hu (u Mariland), November 22-24, 2016.

Thematic Groups

TG	PROGRAM TITLE	COORDINATORS
TG1	Particle Physics	Cheng-Wei Chiang (NTU)
TG2	Dark Physics of the Universe	Chao-Qiang Geng (NTHU)
TG3	Strings	Kazuo Hosomichi (NTU)
TG4	Topology Entanglement in Quantum Many-Body Systems	Ying-Jer Kao (NTU)
TG5	Complex Systems	Chun-Chung Chen (AS), Hsuan-Yi Chen (NCU)
TG6	Quantum Information Science and Quantum Control	Hsi-Sheng Goan (NTU), Yueh-Nan Chen (NCKU)
TG7	Quantum Gases	Ray-Kuang Lee (NTHU)
TG8	Topology & Strong Correlations in Quantum Many-Body Systems	Chung-Hou Chung (NCTU)
TG9	New Quantum Materials and Transport	Yu-Chan Chen (NCTU)

Supported Groups of the Experimental Collaboration Program

ECP	PROGRAM TITLE	COORDINATORS
E1	Quantum Optics and Quantum Manipulation of Ultracold Atoms	Ying-Cheng Chen (IAMS)
E2	Low-D Emergent Quantum Matters and Beyond CMOS Devices	Raynien Kwo (NTHU)
E3	LHC Experimental/Theoretical Exploration	Shih-Chang Lee (AS), Kingman Cheung (NTHU), Jennifer Hsu (NTHU)
E4	Light Dark Matter	Cheng-Pang Liu (NDHU)

Supported Groups of the Interdisciplinary Program

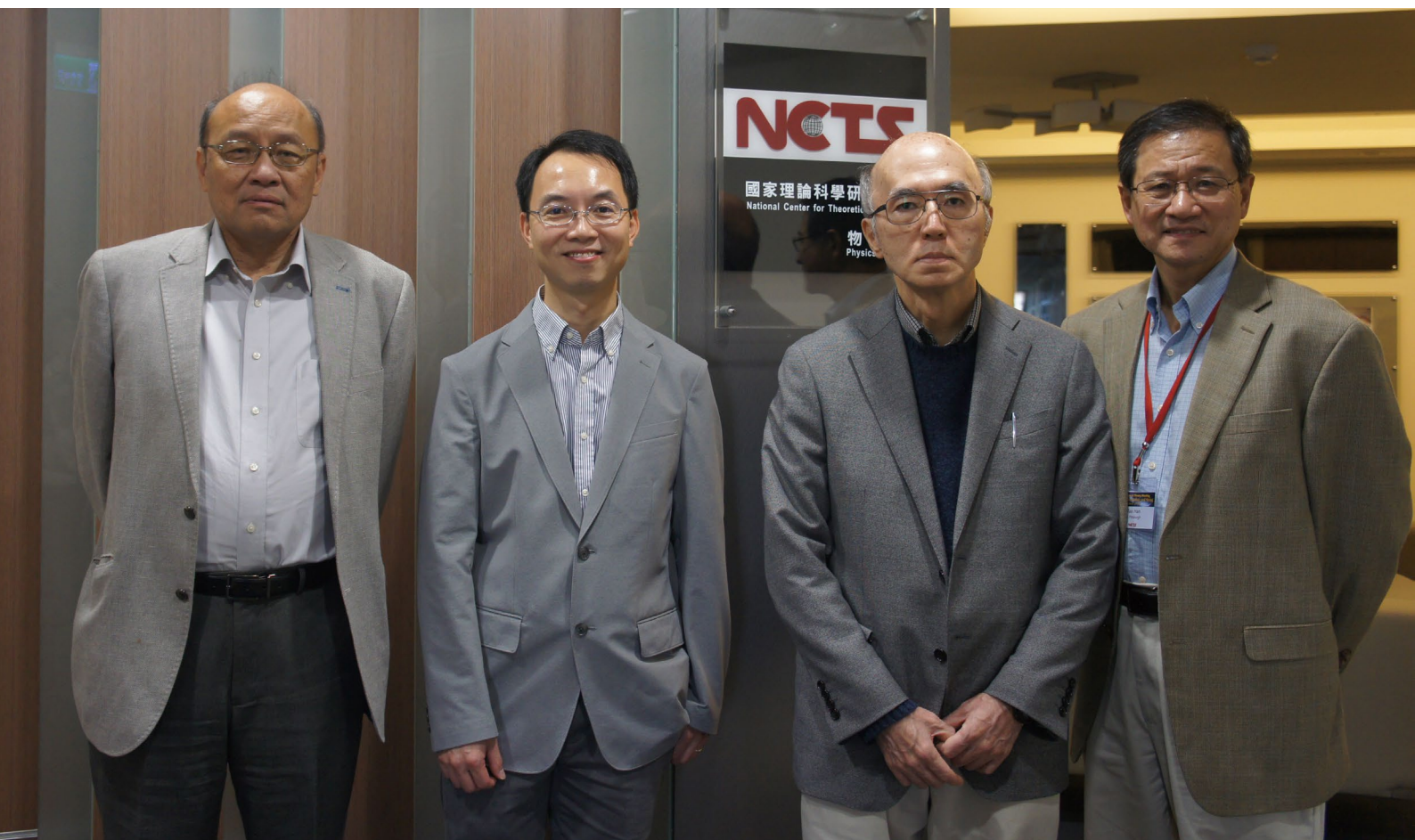
IDP	PROGRAM TITLE	COORDINATORS
I1	Multiscale studies for complex materials, catalysts, and biological systems – theoretical and computational approaches, and experimental stimulus	Chao-Ping Hsu (AS)
I2	Information for Big Data Analysis and Complex Systems	Ming-Chya Wu (NCU)
I3	Complex Systems and Mathematical Biology	Chen-Hsiang Yeang (Inst Stat. Sci, AS)
I4	Geometry, Topology and String Theory	Nan-Kuo Ho (NTHU), Siye Wu (NTHU)

Report from the International Advisory Committee

"The Physics Division of NCTS is gaining international recognition rapidly."

International Advisory Committee Visiting Report

During Dec. 6 - 9, 2016, three members of the International Advisory Committee, Profs. Tohru Eguchi, Tao Han, and Henry Tye participated in the NCTS Annual Theory Meeting, and attended International Advisory Committee Meeting on Dec. 10. After extensive discussions with Director Prof. Chong-Sun Chu and the other NCTS members, and listening to the presentations by the Distinguished Center Scientists (DCS) and the Thematic Group coordinators, we would like to provide the following report for record.



(From left) Prof. Henry Tye (IAS HKUST), Director Chong-Sun Chu, Tohru Eguchi (Rikkyo) and Tao Han (U Pittsburgh) after International Advisory Committee Meeting on Dec 10, 2016.

Findings

The committee members found that the NCTS physics division carried out the missions effectively, and they reached the midterm goals since the re-structuring of the NCTS in 2015. The NCTS members, including the DCS, Center Scientists (CS), postdocs and students conducted active research. They have been prolific and the publications are of high quality in general. Collectively, the physics division of NCTS is gaining international recognition rapidly. The senior members guided and trained the postdocs and students well, and helped to place them to appropriate positions in the career development. The NCTS served the community well and organized a whole array of conferences, workshops and schools. They also hosted a large number of international visitors and formed effective collaborations. NCTS has efficiently used its research funding resources.

Comments and suggestions

The committee members noted the crucial importance of the leading roles played by the DCS and CS in research and activities. A question was raised on how to optimally reappoint the DCS. If the renewals of DCS appointments are decided in the 3rd (final) year, they will not be able to attract high quality postdocs towards the end of 2nd year since funding is not assured for the postdocs beyond one year. This uncertainty is not healthy for NCTS. In addition, it will be difficult for the DCS to plan some of the future activities. One possibility to handle this issue is to implement the "rolling appointment" scheme. That is, every year a DCS appointment will be extended for a year, provided performance is satisfactory. So a DCS will continue to have a 3 year appointment until the time when an in-depth review is appropriate. Recruiting new DCSs is clearly necessary in the long run. It may be necessary to set an appropriate time limit for each DCS appointment.

The committee members praised the efforts for the lively international activities. The committee recognized that the center is already


spending efforts in these directions, such as the organization of the Annual Theory Meeting, or the initiation of the recently established Asian Research Network on High Energy Theory. To further increase the Center's international impact and stature, some possible adjustments for organizing conferences were discussed. One suggestion was to join hands with the well-established international conference series and attracted those meetings to NCTS in rotation. The committee also emphasized the importance to develop a "brand-named" (or "trademark") conference by NCTS.

The committee members and the NCTS members discussed the issues of possible enhancement of interdisciplinary research within and beyond the current research activities. We recommended that NCTS may make a more focused selection on the interdisciplinary topics where NCTS scientists can play a more prominent role so that the center can drive and push the interdisciplinary collaboration more effectively.

The committee members learned the budget reduction for NCTS for the years to come, and showed concerns for the potential damage on the vibrant programs conducted at NCTS. This should be avoided in whichever way possible as stability of funding is of utmost importance to the planning and implementation of programs of any center and institution.

International Advisory Committee Members:

Tohru Eguchi (Rikkyo)



Tao Han (U Pittsburgh)



Henry Tye (IAS HKUST)



Date: December 10, 2016

PERSONNEL

Director Office



Professor

Chong-Sun Chu

Director

Distinguished Center Scientist
National Tsing Hua University
Particle Physics



Professor

Daw-Wei Wang

Vice Director

National Tsing Hua University
Condensed Matter Physics

Center Scientists and Distinguished Center Scientists



Professor

Miguel A. Cazalilla

Distinguished Center Scientist

National Tsing Hua University
Condensed Matter Physics



Professor

Kingman Cheung

Distinguished Center Scientist

National Tsing Hua University
Particle Physics



Professor

Guang-Yu Guo

Distinguished Center Scientist

National Taiwan University
Condensed Matter Physics



Professor

Xiao-Gang He

Distinguished Center Scientist

National Taiwan University
Particle Physics



Professor

Chin-Kun Hu

Honorary Center Scientist

Academia Sinica
Bio-Physic



Professor

Yueh-Nan Chen

Center Scientist

National Cheng Kung University
Atomic, Molecular & Optical Physics



Professor

Cheng-Wei Chiang

Center Scientist

National Taiwan University
Particle Physics



Professor

Chao-Qiang Geng

Center Scientist

National Tsing Hua University
Particle Physics

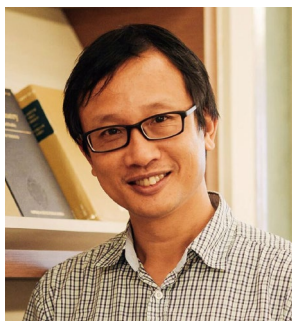


Professor

Kazuo Hosomichi

Center Scientist

National Taiwan University
Particle Physics



Professor

Ying-Jer Kao

Center Scientist

National Taiwan University
Condensed Matter Physics



Professor

Ray-Kuang Lee

Center Scientist

National Tsing Hua University
Atomic, Molecular & Optical Physics



Professor

Tzu-Chiang Yuan

Center Scientist

Academia Sinica
Particle Physics

Thematic Group Coordinators



Professor
Cheng-Wei Chiang

**Thematic Group 1:
Particle Phenomenology**
National Taiwan University



Professor
Chao-Qiang Geng

**Thematic Group 2:
Dark Physics of the
Universe**
National Tsing Hua University



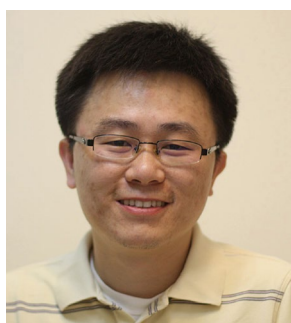
Professor
Kazuo Hosomichi

**Thematic Group 3:
Strings**
National Taiwan University



Professor
Ying-Jer Kao

**Thematic Group 4:
Topology and Entanglement in
Quantum Many-body Systems**
National Taiwan University



Dr.
Chun-Chung Chen

**Thematic Group 5:
Complex systems**
Academia Sinica



Professor
Hsuan-Yi Chen

**Thematic Group 5:
Complex systems**
National Central University



Professor
Hsi-Sheng Goan

**Thematic Group 6:
Quantum Information
Science and Quantum
Control**
National Taiwan University



Professor
Yueh-Nan Chen

**Thematic Group 6:
Quantum Information
Science and Quantum
Control**
National Taiwan University



Professor
Ray-Kuang Lee

**Thematic Group 7:
Quantum Gases**
National Tsing Hua University



Professor
Chung-Hou Chung

**Thematic Group 8:
Topology and Strong
Correlations in Quantum
Many-body Systems**
National Chiao Tung University



Professor
Yu-Chang Chen

**Thematic Group 9:
New Quantum Materials and
Transport**
National Chiao Tung University

Research Staffs



Dr.
Md. Manirul Ali
Postdoctoral Researcher
Atomic, Molecular & Optical
Physics



Dr.
**Carlo Andres
Cardona Giraldo**
Postdoctoral Researcher
Particle Physics



Dr.
Jung Chang
Postdoctoral Researcher
Particle Physics



Dr.
You-Lin Chuang
Postdoctoral Researcher
Condensed Matter Physics



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Assistant Research Scholar
Particle Physics



Dr.
Vijay Kumar Gudelli
Postdoctoral Researcher
Condensed Matter Physics



Dr.
Wu Zhong Guo
Postdoctoral Researcher
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Dr.
Yoshinori Honma
Postdoctoral Researcher
Particle Physics



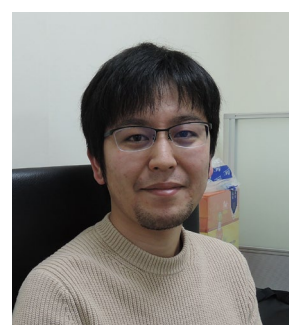
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Condensed Matter Physics



Dr.
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Postdoctoral Researcher
Bio-Physics



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Dr.
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Assistant Research Scholar
Particle Physics



Dr.
Yue-Lin Sming Tsai
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Particle Physics



Dr.
Xing-Bo Yuan
Postdoctoral Researcher
Particle Physics

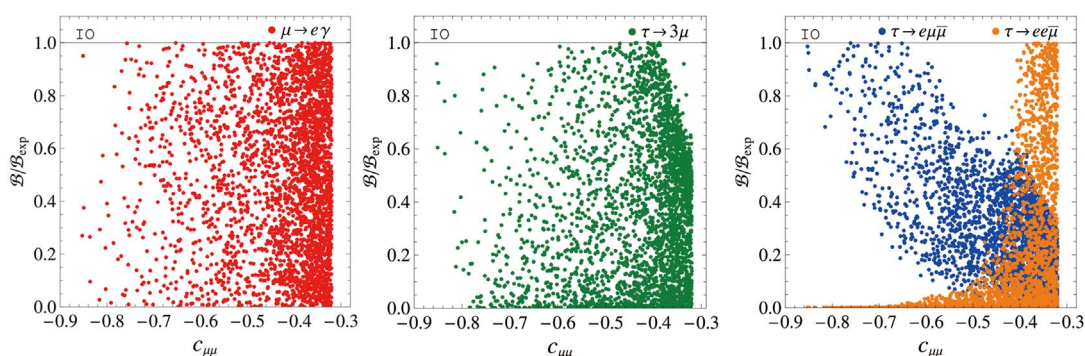
RESEARCH

Phenomenological Particle Physics

The nature of electroweak symmetry breaking (EWSB) is one of the pressing questions in particle physics. Both experimentalists and theorists are working hard to explore its nature, including searching for new physics at the LHC. At the end of 2015, there was a strong hint of a new boson at around 750 GeV, which certainly belongs to new physics if it is genuine. A lot of theoretical studies have been performed about this new particle. Though, unfortunately, the significance was substantially reduced with the data collected in 2016, we shall highlight some achievements.

Another urgent problem in particle physics is to understand the nature of dark matter and dark energy. The only thing we know of dark matter is its gravity effects, other than that we know very little. All the terrestrial direct detection experiments have failed to catch a bit of dark matter, setting only limits on its cross section with nuclei. Yet, there are many studies in indirect detection through gamma-rays and antimatter, as well as collider experiments. Here we highlight the achievements in intensity frontier, high-energy frontier and cosmology frontier.

Intensity Frontier



Theoretical understanding of anomalies in B physics

Intensity frontier includes flavor physics, neutrino physics, and search for rare decays. Flavor is traditionally a strong area in Taiwan. DCS Xiao-Gang He, CS Cheng-Wei Chiang, and CS Chao-Qiang Geng are active players in this area. Geng worked with the NCTS scientist Y.K. Hsiao has published more than 10 papers in refereed journals on B flavor physics. Xiao-Gang published a work on the recent discovered pentaquark (JHEP 1512 (2015) 128). This is perhaps the only one publication about the pentaquark from Taiwan. Xiao-Gang, Cheng-Wei, and Valencia used a Z' model to explain the $b \rightarrow s \bar{l} l$ anomaly (Phys. Rev. D93 (2016) 074003). Cheng-Wei, Hai-Yang Cheng, and Anli Kuo performed a global analysis of

2-body $D \rightarrow VP$ Decays in the framework of flavor symmetry (Phys. Rev. D93 (2016) 114010). Tzu-Chiang Yuan worked with P.Q. Hung and a couple of students on lepton-flavor-violating decays in an electroweak ν_R model (JHEP 1512 (2015) 169).

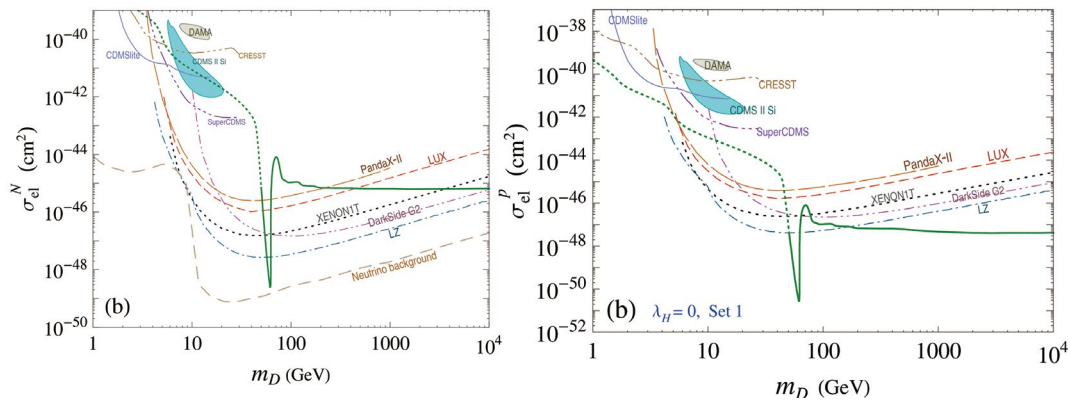
Another exciting anomaly in 2015 was $h \rightarrow \mu \tau$ at about 2.5σ excess. Kingman finished a work with Wai-Yee and Po-Yan on explaining the rare decay $h \rightarrow \tau \mu$ using a leptoquark model (Phys. Rev. D93 (2016) 015010), which is listed as a "hot paper" in the Web-of-Science. Xiao-Gang also worked with his postdocs J. Tandean and Y.J. Zheng explaining the anomaly in the framework with minimal flavor violation (JHEP 1509 (2015) 093).

High-Energy Frontier

The high-energy frontier focuses mainly on collider physics. It is an internationally visible area established in Taiwan. The appearance of the 750 GeV boson at the end of 2015 stimulated a lot of activities. DCS Kingman Cheung, together with postdocs Chih-Ting Lu and Jung Chang, wrote a paper (Phys. Rev. D93 (2016) 075013) to interpret the diphoton resonance using photon-jets. Kingman also wrote another paper (Phys. Rev. D94 (2016) 033010) with Ko, Lee, Park, and Tseng on using the singlet model to explain the resonance. These two papers were cited about 100 times in INSPIRES. CS Cheng-Wei Chiang worked with his Japanese collaborators on the same 750 GeV resonance (JHEP 1605 (2016) 084, Phys. Rev.D93 (2016) 095016), and with his student (Phys.Lett. B760 (2016) 634). CS Tzu-Chiang Yuan with Wei-Chih Huang and Sming Tsai (NCTS Research Scholar)

used a gauge 2HDM to explain the 750 GeV resonance (Nucl. Phys. B909 (2016)122), and another work (arXiv: 1603.08802) with Ko and Yu. DCS Xiao-Gang He also wrote one paper on the subject (Phys. Lett. B759 (2016) 166) with Tang and He. The research scholar Hiroshi Okada finished a total of 6 publications on this subject. Although the LHC data in 2016 did not further support the existence of the 750 GeV resonance, it is clear that Taiwan is strong enough to make substantial contributions to any new area. Kingman, Chih-Ting Lu, Jung Chang, and an ATLAS experimentalist Shih-Chieh Hsu from UW-Seattle has performed a detailed study of a rare decay of the Higgs boson using the idea of muon-jets (arXiv: 1607.07550). This is a solid collaboration between theorists and experimentalists.

Dark Matter Frontier



Higgs portal dark matter physics

Chao-Qiang Geng worked with Myrzakulov, Sami, and Saridakis considered generic models of quintessence and obtained observational constraints on varying neutrino-mass cosmology (JCAP 1601 (2016) 049). Tzu-Chiang Yuan worked with Celine Boehm, Arhrib, and Ma on a model of MeV dark matter interacting with neutrinos (JCAP 1604 (2016) 049). This work

demonstrates a simple renormalizable model of extending the standard model that may potentially solve the core-cusp problem of dark matter. Xiao-Gang and NCTS Research Scholar Dr. Tandeian studied the implications of recent direct dark matter search results from Lux and PandaX-II for the simplest Higgs-Portal model (arXiv: 1609.03551), which is of substantial interests.

Condensed Matter Physics

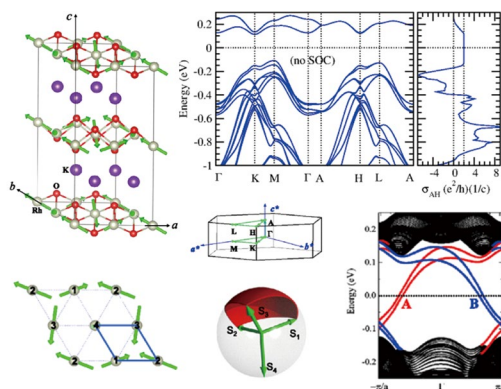
Condensed matter physics is the largest field in physics research and has a very broad area for various researches. Related research groups in NCTS (composed by two DCS, several TGs, and center research fellows) have developed several research directions to investigate related fascinating phenomena. As a continuation of previous research, achievements falls into the following three major directions.

Topological and Strongly Correlated Physics

DCS Miguel Cazalilla and Chang published a invited review article in a special issue of Journal of Statistical Mechanics: Theory and Experiment (J. of Stat. Mech. 060404 (2016)). In this article, they summarized their recent results in Quantum Quenches in the Luttinger model, providing a solid foundation on the quantum many-body dynamics, which is known the most difficult emergent field in condensed matter physics. Furthermore, Cazalilla also had a paper selected as Editor's Suggestion because of his pioneer work in the extrinsic spin Hall effect from anisotropic Rashba spin-orbit coupling in graphene (Phys. Rev. B93, 085418 (2016)). Following similar direction in topological physics, Chung-Hou Chung (NCTU) and Chung-Yu Mou (NTHU) and Tin-Kuo Lee (IoP) have obtained further results on the emergence of a fermionic finite-temperature critical point in a Kondo lattice (Phys. Rev. Lett. 116, 177002 (2016)). The goal is to find a new Dirac semi-metal, called "topological Kondo semi-metal", opening a new possibility to investigate Dirac semi-metallic phase at a finite temperature.

Besides of these highlighted research articles, DCS Cazalilla and core members of TG8 have published dozens of high quality research papers in Phys. Rev. B and Scientific Reports etc. Through the platform of NCTS, research information and manpower (postdocs and new coming junior faculty) are exchanged within the community. They also conducted several important international conferences, including the Condensed Matter Physics in Annual Meeting 2015 and 2016, Rapid response workshop on the "Recent progress in Spintronics of two-dimensional materials" etc. Each of them has more than 15-25 internationally well-known top research to visit and exchange ideas with local community.

Magnetism in Magnetic Oxide



Quantum topological Hall effect (QTHE)

DCS Guang-Yu Guo applied first-principles density functional calculations to investigate the exotic that layered rhodium oxide $K_{0.5}RhO_2$ in the noncoplanar antiferromagnetic state is an unconventional three-dimensional QAH insulator with a large band gap and a Néel temperature of a few tens of Kelvins (Phys. Rev. Lett. 116, 256601 (2016)). Furthermore, he also collaborated with experimental and international group, propose a new mechanism of the formation of 2D electron gas at the interface of two insulating oxides: Hidden lattice instabilities as origin of the conductive interface between insulating $LaAlO_3$ and $SrTiO_3$ (Nature Commun. 7, 12773 (2016)).

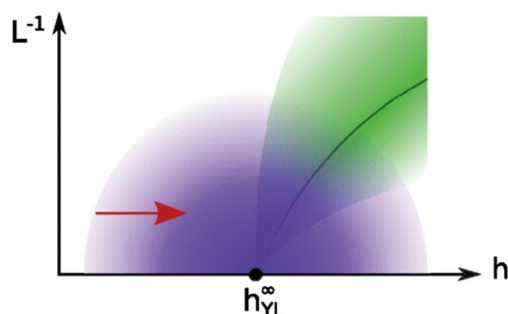
Conducted by Yu-Chang Chen (NCTU), Thematic Group 9 developed strong collaboration in the numerical study on the quantum material as well as mesoscopic systems. For example, Chen invited M. Di Ventra (UCSD) to visit Taiwan for ASIAN19 and formed collaboration on exploring memcomputing and exotic thermoelectric properties in Ni-DNA system. A manuscript is prepared and submitted to Nature Nanotechnology. They currently collaborate with experimental group to confirm this theoretical prediction. Besides, Feng-Chuan Chuang have established strong collaboration with Hsin Lin (National University of Singapore) on topological insulator (Phys. Rev. B 93, 035429 (2016), Scientific Reports 6, 18993 (2016)).

In addition to about 10 papers published in international journals like Scientific Reports and Phys. Rev. B, TG9 also host "19th Asian Workshop on First-Principles Electronic Structure Calculations"(ASIAN19). This workshop is an annual series starting in 1998, and is one of the most important workshop for electronic structure calculations community in Taiwan.

Numerical Methods for Strongly Correlated, Topological and Entangled Physics

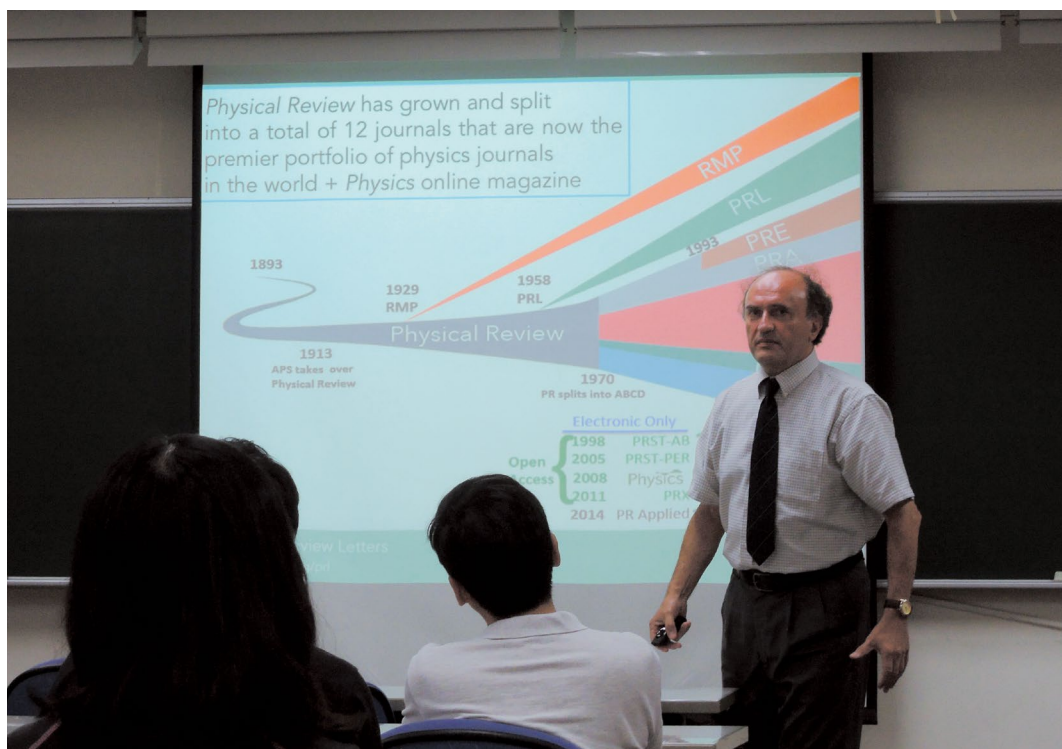
Thematic Group on Topology and Entanglement in Quantum Many-Body Physics (TG4) and Center Scientist, Ying-Jer Kao, formed a critical mass for collaboration in programming. There are several on-going collaborations both among the TG members and with international researchers, for example C. S. Ting (University of Houston), Frank Pollmann (MPIPKS), Masaki Oshikawa (U of Tokyo), Anders W. Sandvik (Boston U; NCTS visitor) etc. This also makes this group known in the international community and got several invited talks in related subjects. Several

collaborative research papers are going to appear recently.



Kibble-Zurek scaling in the Yang-Lee edge singularity

TG9 also helped to host the 8th International Conference on Highly Frustrated Magnetism (HFM2016). This is the signature conference for the community of highly frustrated magnetism, and many prominent researchers in the field attended the meeting. Ying-Jer Kao and Pochung Chen are organizing 4th workshop on Tensor Network States: Algorithms and Applications in December. This is a strong regional network on numerical methods in strongly correlated physics.

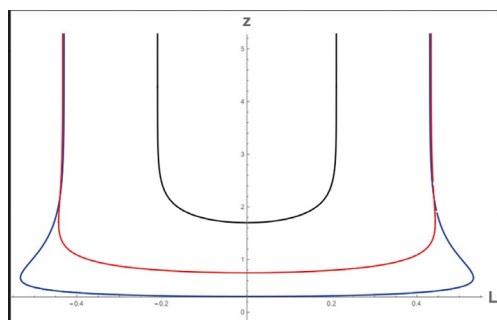


Meeting the PRL editor Dr. Yonko Millev, September 6, 2016

Strings and Quantum Field Theory

One of the most important fundamental question of the physical universe is the quantum nature and origin of spacetime. This is vital for the understanding of various important questions concerning the universe, such as the nature of the big bang and blackhole singularities and the initial condition for the inflationary universe etc. One approach to these questions is to employ string theory and the AdS/CFT correspondence. Another complementary approach is to consider Einstein gravity as an effective theory, and to use the current observation in cosmology, particularly those of dark matter and dark energy, to constraint the possible form of higher derivative correction term to the Einstein gravity. Besides amplitudes has also been an active and highly recognizable area of research. In NCTS, research in string and gravity theory is mainly conducted by DCS Chong-Sun Chu, CS Kazuo Hosomichi, CS Chao-Qiang Geng and TG members Yutin Huang and Feng-Li Lin. The string and gravity community in Taiwan is small compared to particle phenomenology and condensed matter physics community. Nevertheless the results obtained by the group is highly visible in the international community. Below we outline our achievements in these directions.

AdS/CFT Correspondence



String profile for pair of quarks at different separation in deSitter spacetime in a holographic construction. The effect of the cosmological horizon is more apparent as the quarks are closer to the cosmological horizon.

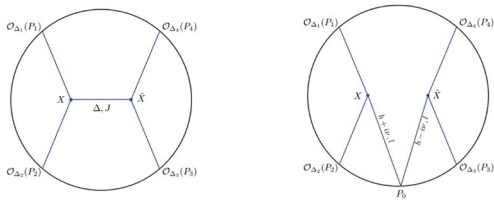
Previous applications of AdS/CFT have resulted in some insightful information about nonperturbative field theory such as the quark-gluon plasma or real time transport phenomena at finite temperature. More recently, AdS/CFT has been used to provide novel understanding of quantum information properties of quantum system; and also, in the opposite direction, how spacetime may emerge through quantum entanglement. This is a very exciting direction of AdS/CFT. Using AdS/CFT as tool, Chu and Miao has obtained new universal relations for the shape dependence of the Renyi entropy

(arXiv:1608.00328). Lin and Ning used the positivity of the relative entropy to argue that a torsion coupling of fermions is disfavored (arXiv:1607.00263). Giataganas, Lin and Liu proposed a protocol of quantum energy teleportation for holographic conformal field theory by mapping the operation of local measurement to projection operation in the CFT that is described by the Banados geometry (arXiv:1608.06523). Another interesting application of the AdS/CFT correspondence is to study the physics of QFT on de Sitter space using holography. This is motivated, partially, by the urge for a better understanding and control of the physics at the inflationary regime. Giataganas and Chu proposed a new holographic relation which relates the superconformal Yang-Mills theory on de Sitter space with type IIB string theory in AdS background (arXiv:1604.05452). They demonstrated the thermal nature of the de Sitter vacuum in the planar coordinates using holography (arXiv:1608.07431). This result is important since in the standard study of inflation, the planar coordinates is employed where the universe is expanding and there is no horizon. As a result the existence of temperature is by no means clear. This nonperturbative result may have implications on the usual statements about inflation.

Modified Gravity

This is an area where CS Chao-Qiang Geng and his group has contributed significantly. With NCTS postdoc Chung-Chi Lee, they considered a running vacuum model where the vacuum energy non-minimally couples to the inflation field. They found deflationary cosmology and proposed it as a mechanism to understand the hierarchy problem of the cosmological constant [JCAP 1606 (2016) 039]. Matter density perturbation and power spectrum were further analyzed (to appear in MNRAS). It should be mentioned that the research works performed by the group of Geng in NCTS in the last couple of years has been highly regarded by the international community. For example, Chung-Chi Lee has received awarded an Newton International Fellow from the Royal Society of UK to work with John Barrow in DAMTP.

Scattering Amplitudes



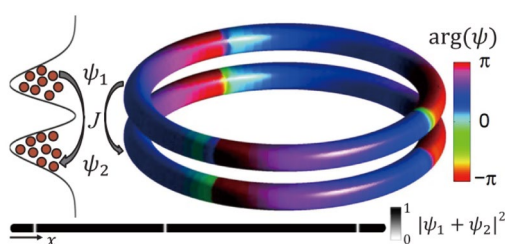
Anatomy of Geodesic Witten Diagrams

In a probably related development, the study of perturbative scattering amplitudes has led to a deeper understanding of quantum field theory and to powerful new tools for computing QCD processes. This is an area with important problems where both formal theorists and phenomenologist are interested in. Yutin Huang, Schlotterer and Wen provided evidence for a certain universality in transcendental coefficients in the low energy effective expansion of the tree level string interactions (arXiv:1602.01674). In arXiv:1605.08697, exploring soft constraints on effective actions Bianchi, Guerrieri, Huang, Lee and Wen studied effective actions for simultaneous breaking of space-time and internal symmetries and found non-conventional soft limits.

AMO/QIS

In NCTS, both Atomic-Molecular-Optical (AMO) Physics and Quantum Information Sciences (QIS) have strong and rapidly growing teams in recent years. In the AMO field, the major research is conducted by Center Scientist, Ray-Kuang Lee (NTHU), and Thematic Group on Quantum Gases (TG7). They also have a close collaboration with Experimental Collaborative Group on Quantum Optics and Quantum Manipulation of Ultracold Atoms (ECP1). QIS research is mostly conducted by Center Scientist, Yueh-nan Chen (NCKU) and Thematic Group on Quantum Information Science and Quantum Control (TG6). Their major directions are following:

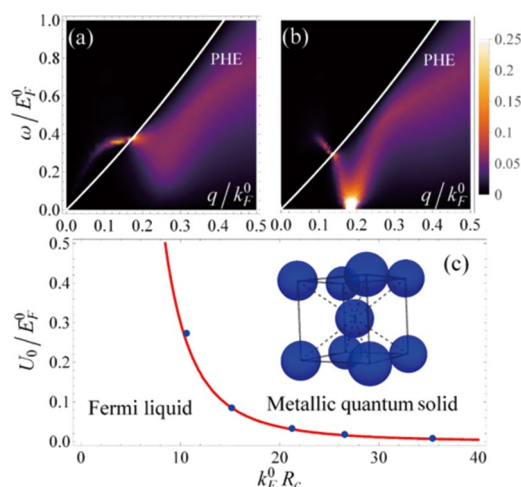
Light-Atom Interaction and Quantum Optics



Schematic of two linearly coupled BECs. The isosurface shows the equilibrated condensate density profile and the color shows a phase profile with three Josephson vortices resulting from a quench. The trapping potential is visualized on the left. The interference pattern of the two atomic fields on the bottom shows clear evidence of the three Josephson vortices located at the low density regions. Source: Shih-Vwei Su, Shih-Chuan Gou, Ashton Bradley, Oleksandr Fialko, and Joachim Brand, "Kibble-Zurek Scaling and its Breakdown for Spontaneous Generation of Josephson Vortices in Bose-Einstein Condensates," *Phys. Rev. Lett.* 110, 215302 (2013)

Ray-Kuang Lee (NTHU) has conducted an active group in quantum optics and its application to nonlinear dynamics. He has published 7 papers in *Phys. Rev. A* etc. Two major contributions are on the study of non-Hermitian system with PT symmetry (*Phys. Rev. A* 93, 042122 (2016)), and three-dimensional atom localization from spatial interference in a double two-level atomic system (*Phys. Rev. A* 94, 013826 (2016)). Both are not main stream research but have an interesting and important application to future development in quantum optics. Besides of that, TG7 has several regular visitors to NCTS, including Gediminas Juzeliunas (Vilnius University, Lithuania), Min-Hsu Hsieh (University of Technology, Sydney, Australia), and Wang Gang (Soochow University, China). Long term collaboration with these regular visitors also makes this group keep productive in research articles, including close collaboration with experimental groups.

Many-Body Physics in Ultracold Atoms/Molecules



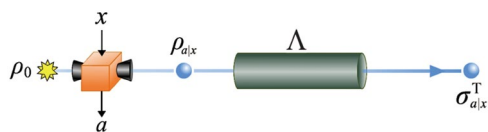
Low-temperature phases of a repulsively Rydberg-dressed Fermi gas in a three-dimensional free space. When the Rydberg block radius is larger or when the interaction strength is larger than a critical value, the Landau Fermi liquid theory breaks down and the system forms a metallic quantum solid phase, where the crystal structure appears with a Fermi sea and gapless fermionic excitations. Source: Wei-Han Li, Tzu-Chi Hsieh, Chung-Yu Mou, and Daw-Wei Wang, "Emergence of a Metallic Quantum Solid Phase in a Rydberg-Dressed Fermi Gas," *Phys. Rev. Lett.* 117, 035301 (2016).

Another important research direction of TG7 is in the many-body physics of ultracold atoms and molecules. Daw-Wei Wang (NTHU) has developed both analytic and numerical calculations to demonstrate the possibility of a new metallic quantum solid in the systems of Rydberg atoms (*Phys. Rev. Lett.* 117, 035301 (2016)). Their results are selected as Editor's Suggestion, and show that strongly correlated physics with a finite ranged interaction can have very different many-body phenomena from the short-ranged or long-ranged interaction systems. Besides of that, Wang also collaborate with Gediminas Juzeliunas to propose for the first time,

the topological ground state of a superfluidity in the presence of a synthetic gauge field, induced by the interaction effects through a non-perturbative mean-field approach (Phys. Rev. A 93, 053630 (2016)). This opens an interplay between atom-light interaction and the many-body effects for the future research. Similarly, Shi-Chuan Guo (NCUE) also had an interaction collaboration with NCTS regular visitor, Gediminas Juzeliunas (Vilnius University, Lithuania) to propose an experimental accessible method for the 2D spin-orbital coupling in a bi-layer systems. Guo and Wang also collaborate with Chungjun Wu (UCSD) in the condensate ground state of p-orbitals (Phys. Rev. A 93, 053623 (2016)).

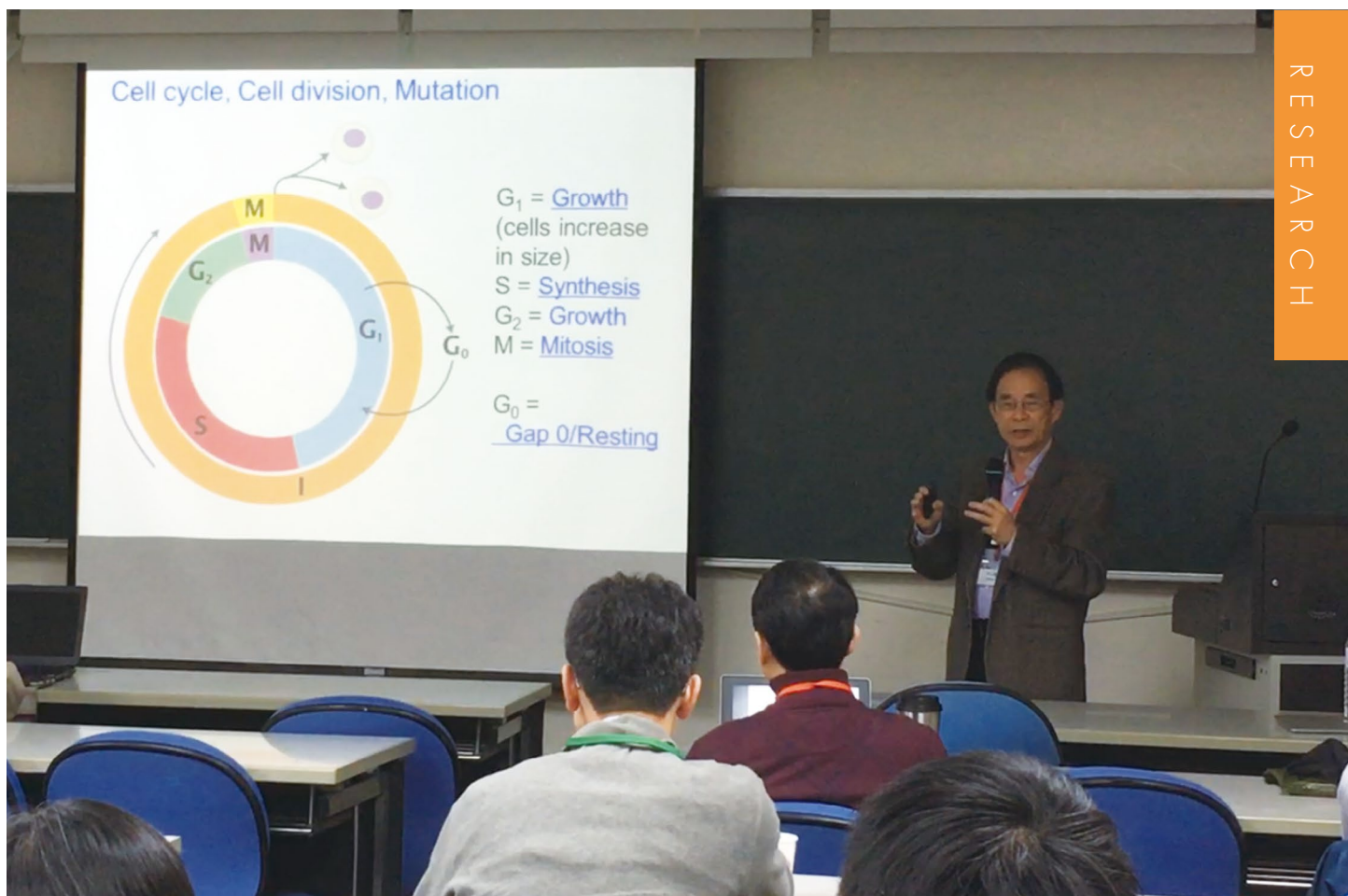
Besides of important research works, TG9, also organized several international workshops, including: Workshop on quantum non-locality, casual structures, and device-independent quantum information (2015) and International Workshop on Solid-State Quantum Computing and Mini-school on Quantum Information Science (2016). Both have many speakers and participants from other countries, including experimental groups in the field of quantum nonlocality, promoting their international reputation and visibility.

Quantum Steering and Mathematical Structure of Quantum Information



Quantifying Non-Markovianity with Temporal Steering

For the topic on quantum steering, the group of Center Scientists, Y. N. Chen, continued the long-term collaborations Nori (Riken, Japan) under the support of NCTS from 2008. Together with the theoretical/experimental group of Che-Ming Li (Dep. of Engineering Science, NCKU), they show that the temporal steering can be measured, via semi-definite programming, with a temporal steerable weight, in direct analogy to the recently proposed EPR steerable weight (Phys. Rev. Lett. 116, 020503 (2016)). Y. C. Liang and Y. N. Chen and Y. C. Liang introduces the concept of assemblage moment matrices, and demonstrate how it can be used for quantum states and measurements characterization in a device-independent manner (Phys. Rev. Lett. 116, 240401 (2016)). This is an interesting application of the mathematical Structures of Quantum Information.



Prof. Wen-Hsiung Li (Biodiversity Research Center, Academia Sinica) gave a talk in the "Conference on Time in Biological Systems and Beyond", Mar 28, 2016.

Soft Matters and Complex System

The Center has also supported activities in the area of soft matters and complex system. For example, honorary CS Chin-Kun Hu has proposed algorithm to predict missing links and identify spurious links via likelihood analysis, which are better than previous algorithms published at top journals, such as Nature, PNAS etc. (Scientific Reports, 6, 22955 (2016)). It has also been quite fruitful this year that a number of collaboration has been established as a result of visit of scholars to NCTS. For example, Yeng-Long Chen established a collaboration with Prof. Ken S. Schweizer from the University of Illinois at Urbana-Champaign following his visit to

Taiwan. The collaborative project is investigating abnormal polymer transport in crowded medium. They found that polymer-medium interactions strongly affect macromolecular transport, and in certain cases polymer transport is enhanced with increased crowding. A recent manuscript has been published in Soft Matter and another is being prepared. Chun-Chung Chen has initiated a research collaboration with Prof. Gang Hu from Beijing Normal University following his visits to the NCTS and the Academia Sinica over the past year. They are currently in the process of writing a joint paper on this project.

HIGHLIGHTS of RESEARCH ACTIVITIES

Experimental Collaboration InterDisciplinary Research Program

Experimental Collaboration Program (ECP) is one of the new structures in this phase of NCTS to support collaboration between experimentalists and theorists in some promising research area. In this first two years, we support four directions in AMO, new material, LHC physics, and nuclear physics respectively, each of them are conducted by renowned or promising experimentalists. The style of operation may include workshops, regular seminars, visiting scholars or student support to other research groups. We expect that such kind of collaboration is worthy of support with a steady (but may not be many), so that both experimentalists and theorists may learn how to work closer gradually in the near future. A highlight of the activities in the respective ECP groups is given below.

Quantum Optics and Quantum Manipulation of Ultracold Atoms/ECP1

The first is to enhance the collaboration between theoretical and experimental researchers through the short-term visit of key postdoc or senior students from theoretical groups to experimental groups. Via in-depth discussion of considerations and issues from both sides, this will help both sides gain deeper understanding of experimental or theoretical concerns and initiating true

collaboration. Secondly, they have a constant monthly or bi-monthly informal discussion seminar held in NCTS lead by core members (or postdoc, students in his/her team) to discuss some un-matured research topic. The discussion usually last up to three hours. In this way, they trigger some new ideas and also possibly initiate collaborations between members.

Low-D Emergent Quantum Matters and Beyond CMOS Devices/ECP2

One of the most important outcome of this group is that Horng-Tay Jeng (NTHU) and J. Raynien Kwo (NTHU) have recently collaborated to adopt a strategy that Jeng calculated various compounds with elements for TIs on different substrates to find the novel properties revealed from the calculated energy band structures, and Kwo's group grew the same compound in thin films by UHV deposition, and study the electronic structures via various physical measurements to confirm its novelty.

For example, Horng-Tay Jeng et al found via first-principle calculation that a pure 2D Rashba electron gas (REG) with a large Rashba splitting can be realized in a topological insulator (TI) Bi₂Se₃ ultra-thin film grown on a transition metal dichalcogenides (TMD) MoTe₂ substrate, ideal for real devices utilizing the Rashba effect. Prof. Kwo (NTHU) et al then have employed the MoS₂ mono layer, a van der Waals type surface with hexagonal symmetry as a growth template to obtain high quality Bi₂Se₃ (TI) thin films. Larger triangular domains of sizes up to 1.5 μm with less spiral defects, about 2-3 times enhancement in mobility and much more intense SdH oscillations have been demonstrated. They expected more fruitful results will be discovered and published soon in this year. Similarly, Shu-Jung Tang (NTHU) and Wei-Wu Pai (NTU) have demonstrated that under the optimal growing condition, germanene would form as a freestanding configuration with 1x1 honeycomb structures on top of Ag(111). Photoemission measurement also reveals the corresponding energy band structures symmetry in collaboration with Horng-Tay Jeng (NTHU). The manuscript is under preparation and will be submitted to Nature Materials shortly.

LHC Experimental/Theoretical Exploration/ECP3

Kingman and Pai-Hsieh Hsu (NTHU) held the Rapid Response Workshop to the 750 GeV Resonance, gathering all the peoples in Taiwan who have performed works related to the new resonances. They had a successful workshop and especially some important information from the CMS and ATLAS experimentalists. This was the first of such a type. Besides of that, they also hosted a workshop, "Beyond the Standard

Model Higgs Searches", inviting a numbers of ATLAS experimentalists from nearby countries, including Japan, China, and Hong Kong, and also local ATLAS and CMS members, together with theorists. As to enhance more regional collaborations, they will start a school at the end of the year, aiming at the relevant software that experimental students need at various stage of their studies.

Light Dark Matter/ECP4

Cheng-Pang Liu and his collaborators have weekly meetings of group members by teleconferencing, with experimentalist members. They have physical collaboration meetings (one-day- long) held either at NTU, NDHU, or AS every two months. Besides, they also support students' and postdocs' domestic travels when special training is needed for project execution. Since they try to form a strong working team to conduct focused research projects, their priority on budget-spending goes to items that facilitate the project execution. For example, They organize schools/lectures for deep learning and/or young-talent training, and provide travel support in order to get people together for intensive collaborations. Several international collaborators from mainland China and other countries are also invited for intensive discussion.

Interdisciplinary research is getting more and more important to physics research in recent decades, since many important problems are found closely related to the application of physical concepts as well as physical knowledge. In the first two years of NCTS Phase IV, four major directions of interdisciplinary research are organized by researchers outside physics community but closely related to physics research, for example, between DFT and applied chemistry, between complex system and big data analysis, between mathematics and biophysics, and between topology and string. However, since most core members are not in physics community and is not familiar with the operation of NCTS, they may need some more time to operate more effectively through the steady support from the center. More details are described below:

Theoretical Chemistry/IDP1

Multi-scale studies for complex materials, catalysts, and biological systems – theoretical and computational approaches and experimental

stimulus, Chao-Ping Hsu (IoC, AS) and her coworkers hosted The Seventh Asian Pacific Conference of Theoretical and Computational Chemistry (APCTCC7) in January 25-28, 2016. This is a biannual conference for Asian-Pacific theoretical and computational chemistry, covering physics and biology as well. Through the discussion and social connection in this conference, core members in this group have a great interaction and connection with important visitors. The second important event is September Student conference, where students compete for the best oral and poster presentation. The overall presentation quality has been increased significantly. By asking the PIs to serve as juries of the contests, this occasion also allows PIs to learn from each other through their students' presentations.

Big Data Analysis and Mathematical biology/IDP2

Ming-Chya Wu (NCU) and his group has developed data analysis approaches (algorithms) based on concepts in statistical physics and nonlinear dynamics to investigate biological problems (such as protein data bank and protein aggregation database), biomedical science (such as biomedical signals), financial and social systems (such as financial data and networks). They do modelling and simulations for the physical systems associated with the big data. One of their achievement is to initiate a very good collaboration with medical doctors on analyzing biomedical signals and obtained the research results published in a biomedical journal: L.-C. Tu, et al. Surface electromyography analysis of blepharoptosis correction by transconjunctival incisions, *J. Electromyogr. Kinesiol.* 28, 23-30 (2016), as well as results published in physical journal: M.-C. Wu et. Disorder profile of nebulin encodes a vernierlike position sensor for the sliding thin and thick filaments of the skeletal muscle sarcomere, *Phys. Rev. E* 93, 062406 (2016)

Complex System/TG5 and IDP3

Chen-Hsien Yeang (ISS, AS) led a group to investigate the interdisciplinary research between mathematics, biology, medical system, and physics. Their regular activity is to have regular seminar to collect people from different background together and to share their experience. Besides, they also hosted

a conference of "Time in Biological Systems and Beyond" on March 2016, inviting several important researchers in Taiwan and other countries to discuss possible collaboration between them.

Geometry, Topology and String Theory/IDP4

Nan-Kuo Ho (NTHU), Siye Wu (NTHU) started the program by an international workshop 'Geometry, Topology, and Physics'. They invited leading experts both in Taiwan and from Japan and Korea. The talks covered various topics in mathematical physics such as symplectic geometry, quantum field theory, gauge theory, mirror symmetry and string theory. In November 2016, we have invited Huijun Fan from Peking University, Varghese Mathai from University of Adelaide and Armen Sergeev from Moscow Steklov Institute to deliver a lecture series on Gromov-Witten invariant, K-theory and T-duality, and the geometry of loops spaces. These lecture series will benefit young researchers and postgraduate students working in these and related areas.



International Cooperation

This year we have signed new MOU with Institute of Basic Science - Center for Theoretical Physics of the Universe, Korea and the Donostia International Physics Center (DIPC), Spain.

In addition, we have initiated and facilitated the formation of the research network, Fundamental Interaction SpaceTime (FIST). FIST is a High Physics network formed by Research Institutions (primarily) in Asia in order to help building up and strengthening transnational research partnership and cooperation among researchers across Asia. This mode of international networking collaboration stimulates the operation of the European research network that has been successfully implemented in Europe for decades and is the first of its kind in Asia.

In summer, NCTS has joined the EU network Cooperation in Science and Technology (COST) on "Quantum structure of spacetime (QSPACE)". The network started in 2015 and involves over 50 institutions from more 28 countries in Europe, as well as four international partners from Japan, India, Australia and Taiwan.

Group picture of Japan-Taiwan Workshop on KARGA, Dec 23, 2015



Cultivation Program

The cultivation and nurturing of students and young researchers is very important as a successful nurturing of young talents is our guarantee for a bright future for the science and economy of Taiwan.

Outreach

To develop the new generation of talented theorists, it is necessary to identify brightest students, including undergraduates or master students, and attract them into theoretical sciences. One of the key event is the annual Nobel lecture held in the summer on NTHU campus we coorganize together with the physics

department of NTHU. The Nobel lecture in the previous 3 years are: 2014 Lobel lecture: Samuel Ting (1976 Nobel Laureate), 2015 Lobel lecture: Eric Cornell (2001 Nobel Laureate), 2016 Lobel lecture: Jeorme Freedman (1990 Nobel Laureate).



Recruitment of Postdoc

The recruitment of outstanding young people to come to work in the Center is very important. Last year Wen-Ming Huang (condensed matter physics) has got a faculty position at the National Chung Hsing UNiversity. This year Sung Po Chao (condensed matter physics) has obtained a faculty position at the National Kaohsiung Normal University, and Chian-Shu Chen has obtained a faculty position at the Tamkang University.

Dr Chung-Chi Lee, a postdoc we hired last year, has recently won a prestigious award, the Newton International Fellowship, from the Royal society of UK to work with John Barrow in Cambridge. He will help to build future links and connection between the research community of UK and Taiwan.

Students and Postdocs Training

We pay much attention on efforts to facilitate the transfer of frontier research to the young generations, through organization of advanced schools and workshops specifically with them as target audiences. The center has regularly organized a number of schools this year. Some of the schools are of an interdisciplinary nature, combining theory and experiments, or traditionally different subjects such as chemistry and computation.

We also support promising students to attend international schools and conferences (about 50 per year), and exchange visit of our postdocs to institutes where we have an agreement on international exchanges.

NCTS SCHOOL	DATE
NCTS School on Atomic Theory for low-Energy Detector Responses	Feb 20 - Feb 22
2016 Spring School on First-principles Computational Materials Research - Introductory Level	May 14 - May 15
Mini school on Structure Formation and Cosmological N-body Simulation	July 18 - July 22
2016 Summer School on First-principles Computational Materials Research - Advance Level	July 25 - July 29
2016 AMO Physics Summer School	Aug 23 - Aug 26

NUTURE SUPPORT	NUMBER
Students: Talks at international conferences	8
Postdocs: Research visits	7
Postdocs: Talks at international conferences	16

Public Talk of Dr. Jerome Frideman
(1990 Nobel Laureate in Physics)
on the Observation of Quarks in the Proton.
July 12, 2016



Workshops

WORKSHOPS/SYMPOSIA/CONFERENCES	DATE
NCTS Condensed Matter Physics Mini-workshop	Jan 13
2016 Joint Workshop Winter Workshop on of New Quantum Materials, Transport, and Excited States	Jan 18-20
Frontiers of complex systems science: soft matters, statistical physics, and big data	Jan 23-25
The 7th Asia-Pacific Conference of Theoretical and Computational Chemistry	Jan 25-28
Rapid Response Workshop on 750 GeV Diphoton Resonance	Jan 28
3rd KIAS-NCTS Joint Workshop on Particle Physics, String Theory and Cosmology	Jan 30 - Feb 4
NCTS School on Atomic Theory for Low-Energy Detector Response	Feb 20-22
Frontier Topics on Topology, Non-Fermi Liquid and Strong Correlations in Quantum Many-body Systems	Mar 02-03
Beyond the Standard Model Higgs Searches	Mar 21-24
2016 NCTS March Workshop on Critical Phenomena and Complex Systems	Mar 28-29
Conference on Time in Biological Systems and Beyond	Mar 28-29
Mini-workshop on bootstrap	Apr 29
Complex Systems Symposium	May 13-14
2016 Spring School on First-principles Computational Materials Research-Introductory Level	May 14-15
NCTS Workshop on Time-Dependent Density Functional Theory and Excited State Properties of Solids	May 17-18
The 1st KEK-KIAS-NCTS Joint Workshop on Particle Physics Phenomenology	May 26-28
East Asia Joint Workshop on Fields and Strings 2016	May 27 - Jun 02
2016 NCTS International Workshop on Critical Phenomena and Complex Systems	Jul 01-03
The Cross Strait Meeting on Particle Physics and Cosmology	Jul 04-07
The Observation of Quarks in the Proto	Jul 12
Mini School on Structure Formation and Cosmological N-body Simulation	Jul 18-21
2016 Summer Workshop on New Quantum Materials and Transport	Jun 23-24
NCTS Summer workshop on Strings and Quantum Field Theory	Jul 25-29
2016 Summer School on First-principles Computational Materials Research-Advance Level	Jul 25-29
NCTS Mini-workshop on Ab Initio Calculations of Excited State Properties and New Materials	Aug 12
Summer institute 2016	Aug 17-23
2016 AMO Physics Summer School	Aug 23-26
The 13th Taiwan International Symposium on Statistical Physics and Complex Systems (StatPhys-Taiwan-2016)	Sep 06-08
General Meeting of Taiwan Theoretical and Computational Molecular Sciences Association (T2CoMSA), and 2016 TCCAT September Conferenc	Sep 07
Continuous Variables for Quantum information processing	Sep 03-04
HFM 2016 8th International Conference on Highly Frustrated Magnetism	Sep 07-11
Intensity Frontier in Particle Physics: Flavor, CP Violation and Dark Physics	Sep 26-27
The 19th Asian Workshop on First-Principles: Electronic Structure Calculations (ASIAN-19)	Oct 31 - Nov 02
9th Taiwan String Workshop	Nov 11-13
Recent Progress in Spintronics of 2D Materials	Nov 13-16
NCTS Annual Theory Meeting 2016: Particles, Cosmology and String	Dec 06-09
NCTS Annual Theory Meeting 2016: Quantum Simulations and Numerical Studies on Many-Body Physics	Dec 09-11
Fourth Workshop on Tensor Network States: Algorithms and Applications	Dec 12-15
The 8th International Workshop on Solid State Quantum Computing (IWSSQC)	Dec 10-15

Joint Meetings

JOINT MEETINGS	INVOLVED PARTIES	DATE
3rd KIAS-NCTS Joint Workshop on Particle Physics, String Theory and Cosmology	KIAS/NCTS	Jan 30 - Feb 4
East Asia Joint Workshop on Fields and Strings 2016	China/Japan/Korea/ Taiwan	May 27 - Jun 2
The 1st KEK-KIAS-NCTS Joint Workshop on Particle Physics Phenomenology	KEK/KIAS/NCTS	May 26-28
Summer Institute 2016	Japan/Korea/Taiwan	Aug 17-23
The 19th Asian Workshop on First-Principles: Electronic Structure Calculations (ASIAN-19)	China/Japan/Korea/Taiwan	Oct 31 - Nov 2



Group picture of the 1st KEK-KIAS-NCTS Joint Workshop on Particle Physics Phenomenology, May 26-28, 2016

Some of the Representative Meetings

Beyond the Standard Model Higgs Searches

NCTS, Hsinchu
March 21st - 24th 2016

Invited Speakers

Experiment

Luis Roberto Flores Castillo (CUHK)
Xin Chen (THU)
Ming-Chung Chu (CUHK)
Lianliang Ma (Shantong)
Tatsuya Masubuchi (Tokyo)
Rachid Mazini (AS)
Stathes Paganis (NTU)
Yanjun Tu (HKU)
Shin-Shan Yu (NCU)

Theory

Justine Chang (NCTS)
Chuan-Ren Chen (NTNU)
Cheng-Wei Chiang (NCU)
Da Huang (NTHU)
Hsiang-Nan Li (AS)
Tao Liu (HKUST)
Chih-Ting Lu (NTHU)
Sichun Sun (HKUST)
Jusak Tandean (NTU)
Po-Yan Tseng (NTHU)
Huitzu Tu (AS)

Organizing Committees

Kingman Cheung
Jennifer Hsu
Shih-Chieh Hsu

<http://phys.cts.nthu.edu.tw/actnews/content.php?Sn=260>
Contact: yychiu@phys.cts.nthu.edu.tw (Ms. Candie Chiu)



Conference on Time in Biological Systems and Beyond

March 28-29, 2016

Keynote Speech

Wen-Hsiung Li 李文雄 (AS)

Coordinators

Chen-Hsiang Yeang 楊振翔 (AS)
Hsuan-Yi Chen 陳宣毅 (NCU)
Wen-Ping Hsieh 謝文萍 (NTHU)
Lee-Wei Yang 楊立威 (NTHU)

Venue

NCTS Lecture Room A
4F, 3rd General Building
NTHU, Hsinchu

Registration Deadline

March 13, 2016

Session 1: Equilibrium and non-equilibrium

Pik-Yin Lai 黎璧賢 (NCU)
Chao-Ping Cherri Hsu 許昭萍 (AS)
Hsuan-Li Su 蘇軒立 (NTU)

Session 2: Oscillation

Rey-Huei Chen 陳蕾惠 (AS)
Kuo-An Wu 吳國安 (NTHU)
Chuan-Hsiang Han 韓傳祥 (NTHU)

Session 3: Progression

Jun-Yi Leu 呂俊毅 (AS)
Shen-Ju Chou 周申如 (AS)
Jr-Kai Yu 游智凱 (AS)

Session 4: Time and frequency

Yasuhisa Mizutani 水谷泰久 (Osaka U)
Li Su 蘇黎 (AS)
Chi Keung Chan 陳志強 (AS)

Session 5: Dependency

Chun-Biu Li 李振彪 (Hokkaido U)
Yet-Ran Chen 陳逸然 (AS)
Stacey H. Chen 陳香如 (AS)
Shihua Zhang 張世華 (CAS)



Contact: Ms. Sherry Shpang@phys.cts.nthu.edu.tw
<http://www.phys.cts.nthu.edu.tw/actnews/?Sn=273>

2016 第一原理材料計算初階課程

Spring School First Principles Computational Materials Research – Introductory Level

時間：2016年5月14日至5月15日

地點：國家高速網路與計算中心（新竹市科學園區研發六路7號）

報名網址及詳細資訊：<http://phys.cts.nthu.edu.tw/actnews/content.php?Sn=277>

廿一世紀是尖端材料科技與生物科技的時代，於是對尖端材料與有機分子微觀結構的瞭解就顯得愈來愈重要，這包括其電子結構、光學性、溫度的影響、磁的特性、機械的特性等。廿世紀初期由於量子力學的發現，使我們有機會從微觀的角度去探討以上的問題，人們希望尋找一個第一原理的材料計算方法。所謂「第一原理」是指在計算過程中不需要由實驗提供參數，只要知道材料組成的元素便可直接從其對應的薛丁格方程，求出其所有的物性。但由於這是一個多電子問題，處理起來非常困難，直到六十年代 W. Kohn 提出局部密度泛函近似理論 (LDA) 才使這個沉澱多年的問題重獲曙光，經過多年電腦模擬計算的驗證，LDA 能對非強關聯系統提供一個非常好的基礎描述，而隨著高速電腦效能的日新月異，使第一原理材料計算方法穩步成長。高科技產業是台灣經濟的命脈，國內需要更多這方面的人才，本中心為推廣第一原理材料計算的研究，將於2016年5月14日至15日舉辦「第一原理材料計算初階課程」，上午上課三小時，下午電腦實習，歡迎對探索尖端材料微結構有興趣的相關系所同學參加。

課程內容：局部泛函理論、虛位勢近似法、與表面現象(如表面重構、表面能、功函數)計算方法

實習內容：本課程以VASP為實習課的計算程式，材料的總能計算、電子能帶及態密度分佈之計算、金屬表面之表面能、表面能、及功函數之計算、分子之鍵長及鍵能之計算。

對象：全國各大專院校相關系所同學及相關研究人員，主辦單位審核後將公告錄取名單若錄取人數超過50人，將加開第二梯次。(預定5/28-5/29上課)

費用：免註冊費，但需預繳保證金1,000元

報名時間：2016年4月20日截止

報名方式：完成線上報名，並郵寄/Email 報名審查資料

報名審查資料：200字參加動機與未來研究規劃、推薦教授簽名、歷年成績單(已通過博士班資格考者僅需附上通過證明)

[1] 中心將於暑期推出「第一原理材料計算進修課程」，該課程只接受具第一原理材料計算經驗之學員參加。
[2] 學員與指導老師的聯絡關係：本課程將以國家高速網路與計算中心作為平台，提供學員與指導老師之聯絡，並由指導老師提供必要之教學資源。此外，本課程也提供在 Windows 環境下建立 Unix 的使用環境 (cygwin)。Unix 的常用指令及 vi 編輯器的介紹。此外，本課程還包括能帶理論的介紹。以上之進修課程包括講義及老師上課時所講之內容，學員將可於上課前完成作品與課程。
[3] Vienna Ab-initio Simulation Package (VASP) 可參閱 VASP 之網站 <http://www.vasp.at/>
[4] 本課程之教材將置於中心之相關網站，歡迎參閱。上課時中心將提供講義。

聯絡人：Ms. Hsiao, 蕭小姐
地址：30013 新竹市光復路二段101號
國家理論科學研究中心物理組
電話：03-5731265; Fax: 03-5735086
E-mail: cmr@phys.cts.nthu.edu.tw
主辦單位：國家理論科學研究中心
協辦單位：國家高速網路與計算中心



The First KEK-KIAS-NCTS Joint Workshop on Particle Physics Phenomenology

May 26th-28th, 2016

NCTS Lecture Room A, 4F, 3rd General Building, NTHU

Introduction

The main purpose is to bring together theorists (faculty, postdocs and PhD students) from different institutes to report their latest research findings. Through interactions in the workshop, we hope to generate new ideas for further explorations and provide unique opportunities for collaborations among members of different institutes. In this very first meeting, we will focus on the topics in the area of phenomenology and cosmology, while other formal topics may be included in the future workshops.

Invited Speakers

Chuan-ren Chen (NTNU)
Ki-Young Choi (Chonnam National U.)
Eung Jin Chun (KIAS)
Jason Lott Evans (KIAS)
Masashi Hayakawa (Nagoya U.)
Junji Hisano (Nagoya U.)
George Wei-shu Hou (NTU)
Jennifer Pai-hsien Hsu (NTHU)
Yu-tin Huang (NTU)
Ryusuke Jinno (KEK)
Wai-Yee Keung (IUC)
Seyong Kim (Sejong U.)
Kazunori Kohri (KEK)

Chia-ming Kuo (NCU)
Masafumi Kurachi (KEK)
Guey-lin Lin (NCTU)
Shigeki Matsumoto (Kavli IPMU)
Kyohke Mukaida (Kavli IPMU)
Mihoko Nojiri (KEK)
Kin-ya Oda (Osaka U.)
Myeonghun Park (IBS/CTPU)
Jeonghyun Song (Konkuk U.)
Masahiro Takimoto (KEK)
Po-yan Tseng (NTHU)
Chaehyun Yu (AS)

Organizing Committee

KEK:

Motoi Endo
Ryuichiro Kitano
Mihoko Nojiri
Yutaka Sakamura

KIAS:

Eung Jin Chun
Pyungwon Ko


NCTS:

Kingman Cheung
Cheng-Wei Chiang
Tzu Chiang Yuan

Website: <http://phys.cts.nthu.edu.tw/actnews/?Sn=271>
Contact: yychiu@phys.cts.nthu.edu.tw (Candie Chiu)



2016 Nobel Laureates Lectures

 **諾貝爾大師
在清華**

觀察質子中的夸克

你知道嗎？其實質子及中子並不是最小的粒子。
1990年諾貝爾獎得主Friedman教授將在這個演講中，娓娓回顧當初他和其他人怎麼由一系列的實驗，看出質子是由三個帶著奇妙電荷且沒有體積的「上/下夸克」($\frac{2}{3}e$, $-\frac{1}{3}e$)所構成的，以及這個重要發現怎麼改變並重現人類看待這個世界的觀點。

The Observation of Quarks in the Proton

Great progress was made in the 20th century in the understanding of the structure of the atom. We now know that the basic building blocks of all atomic matter are electrons and quarks. But the quark model, which embodied a radically new conceptual view of the structure of matter, was fiercely debated and generally rejected by the physics community. Its ultimate acceptance took well over a decade and occurred only after inescapable and compelling experimental evidence was obtained. Quarks were finally discovered in a series of high-energy electron scattering experiments. In these experiments, the electron beam and the detecting equipment were the equivalent of a very powerful electron microscope that probed the interiors of the proton and neutron. Point-like constituents were observed inside, which were identified as quarks. This discovery changed our view of the basic structure of matter and led to a new theory of the strong interaction, quantum chromodynamics.

1990年諾貝爾獎得主 (Nobel Laureate 1990)
Jerome Friedman

2016/7/12 14:00 (13:30入場)
學習資源中心旺宏館國際會議廳


報名網址 <https://goo.gl/forms/owNybgzuTygOZFVx2>

主辦單位：國立清華大學 圖書館、物理學系、NCTS 國家理論科學研究中心、演講：居禮夫人高中化學班

**PHYSICAL
REVIEW
LETTERS**

**Meeting the PRL editor
Dr. Yonko Millev**

September 6, 2016
13:30-14:30
Lecture Room A of NCTS
4F, 3rd General Building, NTHU



Hosted by NCTS director Prof. Chong-Sun Chu

Dr. Millev received his Ph.D. in condensed matter physics at the Bulgarian Academy of Sciences in 1988, where he later became a Senior Research Associate. The award of a Humboldt Fellowship in 1992 facilitated his long-term association with the Max Planck Society institutes in Stuttgart, Halle, and Leipzig. Dr. Millev joined PRL in 2003 where is currently an associate editor.

主辦單位：國家理論科學研究中心 NCTS
National Center for Theoretical Sciences

**Nov 9-10, 2016
NCTS LECTURE SERIES**

Lecture room A, 4F, 3rd General Building, NTHU

Registration deadline: Nov 1


**10:30-12:00
Armen Sergeev**
Steklov Mathematics Institute, Moscow

Kähler geometry of infinite-dimensional complex manifolds

In our talks we concentrate on three basic examples of infinite-dimensional Kähler manifolds:

1. loop spaces of compact Lie groups,
2. Hilbert-Schmidt Grassmannians,
3. Kähler manifolds of complex structures on loop spaces.

As we shall see, these manifolds are closely related to each other. They also play an important role in string theory.

**13:30-15:00
Varghese Mathai**
The University of Adelaide, Australia

T-duality and topological insulators

New directions in the geometry of T-duality

I will briefly survey various new directions of research in geometric/topological T-duality. Then I will review the setting of T-duality for circle bundles with flux, and then discuss one of the new directions, namely spherical T-duality and argue that it is a duality in M-theory.

A mathematical approach to topological insulators and semimetals

I will discuss a mathematical approach to semimetals, that incorporates that of topological insulators. If time permits, I will outline the novel use of T-duality in this context.



**Recent Progress in
Spintronics of 2D Materials**

Time: Nov 13 – 16, 2016

Venue: Meeting Room, 8th floor of the General Physics Building II, NTHU

Invited Speakers:

Enrique Del Barco (US)	Joaquim BS Mendes (Brazil)
Fabian Calleja (Spain)	Mirco Milletari (Singapore)
Eduardo Castro (Portugal)	Barbaros Oezylmaz (Singapore)
Jian-Hao Chen (China)	Siddhartha Omar (Netherlands)
Po-Wen Chiu (Taiwan)	Roberto Raimondi (Italy)
Sergey Dushenko Japan)	Tatiana Rappoport (Brazil)
Jaroslav Fabian (Germany)	Stephan Roche (Spain)
Joshua Folk (Canada)	Justin Song (Singapore)
Chunli Huang (Taiwan)	Shu-Jung Tang (Taiwan)
Alexey Kaverzin (Netherlands)	So Takei (US)
Denis Kochan (Germany)	Sergio O. Valenzuela (Spain)
Minn-Tsong Lin (Taiwan)	Giovanni Vignale (US)
Ivan Vera Marun (UK)	Zhe Wang (Switzerland)
	Jun Zhu (US)

Coordinator: Aires Ferreira (University of York)
Miguel A. Cazalilla (NTHU/NCTS)
J. Raynien Kwo (NTHU/NCTS)

Website: <http://phys.cts.nthu.edu.tw/actnews/?Sn=294>

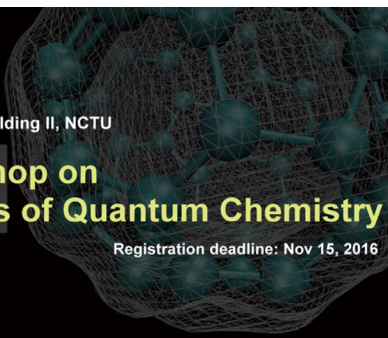
Contact: irispeng@cts.nthu.edu.tw

Room 210, Science Building II, NCTU

Mini-workshop on Foundations of Quantum Chemistry

Registration deadline: Nov 15, 2016



Part I: NOV 19



Debashis Mukherjee
Raman Centre for Atomic,
Molecular and Optical Sciences, Kolkata, India


Foundations of coupled cluster theory

Part II: NOV 26

Andreas Savin
UPMC Sorbonne Universites, Paris, France

Foundations of density functional theory

NCTS 

2016 NCTS Distinguished Lecturer Series

Place : Lecture Room A of NCTS, 4F, 3rd General Building, NTHU

Hiroshi Ooguri

Fred Kavli Professor of Theoretical Physics and Mathematics
Director of the Walter Burke Institute for Theoretical Physics, Caltech

Entanglement and Geometry

11/23
3:15-4:45 PM

Bei-Lok Hu

Professor of Physics, University of Maryland
Fellow of the Joint Quantum Institute, Maryland

Quantum Information in the Face of Gravity- Gravitational Decoherence and Entanglement

11/22
2:00-3:30 PM

Gravitational Cat State and Stochastic Semiclassical Gravity

11/24
2:00-3:30 PM




主辦單位：國家理論科學研究中心 **NCTS**
National Center for Theoretical Sciences
Registration: <http://phys.cts.nthu.edu.tw/actnews/signup.php?Sn=314>




NCTS Annual Theory Meeting 2016

Particles, Cosmology and String

Theory

Jan de Boer (U. Amsterdam)
Tohru Eguchi (Rikkyo)
Kaoru Hagiwara (Karlsruhe, KEK)
Tao Han (U Pittsburgh)
Yutaka Hosotani (Osaka)
P. Q. Hung (Virginia)
Jihn E. Kim (CAPP IBS)
Yoshihisa Kitazawa (KEK)
Matthias Neubert (Mainz/Cornell)
Sandu Popescu (Bristol)
Misao Sasaki (YITP)
Ricardo Schiappa (U Lisbon)
Henry Tye (IAS HKUST)
José W. F. Valle (IFIC/CSIC, U Valencia)
Raymond Volkas (Melbourne)
Piljin Yi (KIAS)

+ Others

Experiment

PandaX-II: Jianglai Liu (Shanghai Jiao Tong U)
AMS: Yuan-Hann Chang (National Central U)
CMS: Stathes Paganis (National Taiwan U)
ATLAS: Song-Ming Wang (Academic Sinica)
LIGO: Stefan Ballmer (Syracuse)
KAGRA: Shinji Miyoki (ICRR, U. Tokyo)

6th - 9th Dec. 2016

12:6
ACX Auditorium, B1, DeltaHall

12:7-9
**International Conference Hall
8F, General Building II
National Tsing-Hua University
Hsinchu, Taiwan**


Scientific organizing committee

Kingman Cheung, Cheng-Wei Chiang, Chong-Sun Chu (Chair), Chao-Qiang Geng,
Xiao-Gang He, Kazuo Hosomichi, Feng-Li Lin, Kin-Wang Ng, Tzu-Chiang Yuan



Registration
<http://http://phys.cts.nthu.edu.tw/actnews/signup.php?Sn=313>
Please sign up before 2016. 11. 20

Contact
yychiu@cts.nthu.edu.tw (Candle Chiu)

NCTS 

NCTS Annual Theory Meeting 2016

Quantum Simulations and Numerical Studies on Many-Body Physics

12:9
Zyxxel Auditorium (合勤演藝廳)

12:10-11
International Conference Hall
8F, General Building II (綜合二館國際會議廳)
National Tsing-Hua University, Hsinchu, Taiwan

9th - 11th Dec. 2016

Since Richard Feynman's proposal in 1982, quantum simulators have been realized on a number of experimental platforms, including systems of ultracold quantum gases, trapped ions, photonic systems and superconducting circuits etc. Systems of ultracold atoms attract extensively attention in recent decades because of the great flexibility of experimental parameters for observing the ground state as well as the dynamical properties of a many-body system. The main purpose of this conference is to provide an opportunity for world renowned physicists in experimental, theoretical, and numerical aspects to interact extensively in related problems, and to present their latest research results with the physicists especially young researchers in Taiwan.

Invited Speakers


Hans Peter Buchler (Stuttgart U, Germany)	Christie Chiu (Harvard U, USA)
Hui Zhai (Tsing Hua U, China)	Ming-Shien Chang (Academic Sinica, Taiwan)
Yuki Kawaguchi (Nagoya U, Japan)	Yu-Ju Lin (Academic Sinica, Taiwan)
Masaki Tezuka (Kyoto U, Japan)	Frank Pollmann (MPQ, Germany)
Ting-Kuo Lee (Academia Sinica, Taiwan)	Lode Pollet (U. Munich, Germany)
Sungkit Yip (Academia Sinica, Taiwan)	Andreas Lauchli (U. Innsbruck, Austria)
Ming-Chiang Chang (NCTU, Taiwan)	Egidijus Anisimovas (U. Vilnius, Lithuania)
Cheng Chin (Chicago U, USA)	Hong Yao (Tsing-Hua U, Beijing)
Chris Monroe (UMCP, USA)	Ian McCulloch (U. Queensland, Australia)
Yosuke Takasu (Kyoto U, Japan)	


Coordinators

Miguel Cazaillia (NCTS/NTHU)	Ying-Jer Kao (NTU)
Pochung Chen (NTHU)	Daw-Wei Wang (NTHU/NCTS)
Gediminas Juzėlūnas (Vilnius University)	

Registration (Deadline of application: 11/15)
<http://phys.cts.nthu.edu.tw/actnews/signup.php?Sn=305>

Contact
irispeng@cts.nthu.edu.tw (ASSISTANT)



NCTS 

Visitors

Ahn, Yang-Hwan
Center for Theoretical Physics of
the Universe, Institute for Basic
Dec 28-31, 2016

Anisimovas, Egidijus
Vilnius University
Dec 07-14, 2016

Aranda Fernández, Alfredo
University of Colima
Dec 02-10, 2016

Arhrib, Abdesslam
Abdelmalek Essaâdi University
Aug 01-20, 2016

Arratia, Paula
University of Pennsylvania
Sep 05-08, 2016

Balazs, Csaba
Monash University
Dec 27, 2016 - Jan 01, 2017

Ballmer, Stefan Werner
Syracuse University
Dec 05-09, 2016

Benbrik, Rachid
Cadi Ayyad University
Jul 06-31, 2016

Björk, Jonas
Linköping University
May 08-14, 2016

Büchler, Hans Peter
Institut für theoretische Physik III,
Universität Stuttgart
Dec 08-11, 2016

Buchleitner, Andreas
Theoretical Physics, Albert-
Ludwigs-University Freiburg
Jan 01-19, 2016

Buscemi, Francesco
Nagoya University
Aug 28-Sep 03, 2016

Castro, Eduardo V.
University of Lisbon
Nov 13-15, 2016

Chan, Garnet Kin-Lic
Division of Chemistry and
Chemical Engineering, California
Institute of Technology,
Dec 11-14, 2016

Chang, Der-Chen
Georgetown University
May 31 - Jul 25, 2016;
Dec 12, 2016 - Jan 08, 2017

Chang, Tu-Nan
University of Southern California
Apr 21 - May 31, 2016
Nov 11 - Dec 13, 2016

Chen, Guanhua
University of Hong Kong
May 17-18, 2016;
Nov 11 - Dec 13, 2016

Chen, Xin
Tsinghua University
Mar 22-25, 2016

Cheung, Yeuk Kwan Edna
Nanjing University
Sep 25 - Oct 05, 2016

Chin, Cheng
University of Chicago
Dec 08-11, 2016

Ching, Emily
Chinese University of Hong Kong
Sep 05-08, 2016

Chiu, Christie Shinglei
Harvard University
Dec 08-11, 2016

Choi, Ki-Young
Chonnam National University
May 26-29, 2016

Chu, Ming-Chung
Chinese University of Hong Kong
Mar 21-25, 2016

Chun, Eung Jin
Korea Institute for Advanced Study
May 25-29, 2016

Chung, Sung Gong
Western Michigan University
Feb 29 - Mar 02, 2016

Coleman, Piers
Rutgers University
Feb 28 - Mar 04, 2016

De Boer, Jan
Institute for Theoretical Physics,
University of Amsterdam
Dec 06-09, 2016

De Gouvêa, André
Northwestern University
Aug 17-22, 2016

Derendinger, Jean-Pierre
Albert Einstein Institute for
Fundamental Physics, Bern
University
Oct 15-29, 2016

Di Ventra, Massimiliano
University of California at San
Diego
Oct 29 - Nov 02, 2016

Eguchi, Tohru
Rikkyo University
Dec 07-11, 2016

Endo, Motoi
The High Energy Accelerator
Research Organization, KEK
May 25-29, 2016

Evans, Jason Lott
Korea Institute for Advanced Study
May 25-29, 2016
Fan, Huijun
Peking University
Nov 20-30, 2016

Fang, Shiang
Harvard University
Jan 10-11, 2016
May 30 - Jun 17, 2016

Feng, Wang-Xiang
Beijing Institute of Technology
May 07 - Jul 31, 2016

Flores Castillo, Luis Roberto
Chinese University of Hong Kong
Mar 22-25, 2016

Foot, Robert
University of Melbourne
Sep 26 - Oct 09, 2016

Fuertes, Guillem Domenech
Kyoto University
May 02-06, 2016

Furtado Valle, José Wagner
Instituto de Física Corpuscular
Dec 05-12, 2016

Golestanian, Ramin
University of Oxford
Sep 05-08, 2016

Gong, Jiangbin National University of Singapore Dec 11-14, 2016	Hu, Ping-Kai University of California, Los Angeles Dec 29-31, 2016	Kawai, Shinsuke Sungkyunkwan University Jul 01-07, 2016
Gong, Jinn-Ouk Asia Pacific Center for Theoretical Physics Dec 28-30, 2018	Hu, Xuedong University at Buffalo Dec 11-15, 2016	Kawashima, Naoki University of Tokyo Dec 11-16, 2016
Gross, Eberhard K. U. Max Planck Institute of Microstructure Physics Apr 14-18, 2016 May 11-19, 2016	Huang, Ching-Yu Stony Brook University Jan 05-08, 2016	Keung, Wai-Wee University of Illinois at Chicago May 21-29, 2016 Dec 27 - Jan 23, 2017
Gu, Pei-Hong Shanghai Jiao Tong University Dec 28, 2016 - Jan 01, 2017	Huang, Chunli Nanyang Technological University Jun 29-30, 2016	Kim, Choong Sun Yonsei University Sep 24 - Oct 01, 2016
Guo, Hong McGill University Oct 30-Nov 02, 2016	Huang, Keh-Ning Sichuan University Feb 18-22, 2016	Kim, Jihn Eui Center for Axion and Precision Physics Research, Institute for Basic Science Dec 05-09, 2016
Hagiwara, Kaoru KEK Theory Center Dec 04-11, 2016	Huang, Qing-Guo Chinese Academy of Sciences Dec 28, 2016 - Jan 01, 2017	Kim, Seok Seoul National University Nov 11-14, 2016
Han, Tao University of Pittsburgh Dec 07-10, 2016	Huang, Rui Zheng Chinese Academy of Sciences Dec 11-16, 2016	Kim, Seyong Sejong University May 26-29, 2016
Hashimoto, Koji Osaka University May 08-10, 2016	Hyun, Young-Hwan Sungkyunkwan University Dec 28-31, 2016	Kimura, Taro Keio University Oct 25 - 29, 2016
Hayakawa, Masashi Nagoya University May 25-30, 2016	Ito, Katsushi Tokyo Institute of Technology Nov 09-14, 2016	Kirchner, Stefan Center for Correlated Matter, Zhejiang University Feb 29 - Mar 04, 2016
Hirsch, Flavien University of Geneva Aug 03-16, 2016	Izmailian, Nikolay Yerevan Physics Institute Sep 01-08, 2016	Kitamoto, Hiroyuki Kyoto University Apr 10-13, 2016
Hisano, Junji Nagoya University May 27-28, 2016	Jiang, Yun NBI, Denmark Dec 27-31, 2016	Kitano, Ryuichiro KEK Theory Center May 25-29, 2016
Hosotani, Yutaka Osaka University Dec 07-09, 2016	Jinno, Ryusuke The High Energy Accelerator Research Organization, KEK May 25-29, 2016	Kitazawa, Noriaki Tokyo Metropolitan University Oct 30 - Nov 01, 2016
Hosoya, Toshihiko RIKEN Brain Science Institute Sep 05-07, 2016	Juzeliunas, Gediminas Vilnius University Apr 17-30, 2016 Dec 09-17, 2016	Kitazawa, Yoshihisa KEK, Japan Dec 04-08, 2016
Hou, Tie-Jiun Southern Methodist University Jan 07-17, 2016	Kaori, Fuyuto Nagoya University Feb 25 - Mar 13, 2016	Klimov, Vasily P.N. Lebedev Physical Institute Dec 08-13, 2016
Hu, Bei-Lok University of Maryland Nov 19-27, 2016	Kawaguchi, Yuki Nagoya University Dec 09-11, 2016	Ko, Pyungwon Korea Institute for Advanced Study May 25-29, 2016 Dec 28-31, 2016

Kohri, Kazunori KEK Theory Center May 25-28, 2016	Li, Chun-Biu Hokkaido University Mar 27-30, 2016	Matsumoto, Shigeki Kavli Institute for The Physics and Mathematics of The Universe May 25-29, 2016
Koshino, Kazuki Tokyo Medical and Dental University Dec 12-15, 2016	Li, Fuli Xi'an Jiaotong University Dec 09-16, 2016	Mcculloch, Ian University of Queensland Nov 30 - Dec 11, 2016
Krapivsky, Paul Boston University Sep 05-08, 2016	Li, Xinqi Beijing Normal University Dec 10-15, 2016	Mckellar, Bruce University of Melbourne Oct 16 - Nov 4, 2016
Kraus, Per University of California at Los Angeles Nov 11-13, 2016	Liao, Hai Jun Chinese Academy of Sciences Dec 11-16, 2016	Mertig, Ingrid Martin-Luther-University of Halle- Wittenberg Oct 30 - Nov 1, 2016
Krřšák, Martin Institute for Theoretical Physics, São Paulo State University Jun 07-17, 2016	Lin, Shin-Ted Sichuan University Feb 15-21, 2016	Millateri, Micro National University of Singapore Jan 10-19, 2016
Kuno, Yoshitaka Osaka University, Japan Dec 28, 2016 - Jan 03, 2017	Liu, Jianglai Shanghai Jiao Tong University Dec 08-09, 2016	Miyoki, Shinji University of Tokyo Dec 05-08, 2016
Kurachi, Masafumi KEK, Japan May 25-29, 2016	Liu, Tao Hong Kong University of Science and Technology Mar 22-24, 2016	Mizutani, Yasuhisa Osaka University Mar 29-31, 2016
Kurizki, Gershon Weizmann Institute of Science Oct 24-27, 2016	Liu, Yu Xi Tsinghua University Dec 10-16, 2016	Modi, Kavan Kishore Monash University Dec 09-20, 2016
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Läuchli, Andreas Universität Innsbruck Dec 08-12, 2016	Low, Ian Northwestern University Dec 28-29, 2016	Mukaida, Kyohei Kavli Institute for The Physics and Mathematics of the Universe May 25-29, 2016
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Ng, John
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Nojiri, Mihoko
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Exact Partition Functions of Interacting Self-Avoiding Walks on Lattices

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Hu, Chin-Kun

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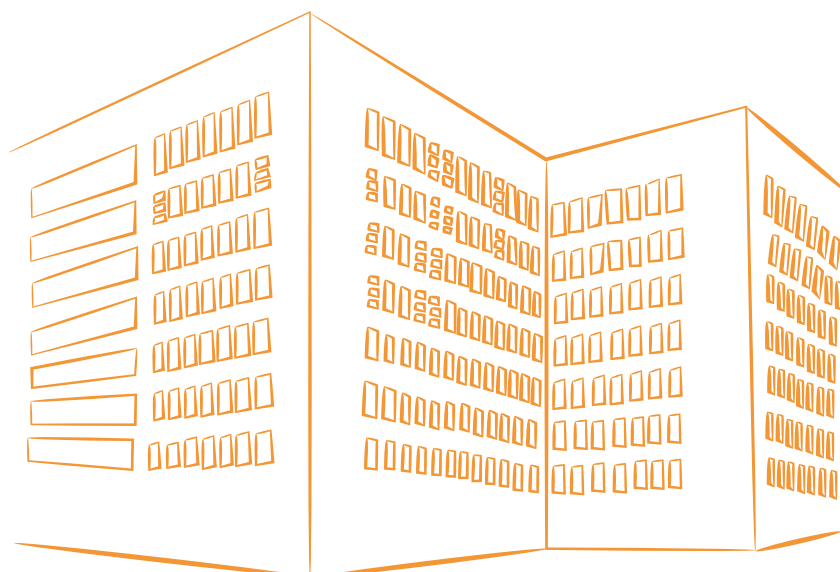
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