Nishina Asia Award 2017年度候補者一覧

査読者（配布資料）

（敬称略）

ファイル番号	候補者	候補者所属	業績の題目	推薦者	論文査読者
No.17-1	Yong-il Shin KOREA	School of Physiccs & Astronomy, Seoul National University, Seooul 151-747 KOREA	for his ingenious demonstration of atom interferometry with Bose-Einstein condensates using atom chips and trapping geometry, in-situ imaging method overcoming outstanding obstacle for exploring strongly interacting Fermi gases, and observation of various topological excitations and Berezinskii-Kosterlitz-Thouless phase transition in quasi-2d Bose gas.	Soo-Jong Rey Professor, School of Physics & Astronomy, Seoul National University, Seoul 151-747 KOREA	西森 家 磯
No.17-2	**Pengjie Zhang** China	Center for Astronomy and Astrophysics, Department of Physics and Astronomy, Shanghai Jiao Tong University	original E_g method to test gravity theories at cosmological scales, and rigorous proof of the Copernican principle	Yipeng Jing Center for Astronomy and Astrophysics, Department of Physics and Astronomy, Shanghai Jiao Tong University	佐々木 福嶋
No.17-3	NGUYEN QUANG HUNG Viatnamese	Instititе of Research and Developmenrt,Duy Tan University	The award is given to Dr. Nguyen Quang Hung for his contributions in the nuclear structure theory, particularly for the description of level density and γ-ray	初田　哲男 理化学研究所	福嶋 江口
No.17-4	Kai-Feng Chan Taiwan(ROC)	Department of Physics,National Taiwan University	"his significant contributions to the measurement of the rarest Bs meson decays with the data from the Large Hadron Collider"	Yuan-Huei Chang Department of Physics,National Taiwan University	山内 梶田 永宮
No.17-5 A-	Ying Jiang China	Associate Professor Internaeional Center for Quantum Materials,School of Physics Peking Univerity,Beijing China	Unraveling nuclear quantum effects of water at atomic scale	Rui-Rui Du Chair Profesor of Physics Director of the International Center for Quantum Materials Peking Universty.Beijing China	三島 前野

No.17-6	Lin Hsin Taiwan	National Universty of Singapore	His theoretical research concerns the electronic structure and spectroscopy of exotic quantum states of matter such as topological insulators and high temperature superconductors. His research effort includes the search for new topological materials which have opened new routes for generating novel phases of matter with huge potential applications in spintronics, information and energy technologies.	Leong-Chuan Kwek Center for Quantun Technologies,National University of Singapore	家 前野 西森
No.17-7 A-	Aninda Sinha Indian	Centre for High Enrgy Physics,Indian Institute of Science,Bangalore	For his key contributions leading to the odd dimensional c-theorem in quantum field theory and for a new method to do the conformal bootstrap for extracting analytic results.	Ashoke Sen harish-Chandra Research Institute	磯 江口 永宮
No.17-8	**Dong Qian** Born in Jan. 24th, 1977， China	Physics Department, Shanghai Jiao Tong University	the coexistence of superconductivity and topological state in topological insulator films, which is a breakthrough for the probing and manipulating of Majorana Fermions in topological insulators	Prof. Dr. Gui Lu Long (APS Fellow, IoP Fellow, Member of IUPAP C13 Commission) Department of Physics, Tsinghua University, Beijing 10084, China	前野 家 西森
No.17-9 A 受賞	Hongming WENG China	Institute of Physics, Chinese Academy of Sciences	For his outstanding contributions to the discovery of Weyl semimetals, in particular, the theoretical prediction of TaAs family compounds as candidates for Weyl semimetals.	Lu Yu, Institute of Physics, Chinese Academy of Sciences,	前野 家 西森
No.17-10	Li-Sheng Geng China	School of Physics and Nuclear Energy Engineering, Beihang University	For his significant contribution to the exploration of relativistic effects in our understanding of microscopic world ranging from nucleons to atomic nuclei.	Jie Meng, School of Physics, Peking University	永宮 磯

No.17-11	Bedangadas Mohanty India	National Institute of Science Education and Research Bhubaneswar (NISER)	the study of the Quantum Chromodynamics phase diagram in high-energy nuclear collisions and for the discovery of the heaviest anti-matter nucleus."	Spenta R Wadia International Centre for Theoretical Sciences (ICTS-TIFR), Tata Institute of Fundamental Research, Bangalore, India	福嶋 江口
No.17-12	Jianglai Liu China	Shanghai Jiao Tong University	For his seminal contributions to PandaX 500kg Liquid xenon dark matter experiment in China Jinping Underground Laboratory,which has reached the world-best detection sensitivities for WIMPs in 2016	Xiangdong JI Distinguished University Professor,U.of Maryland Hongwen Chair Professor,Shanghai Jiao Tong University	梶田 山内
No.17-13	Jun Zhao China	Xie Xide Junnior Chair Professor,Dept.of Physics,Fudan University,Shanghai,China	The elucidation of magnitic properties of unconventional superconductors and related materials.	Ruibao Tao Department of Physics,Fudan University	家 前野
No.17-14 A	Yu-tin Huang Taiwan	Physics Department,National Taiwan University	For his contribution to uncoverring hidden symmetries and structures in the S-matrix of gauge and gravity theories in diverse dimensions.	Pei-Ming Ho Physics Department,National Taiwan University	磯 江口
No.17-15	Bijaya Kumar Sahoo India	Associate Professor,Theoretical Physics Division,Physical Research Laboratory	The candidate have developed a novel many-body atomic theory in a relativistic voupled-cluster framework and performed accurate calculation of the electric dipole moment (EDM) of an atomic system.	Yasuhiro Sakemi Professor,Center for Nuclear Study,The University of Tokyo	福嶋 永宮 梶田

No.17-16	Yang Zhang China	University of Illinois at Urbana-Champaign, 104 South Wright Street, Urbana, IL	For his work on the extreme properties of water as well as other metallic, molecular, and ionic liquids.	Professor Emeritus Sow-Hsin Chen Massachusetts Institute of Technology	三島 家
No.17-17 A-	Cheng-Zhi Peng China	Professor for experimental physics,University of Science and Technology of China(USTC)	Cheng-Zhi Pengs outstanding innovation and major brakthrough in the long-distance quantum communication	Jian-Wei Pan Academician of the Chinese Academy of Sciences,Professor Executive Vice President of University of Science Technology of China	西森 伊藤
No.17-18	Suvrat Raju India	International Centre for Theoretical Sciences,Tata Institute of Fundamental Reserch	For proposing a construction of the black-hole interior in AdS/CFT that has led to new insights into the information paradox and the nature of local observables in quantum gravity,	Spenta Wadia Emeritus Professor and Founding Dfirector,International Centre for Theoretical Sciences	磯 佐々木
No.17-19 A	Bumjoon Kim Korean	Department of Physics Pohang University of Science and Technology	The discovery and experimental study of an unconventional Mott insulating state induced by relativistic spin-orbit coupling in iridates.	Jae-Hoon Park, Ph.D. Chairman/Professor, Department of Physics Pohang University of Science and Thechnology,	前野 家

Nomination form for the 2017 Nishina Asia Award

Candidate
Yong-il Shin Citizen of the Republic of Korea School of Physics & Astronomy, Seoul National University, Seoul 151-747 KOREA Phone: +82 2 880 4226 Web: http://phya.snu.ac.kr/yishin, Email: yishin@snu.ac.kr **Professional Experience** 2011.03 – present Associate Professor, School of Physics & Astronomy, Seoul National University, Seoul 151-747 KOREA 2009.09. – 2011.02. World Class University Assistant Professor, School of Physics & Astronomy, Seoul National University, Seoul 151-747 KOREA 2008.07. – 2009.08. Research Scientist, 2006.01. – 2008.07. Postdoctoral Associate, Both at MIT-Harvard Center for Ultracold Atoms (strongly interacting Fermi gases and novel optical lattice emulator) 2001.08. – 2005.12. Research Assistant Research Laboratory of Electronics, MIT, USA (Bose-Einstein condensate interferometry and atom chips for strongly interacting Fermi gases) **Education** 2001.08 – 2006.02, Ph.D. in Physics Massachusetts Institute of Technology, Cambridge MA USA **Awards, Honors and Fellowships** 2013 Korean Physical Society Young Career Physicist Award 2011 TJ Park Science Faculty Fellowship 2006 Finalist in the competition for the American Physical Society award for Outstanding Doctoral Thesis Research in Atomic, Molecular and Optical Physics (2006) 2005 Martin Deutsch Award for Excellence in Experimental Physics, MIT 2005 Guinness World Record as Lowest Man-made Temperature, 450 pico-Kelvin, based on the publication Science **301,** 1513 (2003) 1995-2000 Fellow of the Korea Foundation for Advanced Studies 1994 Bronze Medal, 25th International Physics Olympiad, Beijing, China
Citation for the Award (within 30 words)
for his ingenious demonstration of atom interferometry with Bose-Einstein condensates using atom chips and trapping geometry, in-situ imaging method overcoming outstanding obstacle for exploring strongly interacting Fermi gases, and observation of various topological excitations and Berezinskii-Kosterlitz-Thouless phase transition in quasi-2d Bose gas.
Description of the work

Shin started his major research career at MIT under the supervision of Wolfgang Ketterle and David Pritchard. He persistently focused on atom interferometry with Bose-Einstein condensate (BEC) using atom chips and successfully demonstrated it in a trapping geometry for the first time.
For this achievement, he received in 2005 the prestigious Martin Deutsch Award for Excellence in Experimental Physics at MIT and was a finalist in 2006 in the competition for the APS award for Outstanding Doctoral Thesis Research in Atomic, Molecular and Optical Physics.
With all momentum built at MIT, Shin continued postdoctoral research there and carried out 2 major research programs – experimental study of unitary Fermi gas and also of DARPA Optical Lattice Emulator. He is the first achiever of so-called in-situ imaging method for the study of thermodynamic properties of strongly interacting Fermi gas. It provided a new way to circumvent the inhomogeneous density broadening effect that is an intrinsic problem in experiments with trapped samples, thus enabled to make significant progress worldwide in our understanding of strongly interacting Fermi gases.
During this relatively short period, Shin achieved direct observation of phase separation of a superfield and a normal phase, quantitative determiniation of the phase diagram of a unitary Fermi gas, and determination of the equation of state of a polarized Fermi gas at unitarity.
Since 2009, Shin vigorously developed his own research program in Korea. Within a year, he succeeded in making BEC of neutral atoms first time in Korea. He ambitiously studied topological excitations (2d skyrmions and half-quantum vortices) in spinor BEC and Berezinski-Kosterlitz-Thouless (BKT) phase transition in quasi-2d Bose gases. It should be stressed how he managed to achieve all these despite intrinsic obstacles pervading in Korean research environment. There was no prior research infrastructure, nor any experienced researchers in the field. Despite this, Shin managed brilliantly how to train new generation of young researchers and at the same time achieve the highest quality of research accomplishment.
In a short career over a decade, Shin has built solid and remarkable reputation among colleagues in Korea and around the world as the most creative and the most audacious researcher in the field of low-temperature atomic physics. His understanding on physics over a wide range of topics, even in the field of quantum field theory and cosmology, both theory and experiments, is truly impressive. For the last 7 years, I always end up tossing physics with him most frequently and I always leave with fully charged ideas and excitement.
I am truly confident that it is only a matter of time that he will surprise all of us with a chain of new jaw-dropping discoveries in the realm where our imagination indicated otherwise so far.

Key references (up to 3 key publications*)

1. Atom interferometry with Bose-Einstein condensates in a double-well potential, Physical Review Letters 92, 050405 (2004) 512 citations
2. Observation of phase separation in a strongly interacting imbalanced Fermi gas, Physical Review Letters 97, 030401 (2006) 421 citations
3. Phase diagram of a two-component Fermi gas with resonant interactions, Nature 451, 689 (2008) 342 citations

*) Copy of the first paper is attached.

Nominator (name, affiliation, email, telephone and relation to the candidate)

Soo-Jong Rey
Professor, School of Physics & Astronomy, Seoul National University, Seoul 151-747 KOREA
Director, Fields, Gravity & String, Center for Theoretical Physics of the Universe, Institute of Basic Sciences, Daejon KOREA
Email: sjrey @ snu.ac.kr, Phone: + 82 2 884 6233 (Office) +82 10 9677 1701 (mobile)
Relation to candidate: both belong to the faculty of School of Physics at Seoul National University

Signature Soo-Jong Rey Date January 13, 2017

Nomination form for the 2015 Nishina Asia Award

Candidate (name, affiliation, curriculum vitae including the date of the degree of Ph.D., nationality, address, email and telephone)
Name: Pengjie Zhang Affiliation: Center for Astronomy and Astrophysics, Department of Physics and Astronomy, Shanghai Jiao Tong University CV: Research field: cosmology, the large scale structure of the universe and its applications in fundamental cosmological physics 2013-present, professor, Department of Physics and Astronomy, Shanghai Jiao Tong University 2005-2015, professor, Shanghai Astronomical Observatory, Chinese Academy of Sciences 2003-2005, postdoc, Fermilab 2003, Ph.D, University of Toronto 1975, year of birth Nationality: China Address: Center for Astronomy and Astrophysics, 955 Jianchuan Road, Shanghai, China Email: zhangpj@sjtu.edu.cn Telephone: 01186-21-67285628 (office), 01186-13472585276 (mobile)
Citation for the Award (within 30 words)
For his original E_g method to test gravity theories at cosmological scales, and for his rigorous proof of the Copernican principle at cosmological scales. Both works have significantly enhanced our understanding of the Universe.

Description of the work
Pengjie Zhang works on the statistics of the large scale structure (LSS) of the universe and using LSS to probe fundamental cosmological physics. He made significant contributions to testing General Relativity (GR) at cosmological scale and the Copernican principle, two fundamental principles of cosmological physics. (1) The E_G method to test GR at cosmological scale (Zhang et al. 2007, PRL). Although GR has been rigorously tested in solar system, it is difficult to test at cosmological scales. Therefore the observed cosmic acceleration can be either caused by a mysterious dark energy, or modifications of GR at cosmological scale. A key to break this degeneracy is to test GR at cosmological scales independently. By combining weak lensing and redshift distortion, Zhang et al. (2007) proposed the E_G method which directly measures the capability of mass to distort space-time. Furthermore, by construction, it significantly reduces uncertainties from the otherwise troublesome galaxy bias and initial density fluctuation. It is therefore a highly discriminating probe of various gravity models such as GR, DGP, f(R) and TeVeS. E_G has been widely accepted as a major method to test GR at cosmological scale (e.g. Clifton et al. 2012, review of modified gravity and cosmology on Physics Reports). It was applied in SDSS surveys and confirmed GR at z~0.3 and ~50 Mpc scales (Reyes et al. 2010). It has been adopted as an important scientific goal by stage IV dark energy surveys such as DESI and LSST. It is capable of testing GR at 1% accuracy at ~100 Mpc scale over the past 10 billion years. (2) The "linear" kinetic SZ method which confirmed the Copernican Principle (Zhang & Stebbins, 2011, PRL). The Copernican Principle, a corner stone of modern cosmology, assumes that we do not live in a special region of the universe. However, it is extremely hard to verify, especially over billion light year radial scale and above. This leaves a major loophole in modern cosmology. For example, violations of the Copernican Principle along the radial direction (the LTB models in general and the void model to be specific), which are consistent with CMB, can explain supernovae data without resorting to cosmic acceleration and dark energy. It therefore challenges a major discovery of modern cosmology and physics. Zhang and Stebbins (2011) found that, violations of the Copernican Principle will inevitably cause a diffuse kinetic Sunyaev Zel'dovich (kSZ) effect with unique "linear" dependence on density fluctuation. Interesting void models, which can explain supernovae data without dark energy, cause a linear kSZ effect orders of magnitude larger than observation. Therefore this linear kSZ test was the most stringent test of the Copernican principle. It robustly ruled out the void models and confirmed the Copernican Principle at >1Gpc radial scale. Ethan Vishniac, the chief editor of ApJ and a leading expert on the kSZ effect, appraised this work as "hard to see any loopholes", during an interview by physicsworld.
Key references (up to 3 key publications*)

1. Zhang, P., M. Liguori, R. Bean, and S. Dodelson, Probing Gravity at Cosmological Scales by Measurements which Test the Relationship between Gravitational Lensing and Matter Overdensity, 2007, Physical Review Letters, vol.~99, Issue 14, id.~141302, 99, 141302
2. Zhang, P. and A. Stebbins, Confirmation of the Copernican Principle at Gpc Radial Scale and above from the Kinetic Sunyaev-Zel'dovich Effect Power Spectrum, 2011, Physical Review Letters, vol.~107, Issue 4, id.~041301, 107, 041301

*) Copy of one most significant publication should be attached.

Nominator (name, affiliation, email, telephone and relation to the candidate)

Name: Yipeng Jing

Affiliation: Center for Astronomy and Astrophysics, Department of Physics and Astronomy, Shanghai Jiao Tong University

Email: ypjing@sjtu.edu.cn

Telephone: 0086-21-34203945 (o), 0086-13641754198 (mobile)

Relation to the candidate: the nominator is the vice dean for research of the department of physics and astronomy. He has been a colleague of the candidate for more than 10 years, and is working in the same research field.

Signature Yipeng Jing Date 2015/3/14

Nomination form for the 2017 Nishina Asia Award

Candidate (name, affiliation, curriculum vitae including the date of the degree of Ph.D., nationality, address, email and telephone)

Name: NGUYEN QUANG HUNG Date of birth: July 24, 1980
Nationality: Vietnamese Sex: male

Affiliation: Institute of Research and Development, Duy Tan University, K7/25 Quang Trung, Danang City, Vietnam

Office address: Representative Office of Duy Tan University in Ho Chi Minh city, No 10C, Tran Nhat Duat street, No 1 district, Ho Chi Minh city, Vietnam
Tel: +84-903-255 294; Email: nqhungdtu@gmail.com

Position: Associate Professor, Group Leader

Home address: Room 06.05, Block A4, Hoang Anh Gold House Building, Nguyen Huu Tho street, Nha Be district, Ho Chi Minh city, Vietnam.

Education:
- Undergraduate: Department of Nuclear Physics, Faculty of Physics, Hanoi University of Science – Hanoi National University. *Date of university graduation*: September 2003;
- Master: Department of Nuclear Physics, Faculty of Physics, Hanoi University of Science, Hanoi National University. *Date of master degree*: November 2005;
- PhD: Heavy-Ion Nuclear Physics Laboratory, Nishina Center for Accelerator-Based Science, RIKEN and Institute of Physics – Vietnam Academy of Science and Technology. *Date of Ph.D. degree*: November 2009;
- Postdoc: Nishina Memorial Fellow at Nishina Center for Accelerator-Based Science, RIKEN, December 2009 – May 2010.

Employment records:
- 2009 – 2011: Contract Researcher, Center for Nuclear Physics, Hanoi Institute of Physics.
- 2011 – 2014: Assistant Professor, Head of Physics Department, School of Engineering, Tan Tao University.
- 2014 – 2015: Associate Professor, Vice Dean, School of Engineering, Tan Tao University.
- 2015 - present: Associate Professor, Leader of Nuclear Theory Group, Institute of Research and Development, Duy Tan University.

Awards:
- Certificate of Merit for Excellent Research Achievement by Hanoi Institute of Physics (2010).
- Young Researcher Award by Vietnam Theoretical Physics Society (2012).
- Certificate of Merit for Excellent Contribution in Teaching and Research at Tan Tao University by President of People's Committee of Long An prefecture (2014).
- Chu Van An Award for Excellent Achievements in Teaching and Research by President of Tan Tao University (2015).

Citation for the Award (within 30 words)
The award is given to Dr. Nguyen Quang Hung for his contributions in the field of nuclear structure theory, particularly for the description of level density and γ-ray strength function.

Description of the work

This work has made a major step forward by proposing, for the very first time, a unifed and consistent microscopic approach capable of describing simultaneously the nuclear level density and the emission probability of γ-rays from hot nuclei, which play essential roles in stellar nucleosynthesis.

According to the rules of quantum mechanics, the atomic nucleus has discrete energy levels. As the excitation energy increases, the level spacing decreases rapidly so that the levels become densely crowded. In this condition dealing with individual nuclear levels becomes impractical. Instead, it is meaningful and convenient to consider the average properties of nuclear excitations in terms of the nuclear level density (NLD) and radiative strength function (RSF). The former, introduced by Hans Bethe 80 years ago, is the number of excited levels per unit of excitation energy. The latter, proposed by Blatt and Weisskopf 64 years ago, describes the emission probability of high-energy light quanta (γ–rays), which is expressed in terms of the average reduced partial radiation of γ-rays per unit energy interval.

These two quantities are indispensable ingredients in astrophysical nucleosynthesis, including the calculations of reaction rates in cosmos and production of elements, as well as in technology such as nuclear energy production and transmutation of nuclear waste. Therefore, the study of these quantities has been one of the most important topics in nuclear physics. This study has gained impetus in 2000 after the experimentalists of Oslo university proposed a method to simultaneously extract both the NLD and RSF from the primary γ-decay spectrum obtained in a single compound nuclear reaction experiment (Fig. 1). This method, however, suffers from the normalization uncertainties. Given the importance of the NLD and RSF, it is imperative to have a consistent theoretical basis to understand these quantities. Nonetheless, a unified theory capable of simultaneously and microscopically describing both the NLD and RSF has been absent so far.

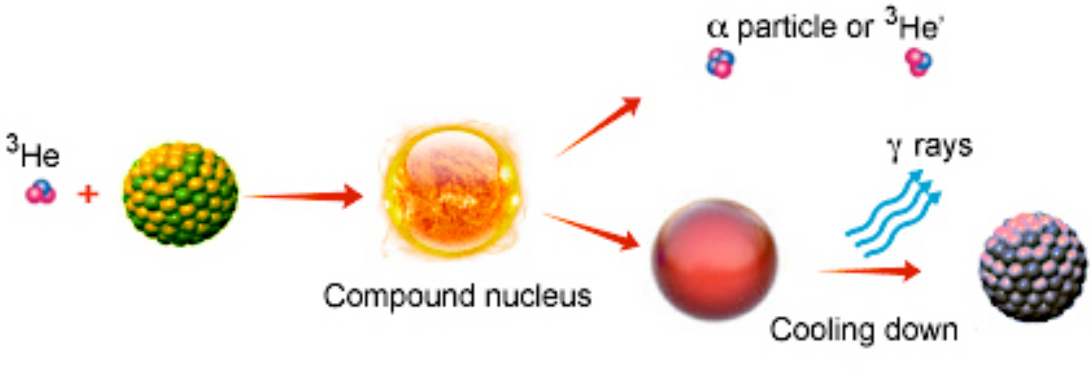


Fig. 1: *In reactions performed by using the Oslo method the light particles (e.g. ^{3}He) fuse with a heavy target creating a compound nucleus at a certain temperature (hot nucleus), which subsequently cools down by emitting light particles (e.g. α-particles in transfer reactions or ^{3}He' in inelastic scattering reactions) and γ-rays.*

In the present work, employing the mean fields of independent nucleons (protons and neutrons), the authors exactly solved the problem with superfluid interactions between nucleons. These exact solutions are employed to construct the partition function to calculate the NLD. To calculate the RSF, the exact neutron and proton pairing gaps as well as the related quantities, obtained from the same partition function, are included in the Phonon Damping Model, a microscopic model proposed by one of the authors, N. Dinh Dang of RIKEN Nishina Center for Accelerator-Based Science, in collaboration with A. Arima in 1998 to describe the damping of giant dipole resonance in highly excited nuclei.

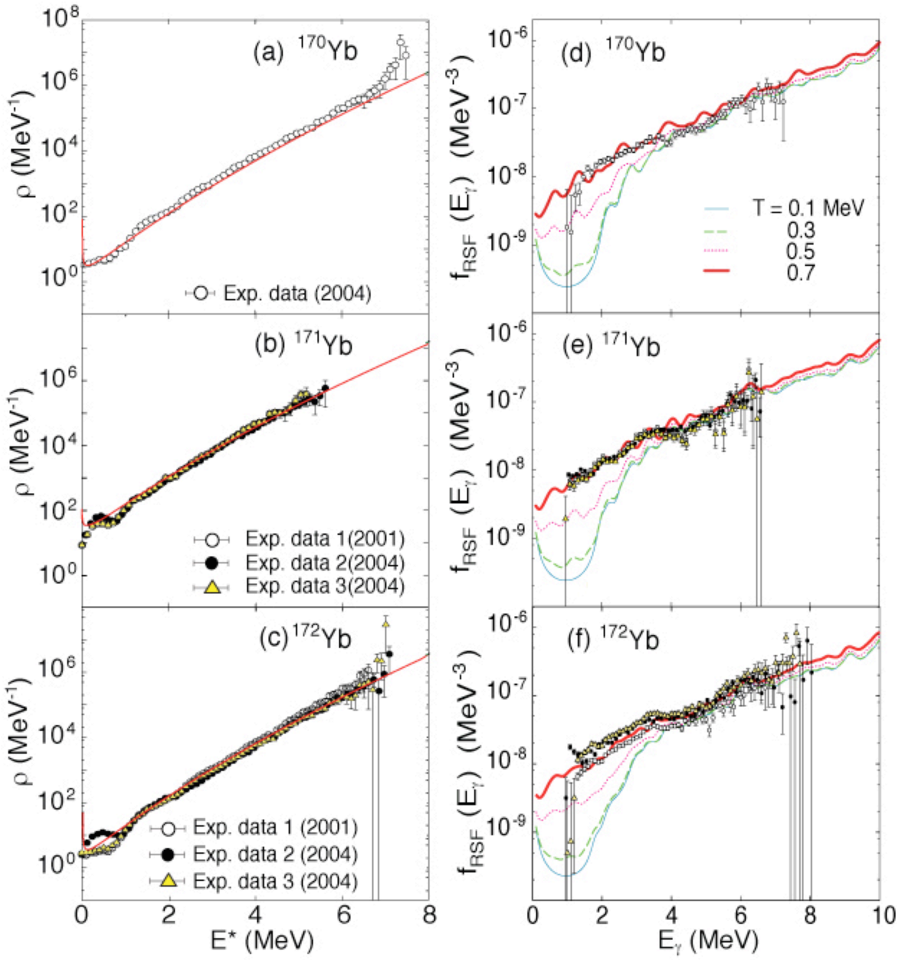


Fig. 2: *NLD [(a) - (c)] as functions of excitation energy and RSF [(d) - (f)] as functions of the γ-ray energy at different temperatures T, predicted by the present approach, in comparison with the experimental data for ytterbium isotopes* $^{170, 171, 172}$*Yb.*

The good agreement between the predictions by the present approach and experimental data (Fig. 2) indicates that the use of exact solutions for pairing, which conserve rigorously the particle numbers, is indeed very important for the consistent description of both NLD and RSF at low and intermediate excitation and γ-ray energies. It shows that the microscopic strength function with the temperature-dependent width, which was successful in the description of the damping of giant resonances in highly-excited nuclei, turns out to be very important for the correct description of the RSF at low γ–ray energies as well. This finding invalidates the 60-year-old Brink-Axel hypothesis, which assumes that the giant dipole resonance built on an excited state should be the same as that built on the ground state. The explanation of the enhancement found of the RSF at low γ–ray energies is also a big plus of this approach as it does not requires a phenomenological introduction of pygmy dipole resonance to describe a group of additional dipole strengths appearing at the giant resonance's low-energy tail.

Key references (up to 3 key publication*)

1) **N. Quang Hung, N. Dinh Dang, L.T. Quynh Huong,**
Simultaneous microscopic description of nuclear level density and radiative strength function, Phys. Rev. Lett. 118 (2017) 022502.

2) **N. Quang Hung and N. Dinh Dang,**
Thermodynamic properties of hot nuclei within the self-consistent quasiparticle random-phase approximation, Phys. Rev. C 82 (2010) 044316.

3) **N. Quang Hung and N. Dinh Dang,**
Exact and approximate ensemble treatments of thermal pairing in a multilevel model, Phys. Rev. C 79 (2009) 054328.

*) Copy of one most significant publication is attached (Ref. 1).

Nominator (name, affiliation, email, telephone and relation to the candidate)

TETSUO HATSUDA
Chief scientist
Director of Quantum Hadron Physics Laboratory
RIKEN Nishina Center for Accelerator-Based Science
Director of RIKEN Interdisciplinary Theoretical Research Group
Main Research Bldg., R. 430
RIKEN, 2-1 Hirosawa, Wako city, 351-0198 Saitama, Japan;
Tel: 048-467-9343, Fax: 048-462-4698
Email: thatsuda@riken.jp

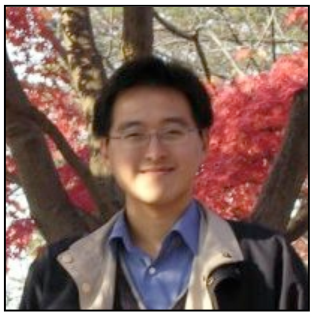
Dr. Nguyen Quang Hung is a former PhD student and current collaborator of Dr. Nguyen Dinh Dang, Nishina Center Research Scientist at my laboratory. His last visit to RIKEN was in March 2016, where he stayed in my laboratory. We are organzing with him a workshop entitled "*International Workshop on Quantum Many-Body Problems in Particle, Nuclear, and Atomic Physics*" (http://np2017.duytan.edu.vn) to be held on March 8 – 11, 2017 at Duy Tan University, Danang city, Vietnam, where Dr. Hung is currently working.

Tetsuo Hatsuda

Signature: Date: 17 January 2017

Tetsuo Hatusda

Nomination form for the 2017 Nishina Asia Award

Candidate (name, affiliation, curriculum vitae including the date of the degree of Ph.D., nationality, address, email and telephone)
Name: Kai-Feng Chen *Affiliation:* Department of Physics, National Taiwan University *Education:* 2005 Ph.D. in Physics, National Taiwan University *Nationality:* Taiwan (R.O.C.) *Address:* R529, Department of Physics, National Taiwan University, No. 1, Sec. 4, Roosevelt Rd., Taipei 10617, Taiwan *E-mail:* kfjack@phys.ntu.edu.tw *Telephone:* +886-2-3366-5153 *Field of Research:* Experimental High Energy Physics CMS Experiment at CERN, Geneva, Switzerland (since 2006) E391a Experiment at KEK, Tsukuba, Japan (since 2005) Belle Experiment at KEK, Tsukuba, Japan (since 1998) *Honor:* IUPAP Young Scientist Prize (2008) Foundation for the Advancement of Outstanding Scholarship Award (2010) Ta-You Wu Memorial Award (2012) GoldenJade Young Scientist Prize (2014) 
Citation for the Award (within 30 words)
"his significant contributions to the measurement of the rarest Bs meson decays with the data from the Large Hadron Collider"
Description of the work

The Bs meson is an unstable composite particle consisting of a bottom antiquark and a strange quark, and decays into two charged muons with a tiny probability of 1/300,000,000. This decay, although rate is very small, but it is especially interesting. Any difference in the observed rate with respect to the prediction would provide a direction in which the Standard Model of particle physics should be modified or extended.

Given the importance, this decay has been searched for more than 30 years by many particle physics experiments. But until recently, only the large production rate of Bs mesons provided by the Large Hadron Collider (LHC) can have the chance to reach the required sensitivity. Prof. Kai-Feng Chen is a member of the CMS (Compact Muon Solenoid) experiment at the LHC. He took over the responsibility of CMS B-physics convenership and coordinated this research work within the collaboration. In summer 2013, CMS collaboration has finished the analysis work with its full data set collected in 2011 and 2012. The result, which shows a statistical significance higher than four standard deviations, had been published in the journal PRL.

Since both CMS, and the LHCb (Large Hadron Collider beauty) experiment, had reach four standard deviations and only a step away from the criterion of "Discovery", a joint analysis for combining the data sets from two experiments has been proceed, with Prof. Chen as one of the corresponding authors. The combined result has a statistical significance exceeding six standard deviations. It is the best measurement of the rarest Bs meson decay so far. It is a major milestone in the particle physics, has been published in the journal Nature.

Key references (up to 3 key publications*)

1. CMS and LHCb Collaborations, "Observation of the rare Bs to mu+mu- decay from the combined analysis of CMS and LHCb data", Nature 522 (2015) 68.
2. CMS Collaboration, "Measurement of the Bs to mu+mu- branching fraction and search for B0 to mu+mu- with the CMS experiment", Phys. Rev. Lett. 111 (2013) 101804.
3. CMS Collaboration, "Search for Bs to mu+mu- and B0 to mu+mu- decays", J. High Energy Phys. 04 (2012) 033.

*) Copy of one most significant publication should be attached.

Nominator (name, affiliation, email, telephone and relation to the candidate)

Name: Professor Yuan-Huei Chang

Affiliation: Department of Physics, National Taiwan University

E-mail: yhchang@phys.ntu.edu.tw

Telephone: +886-2-3366-5126

Relationship: Chair of the department

Signature ______________________________ Date ______________________________

Nomination form for the 2017 Nishina Asia Award

Candidate (name, affiliation, curriculum vitae including the date of the degree of Ph.D., nationality, address, email and telephone)
Ying Jiang, Associate Professor International Center for Quantum Materials, School of Physics, Peking University, Beijing, China Phone: +86-10-62757177 Email: yjiang@pku.edu.cn **Nationality:** China **Education:** Ph.D. Physics. Institute of Physics, Chinese Academy of Sciences (July 2008) Thesis: "The controlled growth and quantum properties of low-dimensional metal systems" Advisor: Prof. Enge Wang B.S. Physics. Beijing Normal University, China (July 2003) **Appointments:** Associate Professor (tenured). International Center for Quantum Materials, School of Physics, Peking University, Beijing, China (Feb. 2016-present) Associate Professor. International Center for Quantum Materials, School of Physics, Peking University, Beijing, China (Feb. 2013-Jan. 2016) Assistant Professor. International Center for Quantum Materials, School of Physics, Peking University, Beijing, China (Jan. 2010-Jan. 2013) Postdoctoral Research Associate. Department of Physics and Astronomy, University of California, Irvine, USA (Mar. 2008-Dec. 2009) **Honors:** Cheung Kong Young Scholar (Ministry of Education of China, 2016) Outstanding Young Scientist (Organization Department of the CPC Central Committee, 2012) Director Awards for excellent research (Chinese Academy of Sciences, 2007)
Citation for the Award (within 30 words)
Unraveling nuclear quantum effects of water at atomic scale

Description of the work

For most of quantum materials, their properties are dictated by the quantum behavior of electrons, while the nuclei are only treated as classical particles. However, light nuclei like H^+ (proton) can exhibit prominent quantum effects due to the small mass, in terms of tunneling and zero-point motion. The so-called nuclear quantum effects (NQEs) are responsible for many abnormal properties of light-element materials such as water. Unfortunately, the accurate and quantitative description of NQEs is very challenging in experiments, since the quantum states of nuclei are much more fragile than those of electrons and are extremely sensitive to the atomic-scale environments. To this end, Dr. Jiang has developed state-of-art scanning tunneling microscopy/spectroscopy (STM/S), which allows the access to the quantum degree of freedom of protons with atomic precision. Combined with *ab initio* path integral molecular dynamics (PIMD) simulations, Dr. Jiang and his collaborators have made groundbreaking steps towards understanding the NQEs of water/ice.

In his first work, Dr. Jiang developed a novel submolecular imaging technique [1], which allows locating in real space the position of protons. Based on this technique, Dr. Jiang succeeded to track the proton transfer in real time within a water nanocluster and observed quantum tunneling of multiple protons in a concerted fashion [2]. It is striking that such a collective proton tunneling can readily occur even near the zero temperature.

This work puts an end to a 20-years long debate whether the collective proton tunneling exists or not and provides an answer to the well-known puzzle: non-zero entropy of ice at zero temperature. The concerted proton tunneling in water/ice has been confirmed afterwards by many groups (both theoretical and experimental) using different techniques.

Another fundamental question of NQEs is how the zero-point motion of proton affects the H-bond interaction. Dr. Jiang provided a smoking gun for this question using a new technique called tip-enhanced inelastic electron tunneling spectroscopy [3]. He and his collaborators unraveled quantitatively, for the first time, the quantum component of a single H bond at a water-solid interface and arrived at a general picture that the zero-point motion of protons weakens the weak H bonds but strengthens the relatively strong ones.

This work yields a cohesive picture for the quantum nature of H bonds. Those findings may completely renovate our understanding of water and provide answers to many weirdness of water from a quantum mechanical view. Furthermore, it is helpful for understanding exotic quantum behaviors of other H-bonded materials such as the high-temperature superconducting phase of H_2S.

Dr. Jiang's creative approaches and his remarkable findings provide substantially new insights into quantum matters. His work opens up a new frontier of condensed matter physics, thus well deserves the Nishina Asia Award.

Key references (up to 3 key publications*)

[1] J. Guo, X. Z. Meng, J. Chen, J. B. Peng, J. M. Sheng, X. Z. Li, L. M. Xu, J. R. Shi, E. G. Wang, Y. Jiang, “Real-space imaging of interfacial water with submolecular resolution”, *Nature Materials* **13**, 184 (2014).

[2] X. Meng, J. Guo, J. Peng, J. Chen, Z. Wang, J. R. Shi, X. Z. Li, E. G. Wang, Y. Jiang, “Direct visualization of concerted proton tunnelling in a water nanocluster”, *Nature Physics* **11**, 235 (2015).

[3] J. Guo, J.-T. Lü, Y. Feng, J. Chen, J. Peng, Z. Lin, X. Meng, Z. Wang, X.-Z. Li, E.-G. Wang, and Y. Jiang, “Nuclear quantum effects of hydrogen bonds probed by tip-enhanced inelastic electron tunneling”, *Science* **352**, 321 (2016).

*) Copy of one most significant publication should be attached.

Nominator (name, affiliation, email, telephone and relation to the candidate)

Rui-Rui Du

Chair Professor of Physics

Director of the International Center for Quantum Materials

Peking University, Beijing, China

Email: rrd@rice.edu

Telephone: 010-13520388312

No mentoring or collaboration relation to the candidate

Signature Rui-Rui Du Date 02/10/2017

Nomination form for the 2015 Nishina Asia Award

Candidate (name, affiliation, curriculum vitae including the date of the degree of Ph.D., nationality, address, email and telephone)
Name: Lin Hsin Affiliation: National University of Singapore Year of PhD Awarded: 2010 Nationality: Taiwan Address: Department of Physics, S12-M01, 2 Science Drive 3, Singapore 117551. Email: phylinh@nus.edu.sg or nilnish@gmail.com Telephone: (+65) 6601 3643
Citation for the Award (within 30 words)
For his important scientific contribution to nanoscience and nanotechnology, particularly in the area of low dimensional nanomaterials, heterostructures, artificial nanostructures including the study and characterization of the optical and transport properties of nanomaterials as well as laser cooling of solids.
Description of the work
His theoretical research concerns the electronic structure and spectroscopy of exotic quantum states of matter such as topological insulators and high temperature superconductors. His research effort includes the search for new topological materials which have opened new routes for generating novel phases of matter with huge potential applications in spintronics, information and energy technologies.
Key references (up to 3 key publications*)
1. S.-Y. Xu, I. Belopolski, N. Alidoust, M. Neupane, G. Bian, C. Zhang, R. Sankar, G. Chang, Z. Yuan, C.-C. Lee, S.-M. Huang, H. Zheng, J. Ma, D. S. Sanchez, B. Wang, A. Bansil, F. Chou, P. P. Shibayev, H. Lin, S. Jia, and M. Z. Hasan, "Discovery of a Weyl fermion semimetal and topological Fermi arcs", Science 349, 613 (2015). 2. S.-M. Huang, S.-Y. Xu, I. Belopolski, C.-C. Lee, G. Chang, B. Wang, N. Alidoust, G. Bian, M. Neupane, C. Zhang, S. Jia, A. Bansil, H. Lin, and M. Z. Hasan, "A Weyl Fermion semimetal with surface Fermi arcs in the transition metal monopnictide TaAs class", Nature Communications 6, 7373 (2015). 3. S.-Y. Xu, C. Liu, S. K. Kushwaha, R. Sankar, J. W. Krizan, I. Belopolski, M. Neupane, G. Bian, N. Alidoust, T.-R. Chang, H.-T. Jeng, C.-Y. Huang, W.-F. Tsai, H. Lin, P. P. Shibayev, F.-C. Chou, R. J. Cava, and M. Z. Hasan, "Observation of Fermi arc surface states in a topological metal", Science 347,

294 (2015). *) Copy of one most significant publication should be attached.

Nominator (name, affiliation, email, telephone and relation to the candidate)

Name: Leong- Chuan Kwek

Affiliation: Center for Quantum Technologies, National University of Singapore

Email: cqtklc@nus.edu.sg

Tel: +6590095232

Relation to Candidate: None

Signature Date Feb 24, 2015

Nomination form for the 2017 Nishina Asia Award

Candidate (name, affiliation, curriculum vitae including the date of the degree of Ph.D., nationality, address, email and telephone)
Aninda Sinha, Centre for High Energy Physics, Indian Institute of Science, Bangalore 560012 Email: asinha.iisc@gmail.com Telephone: +919535663108 Nationality: Indian PhD Degree: 2005 Curriculum vitae enclosed.
Citation for the Award (within 30 words)
For his key contributions leading to the odd dimensional c-theorem in quantum field theory and for a new method to do the conformal bootstrap for extracting analytic results.
Description of the work

Aninda Sinha has made significant contributions towards the understanding of strongly coupled quantum field theories using nonperturbative techniques drawing insights from holography and the conformal bootstrap. His work with R. Myers on c-theorems, based on higher curvature theories of dual gravity models for conformal field theories, in generic dimensions led to a profound novel connection between RG flows and quantum entanglement, which culminated in the conjectured connection between RG flows and entanglement entropy in any dimensions and the subsequent proof in 3 dimensions. With his graduate students, A. Kaviraj and K. Sen, using conformal bootstrap techniques he has proved that the critical exponents for large spin and large twist operators become universal for a large class of conformal field theories. More recently, in a paper with his graduate students (A. Kaviraj and K. Sen) and R. Gopakumar, using conformal bootstrap techniques, he has started a new way of calculating critical exponents, without regularization and renormalization which are in dramatic agreement with Feynman diagram results, but yields new information previously unavailable. This work promises to open new doors in our understanding of strongly coupled phenomena at criticality. The papers pertaining to all the work mentioned above were published during the last seven years after he came back to India and joined the Indian Institute of Science. For his contributions he has been awarded the Ramanujan fellowship of the DST, India in 2010, the Swarnajayanti fellowship of the DST, India in 2015 and the ICTP prize of the International Centre for Theoretical Physics, Trieste, Italy in the honour of Kenneth Wilson in 2016.

Key references (up to 3 key publications*)

1. Holographic c-theorems in arbitrary dimensions, by Robert C. Myers and Aninda Sinha. JHEP 1101 (2011) 125.
2. Universal anomalous dimensions at large spin and large twist, by Apratim Kaviraj, Kallol Sen and Aninda Sinha. JHEP 1507 (2015) 026.
3. Conformal bootstrap in Mellin space, by Rajesh Gopakumar, Apratim Kaviraj, Kallol Sen and Aninda Sinha, Phys. Rev. Lett. 118 (2017) 081601.

Copy of 1 is attached

*) Copy of one most significant publication should be attached.

Nominator (name, affiliation, email, telephone and relation to the candidate)

Ashoke Sen
Harish-Chandra Research Institute
e-mail: sen@hri.res.in
Tel: (+91) 5322569509
Relation to the candidate: Professional acquaintance

Signature Ashoke Sen Date March 11, 2017

Nomination form for the 2014 Nishina Asia Award

Candidate (name, affiliation, curriculum vitae including the date of the degree of Ph.D., nationality, address, email and telephone)
NAME: Dong Qian AFFILIATION: Physics Department, Shanghai Jiao Tong University PERSONAL: Male, Born in Jan. 24th, 1977, P.R. China DEGREE: 1998.7 B.S. in Physics, Fudan University, Shanghai, China 2003.1 Ph.D. in Physics, Fudan University, Shanghai, China EDUCATION AND APPOINTMENTS: 1994.9-1998.7 Physics Department, Fudan University, China 1998.9-2003.6 Surface Physics Lab., Physics Department, Fudan University, China 2003.7-2006.7 Postdoctoral Research Associate, Physics Department, Princeton University, USA 2006.7-2009.3 Associate Research Scholar, Physics Department, Princeton University, USA 2009.5- Professor, Physics Department, Shanghai Jiao Tong University, China RESEARCH INTERESTS: Topological phases of matter, Strongly correlated electrons, Superconductivity, Magnetism, STM, Angle-Resolved Photoemission NATIONALITY: China ADDRESS: 800 Dongchuan Road, Physics Department, Shanghai, China 200240 EMAIL: dqian@sjtu.edu.cn TELEPHONE: 86-21-34203047
Citation for the Award (within 30 words)
Dr. Qian has achieved the coexistence of superconductivity and topological state in topological insulator films, which is a breakthrough for the probing and manipulating of Majorana Fermions in topological insulators.

Description of the work

Topological insulators (TIs) are a new quantum class of matters discovered recently and were considered as a “star materials” in science and technology. Dr. Qian made significant contributions in the experimental realization of three dimensional TIs (Nature 2008, Nature Physics 2009). He and his collaborators found the first 3D TI (BiSb alloy) and the TI with simplest surface band structures and largest bulk gap (Bi_2Se_3). TIs have nontrivial surface states with spin-momentum locking under the protection of time reversal symmetry, which make them promising for application in spintronics, fault-tolerant quantum computation and lots of other fields. Topologically ordered phase in TIs does not break any symmetry. Known from history, new sciences always comes out of the intermixing. The interplay of topological order and system breaking such as superconductivity can lead to new quantum phenomena such as time-reversal invariant topological superconductors and Majorana fermions. To exploring those new phenomena, the first and most important problem is how to introduce superconducting states into TI’s surface states and whether topological surface states can host Cooper pairs. It remains a big challenge due to the extreme difficulty to get atomically sharp and electronic transparent TI/SC interface.

One proposed experimental way to introduce superconductivity to TI’s surface is utilizing superconducting proximity effect between s-wave superconductor (SC) and TI’s surface state. In 2012, Dr. Qian and his collaborators made a breakthrough in introducing superconductivity into TI’s surface (Science 2012):

1) For the first time, they succeeded in growing single crystal Bi_2Se_3 thin films on superconducting $NbSe_2$ substrate with atomically sharp and electronic transparent interface.
2) Further, in this high quality TI/SC heterostructure, by *in situ* scanning tunneling spectroscopy they unambiguously observed that superconducting states are present at $Bi_2Se_3/NbSe_2$ at the surface and interface.
3) By angle-resolved photoemission spectroscopy, they confirmed the formation of topological surface states in the films in which Copper pairs present. The topological surface states can host Copper pairs.

The superconducting TI/SC heterostructure that Dr. Qian made provides excellent platform for feature experiments on the interplay of TI and SC. Those findings immediately lay the groundwork for detecting Majorana fermions in TI system. Majorana fermions are proposed to emerge as superconducting vortex core states on superconducting TI’s surfaces. The thin film based geometry opens many possibilities for probing and manipulating Majorana fermions.

Key references (up to 3 key publications*)

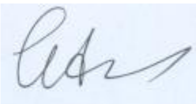
1. The Coexistence of Superconductivity and Topological Order in the Bi2Se3 Thin Films
Mei-Xiao Wang, Canhua Liu, Jin-Peng Xu, Fang Yang, Lin Miao, Meng-Yu Yao, C. L. Gao, Chenyi Shen, Xucun Ma, X. Chen, Zhu-An Xu, Ying Liu, Shou-Cheng Zhang, **Dong Qian**, Jin-Feng Jia, Qi-Kun Xue, *Science* **336**, 52 (2012).
2. Observation of a large-gap topological-insulator class with a single Dirac cone on the surface
Y. Xia, **D. Qian**, D. Hsieh, L. Wray, A. Pal, H. Lin, A. Bansil, D. Grauer, Y.S. Hor, R.J. Cava, M.Z. Hasan, *Nature Physics*, **5**, 398 (2009).
3. A topological Dirac insulator in a quantum spin Hall phase
D. Hsieh, **D. Qian**, L. Wray, Y. Xia, Y. S. Hor, R.J. Cava and M.Z. Hasan, *Nature*, **452**, 970 (2008).

*) Copy of one most significant publication should be attached.

Nominator (name, affiliation, email, telephone and relation to the candidate)

Prof. Dr. Gui Lu Long (APS Fellow, IoP Fellow, Member of IUPAP C13 Commission)
Department of Physics, Tsinghua University, Beijing 10084, China
gllong@tsinghua.edu.cn;guilulong@gmail.com
Tel: +861062772692

Relation to candidate: colleague, fellow members of Chinese Physics Society. Dr Qian is a leading figure in the Chinese physics community. I have also invited President Jie Zhang of Shanghai Jiaotong University, Prof. Qikun Xue(who had worked in Tohoko University for many years), who is one of the leading world experts in topological insulator and superconductivity to write supporting letters to support my recommendation .

Signature  Date 30, December 30, 2012

Nomination form for the 2016 Nishina Asia Award

Candidate (name, affiliation, curriculum vitae including the date of the degree of Ph.D., nationality, address, email and telephone)
Name: Hongming WENG **Date of Degree of Ph.D.**: September 23rd, 2005 **Affiliation**: Institute of Physics, Chinese Academy of Sciences **Nationality**: Chinese **Address**: Institute of Physics, Chinese Academy of Sciences, Zhong Guan Cun Nan San Jie, 8, P.O. Box 603, Beijing 100190, China **Phone**: +86-10-6284-9941 (office); +86-138-1157-0964(mobile) **Fax**: +86-10-6255-3698 **Email**: hmweng@iphy.ac.cn **Education**: • Sep. 1st, 1996 ~ Aug. 31st, 2000, Department of Physics, Nanjing University, China B.S. in Physics • Sep. 1st, 2000 ~ Aug. 31st, 2005, Department of Physics, Nanjing University, China Ph.D. in Physics **Research Experience**: • Sep. 28th, 2005 ~ Mar. 31st, 2007, Kawazoe Lab., Institute for Materials Research, Tohoku University, Japan Postdoctoral Researcher • Apr. 1st, 2007 ~ Aug. 31st, 2010, Research Center for Integrated Science, Advanced Institute of Science and Technology, Japan Assistant Professor • Sep. 1st, 2010 ~ Present, Associate Professor, The Institute of Physics, the Chinese Academy of Sciences, China **Honors and Awards**: • JSPS Postdoctoral Fellowship (2007) • 100-talent program of Institute of Physics (2010) • NSF China "Excellent Young Scientist Award" (2014)
Citation for the Award (within 30 words)
For his outstanding contributions to the discovery of Weyl semimetals, in particular, the theoretical prediction of TaAs family compounds as candidates for Weyl semimetals.

Description of the work

Weyl semimetal is a new topological state of matter that differs from topological insulators, and further it can host Weyl fermions as low-energy quasi-particles — a long sought massless chiral particle proposed as the building block of the Standard Model, but never being observed as fundamental particles. In recent years, we have witnessed the rapid development of this field, stimulated by the discovery of real Weyl semimetal materials, to which Weng has made crucial contributions. While most of the topological semimetals discovered up to now are known compounds, while their topological nature has remained unknown for many years. Weng's work in collaboration with his colleagues, using the first-principles calculations, predicted the unique topological electronic structure of TaAs family compounds, leading to the discovery of Weyl semimetals and Weyl fermions. This work has set up a good example in condensed matter physics showing that computational predictions can drive fundamental discovery and materials design.

In 1928, Paul Dirac proposed the 4-component Dirac equation to describe the motion of relativistic electrons. In the second year, 1929, Hermann Weyl found that Dirac equation can be further simplified if electrons are massless. This leads to the Weyl equation with 2-component chiral Weyl fermions as its low energy particles. Since then, the simplest Weyl representation has been widely accepted in quantum field theory and used as the building block of the Standard Model for particle physics. Unfortunately, all fundamental particles found up to now are massive (including neutrinos) due to symmetry breaking, therefore none of them are true Weyl fermions.

On the other hand, in condensed matter physics, the progress in studying topological states has opened up the possibility of finding Weyl fermions as low-energy quasi-particles of a new topological state, called Weyl semimetals. As early as 2003, a couple of studies, in the context of anomalous Hall effect, has proposed that Weyl nodes can exist in condensed matter materials and can be viewed as magnetic monopoles in the crystalline momentum space. Nevertheless, the field then kept quiet for some years, because it was generally difficult to put the Weyl nodes, if any, exactly at the Fermi level.

The situation, however, has been changed since 2011. A couple of candidates were theoretically proposed as Weyl semimetals, such as pyrochlore iridates and $HgCr_2Se_4$, although they are difficult to realize. In the following years, 2012-2014, further progress was made. Topological Dirac semimetals, where two Weyl nodes with opposite chirality coexist and overlap in the momentum space, were theoretically predicted and experimentally materialized in Na_3Bi and Cd_3As_2, which substantially promoted the field again. In those studies, Weng has made important contributions, being the coauthor of the paper for $HgCr_2Se_4$ [PRL, 107, 186806 (2011)], and one of the corresponding authors for the Na_3Bi paper [PRB, 85, 195320 (2012)] and the Cd_3As_2 paper [PRB, 88, 125427 (2013)].

The true challenge has been: how to find a realistic compound with separated Weyl nodes at the Fermi level? For that purpose one needs to break either time reversal or inversion symmetry, and the latter should be a better choice for experimental measurements. First-principles calculations should play an important role towards that end. After trying numerous compounds, the breakthrough was made by Weng et al. in 2014. They theoretically predicted [PRX, 5, 011029 (2015)] that TaAs family compounds are non-centrosymmetric Weyl semimetals. Soon after the theoretical prediction, Weng et al., collaborating closely with experimental groups, finally observed the Weyl nodes in the bulk [Nature Physics, 11, 724 (2015)] and related Fermi arcs [PRX, 5, 031013 (2015)] on the surface of TaAs in 2015. This series of work leads to the discovery of Weyl semimetals and Weyl fermions. The other members of TaAs family compounds, such as NbAs, TaP and NbP, have been all confirmed to be Weyl semimetals by recent experiments, too. I should mention that this field is highly competitive, and a similar discovery has been made almost simultaneously by a joint group from Princeton and Peking University. Nevertheless, the predictive role played by Weng et al. is crucial in this endeavor.

The discovery of Weyl semimetals and Weyl Fermions is highly appreciated by the international community. Soon after its discovery, this work together with that done by the Princeton group and else was selected as one of the Top 10 Breakthroughs of the year 2015 by <Physics World>, and also as one of the Highlights of Year 2015 by the American Physical Society. For this reason, I think Weng well deserves the Nishina Asia Award.

Key references (up to 3 key publications*)

1. *Weyl Semimetal Phase in Noncentrosymmetric Transition-Metal Monophosphides*, Hongming Weng*, Chen Fang, Zhong Fang, B. A. Bernevig, Xi. Dai, **Phys. Rev. X 5**, 011029 (2015);
2. *Experimental discovery of Weyl semimetal TaAs*, B.-Q. Lv*, Hongming Weng*, B. B. Fu, X. P. Wang, H. Miao, J. Ma, P. Richard, X. C. Huang, L. X. Zhao, G. F. Chen, Z. Fang, X. Dai, T. Qian, and H. Ding, **Phys. Rev. X 5**, 031013 (2015);
3. *Observation of Weyl nodes in TaAs*, B.-Q. Lv*, N. Xu*, Hongming Weng*, J. Z. Ma, P. Richard, X. C. Huang, L. X. Zhao, G. F. Chen, C. E. Matt, F. Bisti, V. N. Strocov, J. Mesot, Z. Fang, X. Dai, T. Qian, M. Shi, **Nature Physics 11**, 724-727 (2015).

*Copies of these significant publications are attached.
Nominator (name, affiliation, email, telephone and relation to the candidate)
Lu Yu, Institute of Physics, Chinese Academy of Sciences, lyu@iphy.ac.cn, Phone:86-10-8264-9325, Fax:86-10-8264-0073, not related
Signature Yu Lu (于) Date 22 March, 2016

Nomination form for the 2017 Nishina Asia Award

Candidate (name, affiliation, curriculum vitae including the date of the degree of Ph.D., nationality, address, email and telephone)
Prof. Li-Sheng Geng, School of Physics and Nuclear Energy Engineering, Beihang University E-mail: lisheng.geng@buaa.edu.cn Tel: 86-10-82338376 Nationality: Chinese Employment： 2011.10-now, Beihang University, Professor of Physics, deputy dean 2009.10-2011.09, Technical University of Munich, Humboldt Research Fellow 2006.04-2009.09, Valencia University, Postdoc 2005.10-2006.03, ITP, CAS, Visiting Research Scientist. Education： 2001.09-2007.07, Peking University, Ph.D. candidate in Nuclear and Particle Physics 2002.10-2005.09, Osaka University, Ph.D. candidate in Nuclear and Particle Physics 1997.09-2001.07, Lanzhou University, Bachelor of Science
Citation for the Award (within 30 words)
For his significant contribution to the exploration of relativistic effects in our understanding of microscopic world ranging from nucleons to atomic nuclei.
Description of the work

The two most recognized achievements of fundamental physics are relativity and quantum mechanics. Quantum mechanics is an essential part of the working principle necessary to understand the microscopic world ranging from atomic physics to particle physics. On the other hand, the impact of relativity is for most parts constrained to the Einstein's mass energy relation. This is evidenced by the widely used Schroedinger equation or its variants. For many years, relativistic effects are completely discarded. Prof. Geng's work concentrated on the relativistic effects and have shown that at different scales from nuclei to nucleons to even heavy hadrons containing heavy charm or bottom quarks, relativistic effects play a far-reaching role.

1) As part of his Ph.D. thesis, Prof. Geng performed the first comprehensive study of the ground state properties of atomic nuclei ranging from the proton drip line to the neutron drip line within the so-called relativistic mean field theory, taking into account self-consistently axial deformation effects and pairing interactions. The resulting bulk properties are not only in good agreement with the then existing data, but also provide essential inputs for nuclear astrophysics simulations and the ongoing experimental studies of drip line nuclei with exotic isospin ratios. In addition, the systematic investigation sheds light on the refinement of the relativistic approach and inspires further studies along this line.

2) QCD becomes non-perturbative at the energy scales relevant to nuclear physics, therefore one often needs to turn to either models or effective field theories or lattice QCD. Chiral perturbation theory, as a low-energy effective field theory of QCD, has played an indispensable role in our understanding of low-energy strong interaction phenomena. Nevertheless, it has met some difficulties in describing three flavor u, d, s physics and their quark mass evolutions as explored by lattice QCD simulations. Prof. Geng's work showed that the fully covariant formulation of baryon chiral perturbation theory can solve in large parts all of the difficulties one encountered in using the non-relativistic heavy baryon chiral perturbation theory, thus paving the way for our further understanding of the basic building blocks of nature, nucleons and its counterparts. In addition, he showed that the covariant baryon chiral perturbation theory can not only describe state-of-the-art lattice QCD simulations of the octet baryon masses but also can make model independent predictions about baryon sigma terms, which plays an important role in our understanding of the quark flavor structure of the nucleons and in direct dark matter searches.

Key references (up to 3 key publications*)

1) Masses, deformations and charge radii: Nuclear ground-state properties in the relativistic

mean field model, **Li-Sheng Geng**, Hiroshi Toki, Jie Meng, Prog.Theor.Phys. 113 (2005) 785-800

2) Leading SU(3)-breaking corrections to the baryon magnetic moments in Chiral Perturbation Theory, **L.S. Geng**, J. Martin Camalich, L. Alvarez-Ruso, M.J. Vicente Vacas, Phys.Rev.Lett. 101 (2008) 222002
3) Octet baryon masses in next-to-next-to-next-to-leading order covariant baryon chiral perturbation theory, X.-L. Ren, **L.S. Geng**, J. Martin Camalich, J. Meng, H. Toki, JHEP 1212 (2012) 073

*) Copy of one most significant publication should be attached.

Nominator (name, affiliation, email, telephone and relation to the candidate)

Prof. Jie Meng, School of Physics, Peking University

E-mail: mengj@pku.edu.cn

Tel: 86-10-62765620

Relation to the candidate: Ph.D. advisor and longtime collaborator

Signature ____________________ Date ____________________

Nomination form for the 2016 Nishina Asia Award

Candidate (name, affiliation, curriculum vitae including the date of the degree of Ph.D., nationality, address, email and telephone)

Name : Bedangadas Mohanty

Affiliation : National Institute of Science Education and Research Bhubaneswar (NISER)

Address : School of Physical Sciences, National Institute of Science Education and Research (NISER), PO- Jatni, Dist-Khurda, Pin: 752050; Odisha, India

Email id : bedanga@niser.ac.in

Telephone : +918895584872; +91674-2494007,

Nationality : Indian

Date of Degree of PhD : July 2002

Discipline : Physical Science

Field of Specialization : Experimental High Energy Physics (Heavy-Ion Collisions)

Employment History:

S.N	Period	Employer	Designation
1	June 2012 till date	National Institute of Science Education and Research Bhubaneswar	Associate Professor
2	July 2012 till date	Homi Bhabha National Institute, Mumbai	Associate Professor
3.	August 2009 – July 2012	Homi Bhabha National Institute, Mumbai	Assistant Professor
4.	August 2008 to June 2012	Variable Energy Cyclotron Centre, Kolkata	Scientific Officer-E
5.	January 2004 to July 2008	Variable Energy Cyclotron Centre, Kolkata	Scientific Officer-D

Educational Qualification:

S.N	Degree	Institute/University	Year	Specialization	Division
1	B.Sc	Utkal University	1994	Physics	1st (Best Graduate)
2	M.Sc	Utkal University	1996	Physics	1st (Gold Medalist)
3	PhD	Institute of Physics	2002	Experimental High Energy Physics	Awarded best thesis by Indian Physics Association

4	Post-Doc	Variable Energy Cyclotron Centre, Kolkata Lawrence Berkeley National Laboratory	2002-03 2006-07	Experimental High Energy Physics	Department of Atomic Energy K. S. Krishnan Fellow Offered Staff position - Declined

Awards and Recognitions:

- Year 2015: **Shanti Swarup Bhatnagar Prize (Highest scientific prize in India)**.
- Year 2014 Onwards: Elected member of Editorial Board ALICE experiment at the Large Hadron Collider Facility, CERN, Geneva.
- Year 2011-2014 : Deputy Spokesperson STAR Experiment at Relativistic Heavy Ion Collider Facility at Brookhaven National Laboratory, New York, USA
- Year 2010-2011 : **Swarna Jayanti Fellowship** Department of Science and Technology, Govt. of India.
- Year 2008-2011: Physics Coordinator STAR Experiment, Brookhaven National Laboratory, New Year, USA
- Year 2006: Young Scientist award – Department of Atomic Energy, Govt of India
- Year 2003: **Associate of Indian Science Academy**, Bangalore
- Year 2003: **INSA Young Scientist Medal** – Indian National Science Academy, New Delhi
- Year 2002: Best thesis award in nuclear physics, Indian Physics Association.
- Year 1997: L.K. Panda Award, Institute of Physics, Bhubaneswar
- Year 1996: **University Gold Medal**, Utkal University, Bhubaneswar

Mentoring of students and postdocs:

Mentored 5 PhD students:

1. Md. Nasim, postdoctoral fellow at UCLA, USA.
2. Chitrasen Jena, postdoctoral fellow at University of Padova, Italy.
3. Ranbir Singh, visiting scientist at University of Catania, Italy and then Scientist at NISER.
4. Subhash Singh, postdoctoral fellowship at KSU, USA stationed at BNL, USA.
5. Md. Rihan Haque, postdoctoral fellow at University of Utrecht, Netherlands.

Supervised Masters Thesis for three students:

1. Ms. Roli Esha, currently graduate student at UCLA, USA.
2. Mr. Evan John Phillip, currently graduate student at University of Stony Brook, USA.
3. Mr. Arabinda Behera, currently graduate student at University of Stony Brook, USA.

Supervised 7 Postdoctoral Fellows:

1. Dr. Victor Roy, Postdoctoral Fellow 2012, currently Alexander von Humboldt fellow FIAS, Frankfurt, Germany.
2. Dr. Anirban Lahari, Postdoctoral Fellow 2013, Currently Postdoctoral Fellow at TIFR, Mumbai.
3. Dr. Sandeep Chatterjee, Postdoctoral Fellow 2014, Currently Postdoctoral Fellow at VECC, Kolkata.
4. Dr. Sabyasachi Ghosh, Postdoctoral Fellow 2015, Currently Postdoctoral Fellow at IFT, UNESP, Sao Paulo, Brazil.
5. Dr. Ajay Dash, Postdoctoral Fellow since 2015
6. Dr. Purba Bhattacharya Postdoctoral Fellow since 2015
7. Dr. Ashwini Kumar Postdoctoral Fellow since 2015

Teaching:

Undergraduate teaching at NISER Bhubaneswar, core courses of Quantum Mechanics, Nuclear and Particle physics, and Relativity, has been lecturer at various **international schools** aboard (Tokyo Institute of Technology, Japan and Institute of Particle Physics, Wuhan, China) and **SERC schools** (SERC School in theoretical high energy physics, SERC schools in experimental high energy physics) in India.

Academic/Scientific/Administrative Positions

Current:

1. Chairperson, School of Physical Sciences, NISER.
2. Dean of Faculty Affairs, NISER.
3. Member STAR Experiment Council, BNL, USA.
4. Member Collaboration Board, ALICE, LHC, CERN.
5. Member ALICE experiment Editorial Board, LHC, CERN.
6. Coordinator ALICE-India light flavour spectra group.
7. Member Subject Research Committee of P.G. Department of Physics, Utkal University.
8. Member Academic Council, NISER.
9. Life member of Indian Physics Association and Member of American Physical Society.

Previous:

1. Deputy Spokesperson, STAR Experiment, BNL USA.
2. Physics Analysis Coordinator, STAR Experiment, BNL, USA.
3. Co-convener of Spectra Physics Working Group, STAR Experiment, BNL, USA.
4. Chairman Post Graduate Council of Schools, NISER.
5. Member Disciplinary Action Committee, NISER.

6. Member of STAR Experiment Decadal Plan Committees for future physics prospects and programs of STAR at RHIC, BNL, USA.
7. Member of 2009/2010 RHIC & AGS Users Executive Committee, BNL, USA.
8. Member STAR Beam User Request Preparation committee in the years 2008, 2009 and 2010.
9. STAR Trigger Board in the year 2008, 2009 and 2010.

Advisory Committee Member of Conferences:

1. International Advisory Committee Member Strangeness in Quark Matter, "Strangeness in Quark Matter", UC Berkeley Clark Kerr Campus, Berkeley, USA from June 27 – July 1, 2016; Dubna, July 6-11, 2015; Birmingham - July 22-27 2013.
2. International Advisory Committee Member Asian Triangular Heavy-Ion Conference, New Delhi 15-19 February 2016; Pusan, Korea, 7 - 10th November 2012
3. Member of International Program Committee for the international conference on "Heavy ion collisions in the LHC era", Qui Nhon, in central Vietnam, 27th - 31st July, 2015; 2012
4. International Advisory Committee Member for The 40th (XL) edition of the International Symposium on Multiparticle Dynamics will be held in Antwerp, Belgium, 21-25, September 2010.

Selection Committee, Referee and Examiner:

1. Referee for the Physical Review Letters, Physical Review, Physics Letters B, Modern Physics Letters, Journal of Physics G, Current Science and Pramana journals.
2. **Project Reviewer**: Veni grant in the Innovational Research Incentives Scheme, **Netherlands Organisation for Scientific Research**, Hague, Netherlands.
3. **Project reviewer**: Lise Meitner-Postdoctoral -position received by the **Austrian Science Fund**, Vienna, Austria.
4. **Project Reviewer: Office of Nuclear Physics (NP) within the Department of Energy Office of Science, USA (evaluated research projects for grants received from from MSU, LANL, Purdue University etc).**
5. Reviewer of Tsinghua University, China 221 Program Evaluation.
6. Member of Selection Committee for Rahul Basu memorial best thesis award in the area of high-energy physics.

Invited Talks (*talks at the important conferences):

Sl. No	Invited Talk/Session Chair	Conference/Workshop/Symposium/Institute	Place	Date
1.	Physics of Relativistic Heavy-Ion Collisions	6th Asian Triangular Heavy Ion Conference	New Delhi	February 15-19, 2016
2.	Freeze-out Dynamics at RHIC Beam Energy Scan Program	Strongly Interacting Hot and Dense Matter: Theory and Experiment	GSI, Darmstadt, Germany	November 2-6, 2015
3.	Search for Critical Point in QCD phase Diagram	13th international eXtreme QCD (XQCD)	Central China Normal University (CCNU), Wuhan, China	September 21-23, 2015
4.	Freeze-out dynamics in high energy heavy-ion collisions	Discussion Meeting on High Moment of Net-charge, Net-Kaon and Net-protons in High-Energy Nuclear Collisions	Lawrence Berkeley National Laboratory, Berkeley USA	June 22-24, 2015
5.	Search for QCD Critical Point and Beam Energy Scan	7th International Conference on Physics and Astrophysics of Quark Gluon Plasma (ICPAQGP-2015)	VECC/SINP Kolkata, India	February2-6, 2015
6.	Exploring the QCD phase diagram through high energy nuclear collisions at RHIC	QCD at High Density	TIFR, Mumbai, India	January 27-30, 2015
7.	Experimental Overview of the QCD Phase Diagram	5th Asian Triangle Heavy Ion Conference (ATHIC) 2014	Osaka University, Japan	August 5 - 8, 2014
8.	Baselines for high moment analysis to study QCD Phase Diagram	Topical Meeting on High Moment Analysis in High Energy Nuclear Collisions	Central China Normal University, Wuhan, China	July 10 - 16, 2014.
9.	Study of QCD phase structure through high energy heavy-ion collisions	New Frontiers in QCD 2013, Yukawa Institute of Theoretical Physics	Kyoto, Japan	November 18 - December 20, 2013
10.	Exploring the QCD phase structure through relativistic heavy-ion collisions	International Symposium on Nuclear Physics	Mumbai, India	December 2-6, 2013.
11.	A new state of matter in relativistic heavy-ion collisions	Workshop on High Energy Physics and Phenomenology, WHEPP13	Puri, India	December 12-21, 2013
12.	Exploring the QCD phase structure through relativistic heavy-ion collisions	International Nuclear Physics Conference	Frienze, Italy	June 2-7 , 2013
13.	High Energy Nuclear Collisions and Phase Diagram of strong interactions	National Conference on Nuclear Physics, NCNP 2013	Sambalpur, India	March 01-03, 2013

14.	QCD Phase Diagram,An Overview	8th International Workshop on Critical Point and Onset of Deconfinement, CPOD 2013	Nappa Valley, CA, USA	March 11-15, 2013	
15.	Results from the Beam Energy Scan Program at RHIC	EMMI Workshop	GSI, Darmstadt, Germany	February 15, 2013	
16.	Phi-meson production a probe for de-confinement transition in high energy heavy- ion collisions	Lawrence Berkeley National Laboratory	Berkeley, USA	December 4, 2012	
17.	Summary of RHIC results and future directions	University of California, Los Angeles	Los Angeles, USA	December 3, 2012	
18.	Beam Energy Scan Program at RHIC	Asian Triangle Heavy Ion Conference 2012	Haeundae, Pusan, South Korea	November 14, 2012	
19.	Relativistic Heavy Ion Collider Experiments: What have we learned?	QGP-Meet 2012	Variable Energy Cyclotron Center, Kolkata, India	July 3, 2012	
20.	Results from the Relativistic Heavy Ion Collider	DAE-BRNS Symposium on Nuclear Physics	Andhra University, Vishakhapatna m, India	December 26-30, 2011	
21.	Studying the QCD phase diagram using conserved number distributions in high energy collisions	7th International Workshop on Critical Point and Onset of Deconfinement	Institute of Particle Physics (CCNU), China	7-11 November 2011	
22. *	STAR experiment results from the beam energy scan program at RHIC	XXII International Conference on Ultrarelativistic Nucleus-Nucleus Collisions (QM2011)	Annecy, France	23-28 May 2011	
23.	Possible evidence for thermalization at RHIC	The Phase Diagram of QCD - Bring your own	Tata Institute Of Fundamental Research, Mumbai, India	December 13 - 14, 2010	
24.	Exploring the QCD landscape with high-energy nuclear collisions	2010 Annual Fall Meeting of the APS Division of Nuclear Physics	Convention Center in downtown Santa Fe, NM, USA	November 2-6, 2010	
25.	QCD Critical Point	Third Asian Triangle Heavy-Ion Conference (ATHIC 2010)	Institute of Particle Physics, Central China (Hua-Zhong) Normal University, Wuhan, China	October 18-20, 2010	
26.	Search for the QCD Critical Point	QCD IN THE MEDIUM	Department of Physics, University of Calcutta, India	4 - 6 October 2010.	

27.	Experimental study of the QCD phase diagram using high energy nuclear colli-sions	Strong Interactions in the 21st Century	Tata Institute Of Fundamental Research, Mumbai, India	February 10 - 12, 2010
28.	Current status of Thermalization from available STAR results	Workshop on critical point, fluctuations and thermalization	Jammu University, Jammu (Patnitop), India	17th Sept to 19th Sept, 2009
29.	Experimental study of the QCD phase diagram and search for the critical point at RHIC	Free Meson Seminar	Tata Institute of Fundamental Research, Mumbai, India	June 23, 2009
30.	Search for the QCD Critical Point Through Study Of Higher Moments Of E-by-ENet-Proton Distributions	Heavy Ion Tea Seminar	Lawrence Berkeley National Laboratory, Berkeley, USA	April 14, 2009
31. *	Phase transitions, Fluctuations and Correlations	21st International conference on nucleus-nucleus collisions at ultra relativistic energies, QM2009	Knoxville, USA	March 30 - April 4, 2009
32.	New Results from Relativistic Heavy Ion Collider	Homi Bhabha Centenary DAE-BRNS Symposium on High Energy Physics 2008	Varanasi, India	14-18 December 2008
33.	Probe the QCD phase diagram with phi-mesons in high energy nuclear collisions	Strange Quark Matter 2008	Beijing, China	6-10 October 2008
34. *	STAR results on medium properties and response of medium to highly energetic partons	20th International conference on ultra relativistic nucleus-nucleus collisions, QM2008	Jaipur, India	February 4-10, 2008
35.	Search for the color factor effect at RHIC	International Symposium on Multiparticle Dynamics	LBNL, Berkeley, USA	August 4-9, 2007
36.	Search for Effects of the QCD Color Factor in High-Energy Collisions at RHIC	Nuclear Science Division Special Seminar	Lawrence Berkeley National Laboratory, Berkeley, USA	May 29, 2007
37.	Effect of color charge dependence on energy loss at RHIC	23rd Winter workshop on nuclear dynamics (WWND07)	Big Sky, Montana, USA	February 12-18, 2007
38. *	Properties of particle production at large transverse momentum in Au+Au andCu+Cu collisions at RHIC	Quark Matter 2006, 19th International Conference on Ultra-relativistic Nucleus-Nucleus Collisions	Shanghai, China	November, 2006
39.	A view on present and vision for future	VECC Foundation Day Celebration, R and D Activities at VECC -Present and Future	Kolkata, India	June 16, 2006
40.	Experimental results from forward rapidity at RHIC	QGP MEET 2006	Kolkata, India	February 6, 2006

41.	Results from STAR experiment at RHIC	9th Workshop on High Energy Physics Phenomenology-WHEPP-9	Bhubaneswar, India	January 3-14, 2006
42.	Results from the Relativistic Heavy Ion Collider	50th DAE-BRNS International Symposium on Nuclear Physics	Mumbai, India	December 12-16, 2005
43.	Results on transverse momentum spectra in p+p and d+Au collisions from STAR experiment at RHIC	47th Workshop on Physics of Hadronic Interaction at LHC with Nucleons and Nuclei and Phase Transition Physics and "The 1st physics ALICE week	Erice, Italy	December 2-10, 2005
44.	Identified hadron spectra at large transverse momentum in p+p and d+Au at 200 GeV	Brookhaven National Laboratory Nuclear Physics Seminar	Brookhaven National Laboratory, USA	November 22, 2005
45.	Particle production in p+p, d+Au and Au+Au collisions at RHIC	Lawrence Berkeley National Laboratory Nuclear Physics Seminar	Lawrence Berkeley National Laboratory, USA	November 17, 2005
46.	First results from Photon Multiplicity Detector at RHIC	5th International conference on physics and astrophysics of quark-gluon plasma	Kolkata, India	February 8-12, 2005
47. *	Particle Production at forward rapidity in d+Au and Au+Au collisions	Quark Matter 2005, 18th International Conference on Ultra-relativistic Nucleus-Nucleus Collisions	Budapest, Hungary	August 4, 2005
48.	Photon and charged particle multiplicity fluctuation and correlation in 158 AGeV/c Pb on Pb collisions	Wayne State University	Detroit, USA	February 2003
49.	Disoriented Chiral Condensates: Experimental Review	QGP Meet 2004	Institute of Physics, Bhubaneswar, India	October 2004
50.	Fluctuations and QCD Phase transitions	QGP Meet 2003	Variable Energy Cyclotron Centre, Kolkata, India	May 2003
51. *	Particle Density Fluctuations	XVI International Conference on Ultra-Relativistic Nucleus-Nucleus Collisions (Quark Matter 2002)	Nantes, France	July 17-24, 2002
52.	Some interesting results from high energy heavy-ion collision experiments	Alumni and Foundation day of the Institute of Physics.	Institute of Physics, Bhubaneswar, India	September 3-4, 2002
53.	Fluctuation in photon and charged particle	DAE-BRNS symposium on nuclear physics	SINP/VECC Kolkata, India	December 26-30, 2001

	multiplicities at SPS and it's prospect at RHIC and LHC			
54.	Photon multiplicity detector : From SPS to RHIC and LHC	International conference on physics and astrophysics of quark-gluon plasma	Jaipur, India	November 26-30, 2001
55.	Localized charged-neutral fluctuations in 158 A GeVPb + Pb collisions	CERN Heavy Ion Forum "on Event-by-event physics	CERN, Geneva, Switzerland	June 21-22 2001
56.	Search for disoriented chiral condensates in 158.A GeVPb+Pb collisions in WA98 experiment	Relativistic heavy-ion physics (RHIP'99). Hot and dense matter	Prague, Czech republic	August 30 - 3 September, 1999

Top 10 Publications

Authors	Year	Title	Journal	Volume	Page	Citations And Impact Factor (IF)	Remark
S. Gupta, X. Luo, B. Mohanty H. Ritter N. Xu	2011	Scale for the Phase Diagram Of Quantum Chromodynamics	Science	332	1525	111 and 31 (IF)	Corresponding author
STAR Collaboration	2011	Observation of Anti-matter Helium-4 nucleus	Nature	473	353	62 and 38.6 (IF)	Part of PhD Thesis of my student and head of the Paper Committee
	2010	Observation of An antimatter hypernucleus	Science	328	58	91 and 31 (IF)	Physics Analysis Leader
STAR Collaboration	2014	Energy Dependence Of Moments of net Proton Distributions At RHIC	Physical Review Letters	112	032302	126 and 7.9 (IF)	Corresponding author, primary author
		Beam Energy Dependence of moments of the net charge multiplicity distributions in Au+Au collisions at RHIC		113	092301	87 and 7.9(IF)	

	2010	Higher Moments Of net-proton Multiplicity Distributions at RHIC		105	022302	168 and 7.9 (IF)	
STAR Collaboration	2016	Centrality and Transverse momentum dependence of elliptic flow of multi-strange hadrons and phi-meson in Au+Au collisions at 200 GeV	Physical Review Letters	116	062301	5 and 7.9(IF)	Primary Author And Part of my PhD Student Thesis work
	2013	Observation of an Energy-dependent Difference in Elliptic flow Between particles And anti-particles In relativistic Heavy ion collisions		110	142301	41 and 7.9 (IF)	
STAR Collaboration	2009	Energy and System Size Dependence of Phi meson Production in Cu+Cu and Au+ Au collisions	Physics Letters B	673	183	75 and 4.5 (IF)	Primary Author and Corresponding author
STAR Collaboration	2007	Energy Dependence of pi+/-, p and pbar transverse momentum spectra in Au+Au collisions at 62.4 and 200 GeV	Physics Letters B	655	104	165 and 4.5 (IF)	Primary Author And Corresponding author

STAR Collaboration	2006	Identified hadron Spectra at large Transverse Momentum in p+p and d+Au collisions at 200 GeV	Physics Letters B	637	161	236 and 4.5 (IF)	Primary Author And Corresponding author
B. Mohanty J. Serreau	2005	Disoriented Chiral Condensates: Theory and Experiment	Physics Reports	414	263	36 and 22.9 (IF)	First author
STAR Collaboration	2005	Multiplicity and Pseudorapidity Distributions of Photons in Au+Au collisions at 62.4 GeV	Physical Review Letters	95	0623 01	40 and 7.9 (IF)	Primary Author And Corresponding author ONLY PRL From India Detector in Heavy-ion experiments
STAR Collaboration	2005	Experimental and Theoretical Challenges in the Search for the Quark gluon Plasma: The STAR Collabora tion's critical assessment of the evidence from the RHIC collisions	Nuclear Physics A	757	102	2220 and 1.5 (IF)	Several Of my Analysis Results Part of this White paper

* Complete list of publication separately attached.

Institutions visited for research collaboration – long duration (selected list):

Institution	Year
CERN, Geneva, Switzerland	1998 – 2016 (several times)
Brookhaven National Laboratory, Upton New York, USA	2000-2016 (several times)
Lawrence Berkeley National Laboratory, Berkeley, USA	2006-2016 (several times)

Yukawa Institute of Theoretical Physics, Kyoto and University of Tokyo, Osaka University, Japan	2014, 2010, 2014
GSI, Darmstadt, Germany	2013, 2014, 2015
Institute of Particle Physics, Wuhan China	2011, 2012, 2014, 2015
Pusan University, South Korea	2012

Outreach and Science Popularization:

1. "STAR experiment reports the discovery of anti-strange matter" – CURRENT SCIENCE, VOL. 99, NO. 7, 10 OCTOBER 2010, Page 873 .
2. "STAR experiment launches the QCD Critical Point Search Program at the Relativistic Heavy Ion Collider facility" – CURRENT SCIENCE, VOL. 100, NO. 5, 10 MARCH 2011, Page 618.
3. "STAR Experiment reports observation of the antimatter helium-4 nucleus" – CURRENT SCIENCE, VOL. 100, NO. 11, 10 June 2011, Page 1613 .
4. "Formation of a perfect fluid in high-energy heavy-ion collisions" – CURRENT SCIENCE, VOL. 103, NO. 11, December 2011, Page 1267 .
5. "Properties of a system of fundamental constituents of visible matter" – CURRENT SCIENCE, VOL. 106, NO. 6, March 2014, Page 798 .
6. Scientific secretary and Organizing Committee member of Understanding the Universe through LHC on 28 February, 2009 an outreach program, held at VECC/SINP, Kolkata, India.
7. Several Popular physics talks in INSPIRE INTERSHIP PROGRAM FOR YOUNG TALENTS (2012, 2013, 2014, 2015, 2016) Sponsored by: Department of Science and Technology (DST), Govt. Of India
8. Mentor to several summer students selected by Indian Academy of Sciences.

Citation for the Award (within 30 words)

Dr. Bedangadas Mohanty is being nominated "for his outstanding and significant contributions to the study of the Quantum Chromodynamics phase diagram in high-energy nuclear collisions and for the discovery of the heaviest anti-matter nucleus."

Description of the work:

His scientific contributions can be categorized into four broad areas:

- **The strong interactions, described by Quantum Chromo Dynamics (QCD), are** one of the four basic interactions that occur in nature. The phase diagram tells us how matter organizes itself when subject to variations in thermodynamic parameters, and it is a key to **understanding the emergent properties of the strong interactions.** While phase diagrams of systems of atoms and molecules interacting via the electromagnetic interaction have been very widely studied and precisely known (e.g water), that for the strong interactions had remained a conjecture for a long time. Dr. Mohanty has significantly contributed towards the establishment of the Phase Diagram of QCD.

(a) He led the physics program of a dedicated experiment at Brookhaven National Laboratory for the purpose of studying phase diagram of QCD called the "Beam Energy Scan Program". His work has led to the possible existence of a critical point in the phase diagram of QCD. He led the team that established the "observable" for the critical point search in the experiment that is published in **Phys.Rev.Lett. 105 (2010) 022302. This work** is considered as a landmark work in the field. Then, based on the first data of the beam energy scan program, they showed that the possible critical point region of the QCD phase diagram is near the beam energy of 20 GeV (temperature ~ 160 MeV and baryonic chemical potential ~ 400 MeV). This work is published in **Physical Review Letters 112 (2014) 032302.** He has very successfully led the beam energy scan physics program to publish so far **5 important scientific papers in Physical Review Letters**.

(b) He has ***significantly*** contributed to the establishment of the quark-hadron transition and its transition temperature that is published in **Science 332 (2011)1525,** and "Physics World" considered it among the 10 best in the year 2011.

- ***Contribution to establishing the formation of a new phase of matter the Quark Gluon Plasma (QGP), in the laboratory***: This state of matter existed in the first few microseconds old Universe. In QGP quarks and gluons are de-confined and move freely in volumes much larger than nucleonic scales. In order to achieve such matter in the laboratory, temperatures of the order of 10^{12} degrees Kelvin need to be created. The quark-gluon plasma state allows for studying transport properties like viscosity, thermal conductivity, opacity and diffusion co-efficient of QCD matter. Dr. Mohanty has several significant papers on signatures that experimentally confirm the existence of QGP, related to the observation of strangeness enhancement in heavy-ion collisions – **Phys.Lett.B 673 (2009) 183;** jet quenching effect - **PRL 97 (2006) 152301 and Physics Letters B 655 (2007)104, 637 (2006)161; and** partonic collectivity – **PRL 116 (2016) 062301 and PRL 99 (2007) 112301.** These are summarized in a review paper in **Nucl. Phys. A 757 (2005) 102.** They support the formation of a QGP that exhibits perfect fluidity (viscosity to entropy density ratio close to the quantum bound). These papers have a total citations of about **2300**.

- ***The discovery of two new anti-matter nuclei***:
  (a) Dr. Mohanty as the physics analysis leader led a team that discovered the heaviest known anti-matter nuclei the **anti-alpha** (consisting of two anti-protons and two anti-neutrons) in the laboratory. The discovery is published in **Nature 473 (2011) 353**. This measurement provided the probability of production of anti-helium through nuclear interactions, thereby providing the predominant baseline for measurements carried out in space.
  (b) Dr. Mohanty as the physics analysis leader led a team that discovered the heaviest strange anti-matter nuclei. Normal nuclei are formed only of protons and neutrons. Hyper-nuclei are made up of protons, neutrons and hyperons. The **anti-hypertrion**, nuclei consist of anti-proton, anti-neutron and anti-lambda (a strange hadron). This work is published in **Science 328 (2010) 58**. It has implications for neutron stars and also understanding of the nuclear force. To study nuclei, nuclides are arranged into a two-dimensional table of nuclides. On one axis is the number of neutrons *N*, and on the other is the number of protons *Z*. The discovery of antihyperon introduces a third axis (strangeness) and the table becomes three-dimensional.
- ***Disoriented Chiral Condensates (DCC) and Chiral Phase Transition:*** J. D. Bjorken, F. Wilczek and collaborators have advocated the existence of DCC due to the chiral phase transition in QCD matter. The possibility of producing quark-gluon plasma in high-energy collisions is an exciting one from the point of view of observing the chiral phase transition as the hot plasma expands and cools. As the system returns to its normal phase it is possible for local regions of misaligned vacuum to be produced. These domains, which are analogous to misaligned domains of a ferromagnet have been named Disoriented Chiral Condensates (DCCs). DCC's are regions where the chiral field is aligned in a isospin direction. These domains relax back to ground state configuration by emitting pions. Towards this goal, and since a neutral pion readily decays to photons, Dr. Mohanty has put in several years of effort to search for the signature of the chiral phase transition (through DCC) by ***establishing photon production in heavy-ion collisions using a detector built in India.*** He is the lead author of the Physical Review Letters paper on inclusive photon production in heavy-ion collisions (**PRL-95 (2005) 062301**) using the Indian detector. His contribution to photon production and to the physics of DCC in heavy-ion collisions led to the invitation from the editorial board of Physics Reports to write a review article, titled "Disoriented Chiral Condensate – Theory and Experiment", published in – **Phys. Rept. 414 (2005) 263**

- **Impact of the contributions:**
  (a) His work has contributed to the experimental confirmation of the formation of the Quark Gluon Plasma. This has enabled (for the first time) the study of properties of QCD matter

like viscosity, conductivity, diffusion co-efficient and opacity.

(b) His work has contributed to the phase diagram of QCD becoming a reality: transition temperature, order of transition and two different phases have been established at zero baryonic chemical potential. The possibility of the existence of a critical point is the seen in data.

(c) The discovery of anti-alpha and anti-hypertriton, have implications in the fields of cosmology, astro-particle physics and nuclear physics.

He has been invited to deliver plenary talks at important conferences in his field and he gave the conference summary talk on "Phase transitions, Critical point and Correlations" at Quark Matter 2009. Within India his scientific work has been recognized through the award of the CSIR Shanti Swarup Bhatnagar Prize (highest scientific honor in India for scientists below the age of 45 years) and the DST Swarna Jayanti Award ((highest scientific honor in India for scientists below the age of 40 years).

Key references (up to 3 key publications*)

1. *Scale for the Phase Diagram Of Quantum Chromodynamics, Science 332 (2011) 1525
2. #Observation of Anti-Matter Helium-4 nuclei, Nature 473 (2011) 353
3. Energy Dependence of Moments of net-proton Distributions at RHIC, Physical Review Letters 112 (2014) 032302

*) Copy of one most significant publication should be attached.

Two papers one from Nature and another from Science are attached together with a certificate from Dr Nu Xu, Spokesperson for STAR Collaboration, Lawrence Berkeley Laboratory.

Nominator (name, affiliation, email, telephone and relation to the candidate)

Name: Spenta R Wadia

Affiliation: International Centre for Theoretical Sciences (ICTS-TIFR), Tata Institute of Fundamental Research, Bangalore, India

Email: spenta.wadia@icts.res.in; spenta.wadia@gmail.com

Telephone: +91 - 80 – 6730 6010

Relation to the Candidate: Senior Colleague

Signature Date 20 March 2016

Nomination form for the 2017 Nishina Asia Award

Candidate (name, affiliation, curriculum vitae including the date of the degree of Ph.D., nationality, address, email and telephone)
Jianglai Liu, Shanghai Jiao Tong University Nationality: China Address: Physics Bldg. 317, School of Physics & Astronomy, Shanghai Jiao Tong University Dongchuan Rd 800, Minhang District, Shanghai, China, 200240 Email: jianglai.liu@sjtu.edu.cn Phone: 86-21-3420-3040, 86-152-1433-3469 1998 B.S. Nanjing University 2006 Ph.D. University of Maryland at College Park 2006-2010 Postdoc/Senior Postdoc, Caltech 2010-Now Shanghai Jiao Tong University, Associate Professor (10-15), Professor (15-Now) Dr. Jianglai Liu has worked on various experiments in the intersections of nuclear, particle, and astrophysics. He studied the strange form factors of the nucleon at the Thomas Jefferson National Accelerator Facility via parity-violating electron scattering (1999-2006), and performed measurements of the axial-vector coupling constant using ultracold neutron decays at the Los Alamos National Laboratory (2006-2010). Currently he is the PI of the neutrino physics group at the SJTU, working on the Daya Bay and JUNO neutrino experiments, studying the fundamental properties of the neutrinos. He is in charge of the detector calibration for both projects. Since 2010 he started his endeavor on the PandaX experiment, a xenon-based direct dark matter search at the China Jin-Ping Underground Laboratory, and is presently serving as the deputy spokesperson of the project. Dr. Liu received the best Ph.D. dissertation prize from Jefferson Science Association in 2006. He was selected into the “1000 Junior Talent Program” in China in 2011 and Outstanding Junior Investigator awards from NSFC in 2015.
Citation for the Award (within 30 words)
For his seminal contributions to PandaX 500kg liquid xenon dark matter experiment in China Jinping Underground Laboratory, which has reached the world-best detection sensitivities for WIMPs in 2016.

Description of the work
PandaX-II 500kg liquid xenon dark matter experiment in China Jinping Underground Lab started to take data in March 2016. It was then and still is the world largest dark matter running detector in the world. It detects the charge and ionization produced by the scattering of a class of dark matter particles called Weakly Interacting Massive Particles (WIMP's) near the solar orbit in Milky Way on the nuclei of xenon atoms. In the first 3 months, the detector accumulated 3.3×10^4 kg·day data and recorded 24 million events, after various cuts, only one event has the profile of WIMPs, which indicates the superb capability of the detector's discrimination against the radioactive background. With expected 2.4 background events, the data sets the most stringent limit on the WIMP scattering scattering cross section with xenon atoms. The best upper limit on the scattering cross section is found 2.5×10^{-46} cm^2 for the WIMP mass 40 GeV/c^2 at 90% confidence level. The result was published as a cover article in PRL (Phys. Rev. Lett. 117, 121303 (2016)), and was an Editor's Choice. A viewpoint article (highest level recommendation of PRL) was written by a PRL reviewer (https://physics.aps.org/articles/v10/3). Dr. Jianglai Liu is de facto the leader of the PandaX-II liquid xenon dark matter experiment in the China, he serves as the deputy spokesperson, in charge of the 500kg liquid xenon dark matter experiment construction (particularly the PMT system and data acquisition) and lead the data analysis group, and is the corresponding author of the major physics publications of the experiment. (see key references 1, 2, and 3 below). Dr. Jianglai Liu is an outstanding experimental particle physicist, and is a well-known leader in the world neutrino and dark matter community, and is strongly recommended for the 2017 Nishina award.
Key references (up to 3 key publications*)
(1) PandaX-II Collaboration (Andi Tan et al., Jianglai Liu*), Dark Matter Results from First 98.7-day Data of PandaX-II Experiment, Phys. Rev. Lett. 117, 121303 (2016) (2) PandaX-II Collaboration (Andi Tan et al., Jianglai Liu*), Dark Matter Search Results from the Commissioning Run of PandaX-II. Phys. Rev. D 93, 122009 (2016) (3) PandaX Collaboration (Mengjiao Xiao et al., Jianglai Liu*), First Dark Matter Search Results from the PandaX-I Experiment, Sci China-Phys Mech Astron, 2014, 57(11): 2024-2030 (2014) *) Copy of one most significant publication should be attached.

Nominator (name, affiliation, email, telephone and relation to the candidate)

Xiangdong JI

Distinguished University Professor, U. of Maryland

Hongwen Chair Professor, Shanghai Jiao Tong University

Email: xdji@sjtu.edu.cn

Telephone: 86-17702116799

Relation to the candidate: the spokesperson of the PandaX collaboration in which Jianglai Liu is a deputy.

Signature March, 15, 2017

Nomination form for the 2017 Nishina Asia Award

Candidate (name, affiliation, curriculum vitae including the date of the degree of Ph.D., nationality, address, email and telephone)
Curriculum Vitae of ***Jun Zhao*** ***Citizenship***: China ***Current Appointments:*** Xie Xide Junior Chair Professor, Dept. of Physics, Fudan University, Shanghai, China (from 2014) ***Past Appointments:*** Professor, Dept. of Physics, Fudan University, Shanghai (2012-2014) Miller Research Fellow, University of California at Berkeley (2010-2012) ***Education:*** Dept. of Physics and Astronomy, the University of Tennessee, Knoxville (August 2005 - May 2010) Degree: Ph.D. in Physics Thesis: Neutron Scattering Study of High Temperature Superconductors Advisor: Professor Pengcheng Dai Institute of Physics, Chinese Academy of Sciences, Beijing, China (September 2002 to July 2005) Degree: M.S. in Physics Advisor: Professor Zhongxian Zhao Physics Department, Tsinghua University, Beijing, China (September 1998 - July 2002) Degree: B. S. in Physics ***HONORS AND AWARDS:*** Qiushi Outstanding Young Scholar Award, Qiushi Foundations, China (2014) Pujiang Scholar Award, City of Shanghai, China (2013) Thousand Young Talents Investigator Award, Department of Organization, China (2012) Miller Fellowship, University of California, Berkeley (2010-2012) Outstanding Dissertation in Magnetism Award (for doctoral thesis of outstanding quality and achievements in magnetism), American Physical Society (2010) Chinese Government Scholarship for Outstanding Self-financed Students Studying Abroad, China (2010) Fowler-Marion Outstanding Graduate Student Award, the University of Tennessee (2010)

Chancellor's Honors (for Extraordinary Professional Promise), the University of Tennessee (2009) Neutron Fellowship, Oak Ridge National Laboratory & the University of Tennessee (2009) Tennessee Advanced Materials Laboratory Fellowship, the University of Tennessee (2005-2008) Paul H. Stelson Fellowship, the University of Tennessee (2006) Address: Advanced Materials Laboratory 435, 2205 Songhu Rd. Shanghai 200438, China Tel: +86-15921879158 E-mail: zhaoj@fudan.edu.cn Website: http://jzhao.fudan.edu.cn/ Publication Citations: https://scholar.google.com/citations?hl=en&user=Ue1WSaYAAAAJ
Citation for the Award (within 30 words)
The elucidation of magnetic properties of unconventional superconductors and related materials.
Description of the work
The discovery of iron-based high temperature superconductors (iron pnictides and iron chalcogenides) opened a new avenue of research that could help to unravel one of the biggest mysteries in condensed matter physics—the mechanism of high temperature superconductivity. Prof. Jun Zhao has made outstanding contributions in understanding magnetic correlations and their relationship to high temperature superconductivity in iron-based materials. Shortly after the discovery of the iron-based superconductors, Prof. Jun Zhao and his collaborators used neutron powder diffraction to study the magnetic and structural phase diagram for iron pnictides. They discovered that the electronic phase diagram of the iron pnictides is very similar to that of the cuprates. Like the cuprates, the parent compounds of the iron pnictides are antiferromagnets, where superconductivity arises from the proximity of the antiferromagnetic ground state through chemical doping. To understand the nature of the antiferromagnetic ground state of the parent compounds, Prof. Jun Zhao and his collaborators used inelastic neutron scattering to map out the entire energy spectrum of spin wave excitations in the parent compounds of iron pnictides. They solved the effective magnetic exchange Hamiltonian and found that the magnetic interactions are anisotropic in the *ab* plane, which suggests the presence of magnetic nematicity; in addition, they found that the magnetism in iron pnictides has both local moment and conduction electron characters. Recently, Prof. Zhao's group also used inelastic neutron scattering to show that the structurally simplest iron-chalcogenide superconductor FeSe displays both spin fluctuations at two different wavevectors $(\pi,0)$ and (π,π), both of which are coupled with nematicity, indicating that FeSe is a novel S=1 nematic quantum paramagnet. The elucidation of the interplay between spin fluctuations, nematicity and superconductivity in these materials are important for establishing the

mechanism behind high temperature superconductivity.

In addition to the work described above, Prof. Zhao's group has been active in studying the magnetic correlations in unconventional superconductors and their related materials, such as the quantum spin liquids (QSL) and heli-magnetic superconductors. A QSL is an exotic quantum state of matter in which spins are highly entangled and remain disordered down to zero temperature. The concept of a QSL was initially introduced in 1973 by Nobel laureate Philip Anderson. This idea was revived after 1987, when Philip Anderson theorized that QSL theory may be related to high-temperature superconductivity. The search for QSL has been going on for more than forty years, and is one of the most important topics in quantum materials. Very recently, Prof. Zhao's group reported neutron scattering measurements that reveal continuous spinon excitations in the triangular-lattice antiferromagnet $YbMgGaO_4$, providing evidence of QSL state in this rare earth magnet. This work was later confirmed by an independent experiment by M. Mourigal's group [Nature Physics 13, 117 (2017)]. Moreover, Prof. Zhao's group discovered that, for the first time, a spin re-orientation transition coincides with the occurrence of superconductivity in the exotic heli-magnetic superconductor CrAs.

Prof Jun Zhao's works are filled with creativity and have already created a large impact to the condensed matter physics; they deserve the Nishina Asia Award.

Key references (up to 3 key publications*)

1. Structural and magnetic phase diagram of $CeFeAsO_{1-x}F_x$ and its relationship to high-temperature superconductivity
Jun Zhao, Q. Huang, C. de la Cruz, S. Li, J. W. Lynn, Y. Chen, M. A. Green, G. F. Chen, G. Li, Z. Li, J. L. Luo, N. L. Wang, Pengcheng Dai,
Nature Materials 75, 953-959 (2008)

2. Strong interplay between stripe spin fluctuations, nematicity and superconductivity in FeSe.
Qisi Wang, Yao Shen, Bingying Pan, Yiqing Hao, Mingwei Ma, Fang Zhou, P. Steffens, K. Schmalzl, T. R. Forrest, M. Abdel-Hafiez, Xiaojia Chen, D. A. Chareev, A. N. Vasiliev, P. Bourges, Y. Sidis, Huibo Cao and Jun Zhao.
Nature Materials 15, 159-163 (2016)

3. Evidence for a spinon Fermi surface in a triangular-lattice quantum-spin-liquid candidate
Yao Shen, Yao-Dong Li, Hongliang Wo, Yuesheng Li, Shoudong Shen, Bingying Pan, Qisi Wang, H. C. Walker, P. Steffens, M. Boehm, Yiqing Hao, D. L. Quintero-Castro, L. W. Harriger, M. D. Frontzek, Lijie Hao, Siqin Meng, Qingming Zhang, Gang Chen and Jun Zhao
Nature 540, 559–562 (2016)

*) Copy of one most significant publication should be attached.

Nominator (name, affiliation, email, telephone and relation to the candidate)

Nominator name: Ruibao Tao

Affiliation: Deparment of Physics, Fudan University

Email:

Telephone: +86-21 65642968 (office), +86 18930576922

Relation: The candidate, Dr. Jun Zhao, is a professor of our department recruit in last few years.

Signature Ruibao Tao Date 22 March, 2017

Nomination form for the 2017 Nishina Asia Award

Candidate (name, affiliation, curriculum vitae including the date of the degree of Ph.D., nationality, address, email and telephone)

Name: Yu-tin Huang

Nationality: Taiwan

Affiliation: Physics Department, National Taiwan University

Ph. D: May 2009 Stony Brook University

Address: No. 1, Section 4, Roosevelt Rd, Da'an District, Taipei City, 10617

E-Mail: , Tele: 886-2-3366-5194

Previous Affiliation:

2014- Physics Department, National Taiwan University, Assistant Professor

2013-2014 Institute for Advanced Studies, Member

2012-2013 Michigan University Post Doc

2009-2012 UCLA Post Doc

Citation for the Award (within 30 words)

For his contribution to uncovering hidden symmetries and structures in the S-matrix of gauge and gravity theories in diverse dimensions.

Description of the work

As a leading experts in the world on the S-matrix for gauge and gravity theories, Yu-tin Huang is one of the few people who initiated, with amazing insight and endeavor, a series of surprising developments that have revolutionized our understanding about scattering amplitudes, and about field theory and gravity. Invited by Cambridge University Press, he and Elvang wrote the textbook titled "Scattering Amplitudes in Gauge Theory and Gravity", published in 2015. Its clarity and style are highly appreciated by the field theory community around the world. It is clear that it is becoming the standard reference on this topic and will influence a few generations.

Ref. [1] demonstrated how structures of the S-matrix could be completely hidden in the conventional Lagrangian of gauge and gravity theories. In particular, by augmenting the classical Lagrangian by terms that vanish through algebraic identities, a duality between the color structure of its scattering amplitude and its kinematic factor is revealed. This shows that the hidden structure for the S-matrix is present beyond the tree-level approximation. This realization led tremendous progress for loop level computations of quantum gravity amplitudes, where color kinematic duality was employed to obtain amplitudes of (super)gravity, leading to surprising results for the ultra-violet behavior of quantum gravity theory. A new layer of the amazing hidden connection between gauge theory and gravity is unraveled by this work.

Ref. [2] established the presence of dual-superconformal symmetry for N=6 to all orders in perturbation theory. Unlike the case of the N=4 super Yang-Mills, this symmetry was not expected from the dual string picture, and hence the establishment of its presence was an important field theory accomplishment, which led to high-multiplicity and loop-order computations of Chern-Simons matter theories.

Ref. [3] explored soft-theorems associated with spontaneous symmetry breaking. Most importantly, using the Akulov-Volkov theory, it demonstrated how spontaneously broken fermionic symmetries leave its fingerprint in the zero-momentum limit of Goldstone fermions in the S-matrix. Turning to supergravity, it was shown that similar soft theorems are present in the fermion sectors, which are not implied by supersymmetry, hinting at further hidden symmetries.

Finally, since returning to Taiwan, Yu-tin Huang has made great effort in helping local students and young researchers, as well as offering services to the theory community. He organized *Amplitudes in Asia 2015*, as well as many other conferences and workshops. People in Taiwan could feel the clear difference due to his heart-warming effort. It is the common opinion of many senior physicists that Yu-tin Huang is the most promising theorist in Taiwan in the younger generation.

Key references (up to 3 key publications*)

[1] "Gravity as the Square of Gauge Theory", Zvi Bern, Tristan Dennen, Yu-tin Huang, Michael Keirmaier, **Phys.Rev. D82 (2010) 065003**

[2] "Tree-Level Recursion Relation and Dual Superconformal Theory of ABJM", Dongmin Gang, Yu-tin Huang, Eunkyung Koh, Sangmin Lee, Arthur Lipstein **JHEP 1103 (2011) 116**

[3] "New Fermionic Soft Theorems", Wei-Ming Chen, Yu-tin Huang, Congkao Wen, **Phys.Rev.Lett. 115 (2015) no.2, 021603**

*) Copy of one most significant publication should be attached.

Nominator (name, affiliation, email, telephone and relation to the candidate)

Pei-Ming Ho (Physics Department, National Taiwan University)
Email: pmho@phys.ntu.edu.tw, Phone: +886-2-33665192
Relation to the candidate: colleague.

Signature Pei-Ming Ho Date Mar. 15, 2017

Nomination form for the 2017 Nishina Asia Award

Candidate (name, affiliation, curriculum vitae including the date of the degree of Ph.D., nationality, address, email and telephone)

Name: Bijaya Kumar Sahoo
Affiliation: Associate Professor, Theoretical Physics Division, Physical Research Laboratory (PRL), Ahmedabad 380009, India
Curriculum vitae:
- Ph.D.: Indian Institute of Astrophysics, India, September 2005 (Thesis title: "Coupled-cluster theory of parity non-conservation in atoms")
- Nationality: India
- Address: Navrangpura, Ahmedabad-380009, India
- Email: bijaya@prl.res.in
- Telephone: 0091 79 26314455

Citation for the Award (within 30 words)

The candidate have developed a novel many-body atomic theory in a relativistic coupled-cluster framework and performed most accurate calculation of the electron electric dipole moment (EDM) of an atomic system.

Description of the work

Dr B. K. Sahoo's Ph.D. thesis work probes the standard model (SM) of elementary particle physics via sophisticated high precision atomic calculations. He has developed a novel many-body approach in a relativistic coupled-cluster (RCC) framework that deals with two very different fundamental interactions, namely the usual electromagnetic interactions in an atom and the neutral current weak interaction between the atomic electrons and the nucleus, which has been published in Phys. Rev. Lett. 96, 163003 (2006) and it has already been cited 35 times. He has also performed high accuracy calculations for the parity non-conservation (PNC) observable in singly ionized, which is being considered for the observation of PNC at the University of Washington, Seattle, USA. The method he has developed has been later employed to determine the PNC results accurately in many atomic systems including Ra ion, which has been cited 48 times. Recently, he has also demonstrated a procedure for inferring signature of possible existence of nuclear anapole moment (NAM) of Fr atom in collaboration with our group at Cyclotron and Radioisotope Center, Tohoku University, Japan.

As a part of his thesis work, Dr. Sahoo has also obtained a new limit to the coupling constant for a parity and time reversal violating scalar pseudoscalar interaction in Tl EDM calculations which can deepen our understanding of semi-leptonic CP violation with important implications for new physics beyond the SM; this work was published as a Rapid Communication in Phys. Rev. A. It also paved the way for the determination of the enhancement factors of the EDMs of Rb and Cs arising from the EDM of the electron. This work was published in Phys. Rev. Lett. and has been cited by 27 times. Recently, he has also performed very sophisticated calculations to extract best limits on the Theta_QCD parameter, chromo EDMs of up and down quarks and coupling coefficient related to tensor-pseduotensor interaction between electron and quarks. These results are published as Rapid Communication in Phys. Rev. A.

By performing rigorous relativistic atomic many-body calculations and combining with the recent experimental result on the EDM of ^{199}Hg due to time-reversal and parity violating interactions, best limits on the θ_{QCD} parameter and chromo-electric dipole moments of quarks were reported. In addition, constraint on the coupling coefficient of the tensor-pseudotensor interaction between an electron and atomic nucleus were inferred by allowing a possible exchange of dark matter candidate between them. A possible scope of estimating mass of a bosonic dark matter candidate from this coupling coefficient was highlighted. Furthermore suitability of a number highly charged ions for carrying out ultra high precision accuracy atomic clocks below 10^{-20} precision level were demonstrated and their roles in observing temporal variation of fine structure constant were outlined.

Dr Sahoo's commitment to the highest standards of research are reflected in his more than 115 peer reviewed papers in the leading journals of physics that include many single author papers, 4 Phys. Rev. Letts., 16 Rapid Communications in Physical Review A, 1 Fast Track Communication in J. Phys. B etc. He was also invited to write a book chapter on atomic clocks in the Handbook on Relativistic Quantum Chemistry of Springer Publication. He has received several awards both in India and abroad in recognition of his achievements. Awarded as an "Outstanding Reviewer" by J. Phys. B: Atomic, Mol. And Opt. Physics for 2016. Also have been awarded the "PIFI Fellowship" by Chinese Academy of Sciences (CAS) for 2017-2018 and "Indo-Australia EMCR Fellowship" by Indian National Science Academy for 2016-2017. He has guided successfully two PhD students who are now working outside India on postdoctoral fellowships and assisted several PhD and Masters students to carry out projects in collaboration with him. He has been teaching to the PhD students at Physical Research Laboratories since he joined that institute. He is widely considered to be one of the leading atomic many-body theorists in the world.

Key references (up to 3 key publications*)

(1) B. K. Sahoo, R. K. Chaudhuri, B. P. Das and D. Mukherjee, “Relativistic Coupled-Cluster Theory of Atomic Parity Nonconservation: Application to 137Ba+”, Phys. Rev. Lett. 96, 163003 (2006).

(2) B. K. Sahoo and B. P. Das, “Parity nonconservation in ytterbium ion”, Phys. Rev. A 84,

010502(R) (2011).

(3) B.K. Sahoo, T. Aoki, B.P. Das, Y. Sakemi, ”Enhanced spin-dependent parity-nonconservation effect in the 7s2S1/2→6d2D5/2 transition in Fr: A possibility for unambiguous detection of the nuclear anapole moment”, Phys.Rev. A93 (2016) no.3, 032520(2016-03-30)

*) Copy of one most significant publication should be attached.

Nominator (name, affiliation, email, telephone and relation to the candidate)

Name: Yasuhiro Sakemi

Affiliation: Professor, Center for Nuclear Study, The University of Tokyo

E-mail: sakemi@cns.s.u-tokyo.ac.jp

Telephone: +81-48-464-4048

Relation to the candidate:

Dr. B.K. Sahoo is the important collaborator from theoretical side on our experimental project about the search for the permanent electric dipole moment (EDM) using laser cooled radioactive atoms. To calculate the enhancement factor of the electron EDM to heavy atoms such as Francium is most important to extract the EDM with highest accuracy, and Dr. Sahoo’s theoretical method ‘Relativistic Coupled Cluster theory’ is needed for this type of studies. We started the collaboration from the international workshop on Violation of discrete symmetries in atoms and nuclei in 2010 at Trento, Italy. We also applied JSPS - INSA Bilateral Cooperation Program of JSPS from 2013 to 2015. We have already 4 publications with the collaboration.

Signature *Yasuhiro Sakemi* Date 27-March, 2017

Nomination form for the 2017 Nishina Asia Award

Candidate (name, affiliation, curriculum vitae including the date of the degree of Ph.D., nationality, address, email and telephone)
Yang Zhang, University of Illinois at Urbana-Champaign, 104 South Wright Street, Urbana, IL 61801, zhyang@illinois.edu, +1 (217) 300-0452, Nationality: China, http://zhang.cse.illinois.edu/ Appointments 2012 – *present* **Assistant Professor**, Department of Nuclear, Plasma, and Radiological Engineering, Department of Materials Science and Engineering, Program of Computational Science and Engineering, Beckman Institute for Advanced Science and Technology, University of Illinois at Urbana-Champaign (UIUC) 2010 – 2012 **Clifford G. Shull Fellow**, Neutron Sciences Directorate, Oak Ridge National Laboratory (ORNL) Education **Ph.D.** Nuclear Science and Engineering, **Massachusetts Institute of Technology** (MIT), 2010 Thesis: "*Neutron Scattering Investigations on the Unusual Phase Behavior of Water*" **B.S.** Electrical Science and Technology, **University of Science and Technology of China** (USTC), 2004 Research Interests He is interested in the fundamental science (especially the long timescale phenomena and rare events) as well as the applications of a range of **non-equilibrium materials**. These materials contain novel non-equilibrium structures intentionally designed to highlight specific functions and thus often carry unique properties. His current research can be roughly divided into two areas: • **Extreme properties of liquids**: *metallic, molecular, ionic, macromolecular, colloidal, granular, etc.* • **Glassy, jammed, and kinetically trapped soft matter**: *heterogeneity, hierarchy, self-organization, functionality, programmability, controllability, etc.* Publications **More than 30 publications (citations > 1000, h-index = 17)** in book sections and high-impact journals such as *P. Natl. Acad. Sci. USA*, *Phys. Rev. Lett., J. Am. Chem. Soc., Angew. Chem., and Nat. Commun.*
Citation for the Award (within 30 words)
For his work on the extreme properties of water as well as other metallic, molecular, and ionic liquids.
Description of the work

From 2005 to 2011, Prof. Zhang primarily worked on applying neutron and x-ray scattering techniques to study the fascinating thermodynamic and dynamic properties of supercooled water in confined geometry. Water is important in many biological and industrial processes and has rather unique and anomalous properties. Among the various research achievements, his most significant work is the discovery of a non-trivial density hysteresis phenomenon for confined heavy water at extremely supercooled temperatures and high pressures by applying a clever use of a cold neutron triple-axis spectrometer at NIST Center for Neutron Research [*PNAS* 108(20), 12206 (2011)]. This is a groundbreaking result that provides the strongest experimental evidence so far supporting the existence of a novel liquid-liquid phase transition in water, and marks a milestone in the understanding of the peculiar behaviors of water. It was highlighted on MIT's homepage as a showcase of outstanding MIT research, and was widely covered in many public media. I have also chosen a figure from this paper as the cover of my latest book *Scattering Methods in Complex Fluids* published by Cambridge University Press, May 2015.

From 2011 to present, Prof. Zhang worked on the fundamental science (especially the long timescale phenomena and rare events) as well as the applications of a range of non-equilibrium materials. Through a series of high-profile publications, he systematically studied the extreme properties of metallic, molecular, and ionic liquids and aimed to provide a universal understanding of the rich non-equilibrium phase behavior of liquids. One major achievement of his is the identification of a universal Arrhenius crossover phenomena which defines the separation between simple liquids and cooperative liquids. This is the first time the Ioffe-Regel localization has been observed in liquids. He has also investigated similar non-equilibrium phenomena in many soft materials in order to reveal the emergent universal principles that govern far-from-equilibrium processes where correlations are highly non-localized.

Key references (up to 3 key publications*)

[1] A. Jaiswal, T. Egami, K. F. Kelton, K. S. Schweizer, **Y. Zhang*,** "Correlation between fragility and the Arrhenius crossover phenomenon in metallic, molecular, and network liquids", *Phys. Rev. Lett.* 117, 205701 (2016)

[2] K. Yang, Z. Cai, A. Jaiswal, M. Tyagi, J. S. Moore, **Y. Zhang*,** "Dynamic odd-even effect in liquid n-alkanes near melting points", *Angew. Chem. Int. Ed.* 128, 14296 (2016)

- ***"The science behind faster gasoline" from Rob Dimeo, Director of NIST Center for Neutron Research.***
- ***"New discovery may lead to the development of super premium gasoline", UIUC College of Engineering news, Beckman Institute news, etc.***
- ***"New discovery may lead to the development of super premium gasoline", Science Daily, Science Newsline, scienceblog, phys.org, phys.org Last Week Top Stories, AAAS EurekAlert, chemeurope, Principia Scientific, Chem Info, Science Mic, Parallel State, etc.***

- ***"Discovery on Liquid Alkanes can Benefit Petroleum Industry", AZO Materials.***
- ***"Revolutionary Novel Discovery may Result in Development of Super-Premium Gasoline", Engineers Garage.***
- ***"Discovery could lead to crude oil and gasoline being transported across country 30 times faster", Innovation Toronto.***
- ***"Transporting Petroleum Could Now Be Done 30 Times Faster Than Usual", Gineers Now.***

[3] **Y. Zhang,** A. Faraone, W. A. Kamitakahara, K.-H. Liu, C.-Y. Mou, J. B. Leao, S. Chang, S.-H. Chen, "Density hysteresis of heavy water confined in a nanoporous silica matrix", *P. Natl. Acad. Sci. USA* 108(30), 12206 (2011).

- ***"Unraveling water's secrets", MIT homepage today's spot, Aug. 1, 2011.***
- ***Book Cover, "Scattering Methods in Complex Fluids", by Sow-Hsin Chen and Piero Tartaglia, Cambridge University Press, 2015.***
- ***"Density Hysteresis in Nanoconfined Water", 2011 Accomplishments and Opportunities, NIST Center for Neutron Research (2011).***
- ***"Shedding light on water's mysterious behavior", DOE Office of Science headlines.***
- ***Cover of the DOE Neutron Scattering Principal Investigators' Meeting Report, 2012.***
- ***"Revealing water's secrets", MIT news, MIT NSE news, Phys.org, ORNL in the news, etc.***
- ***"MIT research supports controversial theory about water", Newsroom America.***
- ***"MIT Scientists Tackle Water Controversy", Crazy Engineers.***
- ***"Explaining some of water's mysteries", Softpedia.***
- ***"The Secrets of Water", Hydrophilia.***
- ***"Water's secrets revealed", R&D Magazine.***
- ***"More light on anomalous behavior of water", Chemical Industry Digest.***

*) Copy of one most significant publication should be attached.

Nominator (name, affiliation, email, telephone and relation to the candidate)

Professor Emeritus Sow-Hsin Chen
Massachusetts Institute of Technology
sowhsin@mit.edu
+1 (617) 413-3414
Relation: PhD Adviser of the candidate

Signature SH Chen Date 3/30/2017

Nomination form for the 2017 Nishina Asia Award

Candidate (name, affiliation, curriculum vitae including the date of the degree of Ph.D., nationality, address, email and telephone)
Cheng-Zhi Peng, Male, Chinese, Born on October 06, 1976 in Guangzhou, Guangdong Province, China Address: Shanghai Branch, National Lab. for Phys. Sci. at Microscale, USTC 99 Xiupu Road, 201315 Shanghai Email: pcz@ustc.edu.cn Phone: +86-139-18638800 Since2009 Professor for experimental physics, University of Science and Technology of China (USTC) 2007-2009 Assistant Professor, Tsinghua University 2005-2007 Postdoctoral researcher at Tsinghua University 1999-2005 Graduate student at Dept. of Mod. Phys., USTC Ph.D., Received in January 2005 1993-1998 Undergraduate student at Dept. of Mod. Phys., USTC B.Sc., Received in July 1998
Citation for the Award (within 30 words)
Cheng-Zhi Peng's outstanding innovation and major breakthrough in the long-distance quantum communication
Description of the work
The candidate's main research interest is experimental quantum communication, and he is committed to the development of practical quantum key distribution and entanglement based quantum communication. He realized for the first time decoy-state quantum key distribution (QKD) in the world, extended the security distance of quantum communication to 100 km level [Phys. Rev. Lett. 98, 010505 (2007)] which demonstrated the practical prospect of quantum communication, and further constructed an all-pass-type metropolitan quantum communication network in China. He demonstrated entangled distribution over 13 km free-space channel [Phys. Rev. Lett. 94, 150501 (2005)], which for the first time proved that entanglement can still survive after penetrating the effective thickness of the atmosphere, and quantum teleportation over 16 km later [Nature Photonics 4, 376 (2010)]. He demonstrated quantum teleportation and entanglement distribution over 100-kilometer free-space channels [Nature 488, 185 (2012)], which verified the feasibility of the global quantum communication based on satellite platform. He also achieved direct and full-scale experimental verifications towards ground–satellite decoy-state QKD [Nature Photonics 7, 387 (2013)]. For longer distance quantum communication, he has led the research of quantum payloads in "Micius" quantum science satellite and the corresponding ground stations. The quantum science satellite was launched on August 16, 2016, which will realize the space-earth wide-area quantum communication for the first time in the world. To further show the impact of the his major achievements, I would like to briefly mention the following facts: his work in the field of quantum communication and quantum information has been selected for one time annual highlight by Nature as "**Features of the Year 2012**", and one time annual highlight by IOP *Physics-World* (before was called as *Physics-Web*) as "**Highlights of the Year for 2013**". Furthermore, his work has been selected for twice "**The Top Ten Annual Scientific and Technological Progresses in China**" by the academicians of the Chinese Academy of Science and the Chinese Academy of Engineering.
Key references (up to 3 key publications*)

1. Juan Yin, Ji-Gang Ren, He Lu, Yuan Cao, Hai-Lin Yong, Yu-Ping Wu, Chang Liu, Sheng-Kai Liao, Fei Zhou, Yan Jiang, Xin-Dong Cai, Ping Xu, Ge-Sheng Pan, Jian-Jun Jia, Yong-Mei Huang, Hao Yin, Jian-Yu Wang, Yu-Ao Chen, **Cheng-Zhi Peng**, Jian-Wei Pan; Quantum teleportation and entanglement distribution over 100-kilometre free-space channels; Nature, 488 185 (2012)
2. Jian-Yu Wang, Bin Yang, Sheng-Kai Liao, Liang Zhang, Qi Shen, Xiao-Fang Hu, Jin-Cai Wu, Shi-Ji Yang, Hao Jiang, Yan-Lin Tang, Bo Zhong, Hao Liang, Wei-Yue Liu, Yi-Hua Hu, Yong-Mei Huang, Bo Qi, Ji-Gang Ren, Ge-Sheng Pan, Juan Yin, Jian-Jun Jia, Yu-Ao Chen, Kai Chen, **Cheng-Zhi Peng**, and Jian-Wei Pan; Direct and full-scale experimental verifications towards ground-satellite quantum key distribution; Nature Photonics, 7 387 (2013)
3. Xian-Min Jin, Ji-Gang Ren, Bin Yang, Zhen-Huan Yi, Fei Zhou, Xiao-Fan Xu, Shao-Kai Wang, Dong Yang, Yuan-Feng Hu, Shuo Jiang, Tao Yang, Hao Yin, Kai Chen, **Cheng-Zhi Peng**, and Jian-Wei Pan; Experimental free-space quantum teleportation; Nature Photonics, 4 376-381 (2010)

*) Copy of one most significant publication should be attached.

Nominator (name, affiliation, email, telephone and relation to the candidate)

Jian-Wei Pan, Academician of the Chinese Academy of Sciences, Professor and Executive Vice President of University of Science and Technology of China
Email: pan@ustc.edu.cn
Phone: +86-180-55119827

The candidate was my Ph.D student twelve years ago, and now is my colleague at USTC.

Signature [signature] Date 2017.3.27

Nomination form for the 2017 Nishina Asia Award

Candidate (name, affiliation, curriculum vitae including the date of the degree of Ph.D., nationality, address, email and telephone)
Name: Suvrat Raju Affiliation: International Centre for Theoretical Sciences, Tata Institute of Fundamental Research. Address: ICTS-TIFR, Shivakote, Hesaraghatta Hobli, Bangalore 560089 Email: suvrat@icts.res.in Telephone: +91-80-4653-6330 Cellphone: +91-9455999243 **Brief c.v:** **Education** • B.Sc. (Hons) Physics, St. Stephen's College, University of Delhi, 2002. • A.M., Harvard University, 2003. • PhD, Harvard University, 2008. **Positions Held** • Postdoctoral fellow, Harish-Chandra Research Institute, 2008—10. • Ramanujan fellow, Harish-Chandra Research Institute, 2010—12. • Reader, International Centre for Theoretical Sciences, TIFR, 2012—present. **Selected Awards:** • Saraswathi Cowsik medal, TIFR, 2015. • Young Scientist Medal, Indian National Science Academy, 2013. • Young Scientist Platinum Jubilee Award, National Academy of Sciences of India, 2013. • Ramanujan fellowship, Department of Science and Technology, 2010. • St. Stephen's College centenary medal, 2002. • Bronze medal and special award for best solution to the second theoretical problem, International Physics Olympiad, 1999. (see c.v. attached for further details, including complete list of publications.)
Citation for the Award (within 30 words)
For proposing a construction of the black-hole interior in AdS/CFT that has led to new insights into the information paradox and the nature of local observables in quantum gravity.

Description of the work

The information paradox is a central problem in quantum gravity. In the context of the AdS/CFT correspondence, this paradox is closely related to the question of whether the interior of the black hole can be described holographically.

The nominee (Suvrat Raju), in collaboration with Kyriakos Papadodimas and other collaborators, has made a significant contribution to this area of research by proposing a construction of the black hole interior for large AdS black holes in the boundary conformal field theory (CFT). This was done in two steps. First, by means of physical reasoning in [1,2], Raju and Papadodimas argued that it was necessary for local operators in the interior of the black hole to obey certain equations. The question of whether the black hole interior has a representation in the CFT then reduces to a question of the existence of solutions to these equations. Raju and Papadodimas then explicitly solved these equations in [2] thereby constructing a realization of the black hole interior in the CFT.

This solution has several interesting consequences. First, it leads to a precise version of an old idea known as black hole complementarity. In this context, the precise statement is that the interior of the black hole is spanned by operators that are complicated combinations of the same operators that span the exterior. This leads to a non-zero commutator between local operators inside and outside the black hole. The construction cleverly ensures that locality is preserved to an excellent approximation in ordinary correlators and this non-zero commutator is significant only for correlators which involve S insertions, where S is the entropy of the black hole. Hence this effect is very delicate. But it is intrinsically interesting and from a fundamental perspective, the existence of such an effect helps to resolve various puzzles about the interior.

Second, this construction has the property that the representation of an operator in the interior of a black hole in the CFT *depends on the microstate* of the system. This is a very interesting statement about how local operators must be represented in quantum gravity. In [3] the authors showed that not only is state-dependence necessary in single-sided black holes, it is also important in the duality between the thermo-field doubled state and the eternal black hole.

Third, the construction also provides a concrete alternative to the hypothesis that AdS black holes have a “firewall” at the horizon, which has been debated intensely in the quantum gravity community.

Subsequent work by Raju, Papadodimas, Bryan and Banerjee, showed that the physical effect of the loss of locality in very high point correlators was present even in empty AdS where it could be examined in a very explicit setting.

Raju and his student, Sudip Ghosh, have recently shown that a similar effect is present even in flat space string theory. In this work (recently published in *Phys. Rev. Lett.*) Raju and Ghosh used mathematical results on the volumes of moduli spaces of Riemann surfaces which they combined with extensive numerical analysis of string scattering amplitudes to argue that string perturbation theory breaks down for a large number of particles even when the individual particle energies are small. This breakdown happens precisely at the point where one might expect a loss of locality from the proposal of [2], and lends support to that result.

Key references (up to 3 key publications*)
[1] K. Papadodimas and S. Raju, "An Infalling Observer in AdS/CFT", *JHEP,* 1310, 212 (2013). [2]. K. Papadodimas and S. Raju, "The Black Hole Interior in AdS/CFT and the Information Paradox", Phys. Rev. Lett, 112 051301 (2014); "State-Dependent Bulk-Boundary Maps and Black Hole Complementarity", Phys. Rev. D, 89, 086010 (2014). [3] K. Papadodimas and S. Raju, "Local Operators in the Eternal Black Hole", Phys. Rev. Lett, 115, 211601(2015); "Remarks on the necessity and implications of state-dependence in the black hole interior", Phys. Rev. D., 93, 084049 (2016). Copy of Publication [2] is attached. *) Copy of one most significant publication should be attached.
Nominator (name, affiliation, email, telephone and relation to the candidate)
Prof Spenta R. Wadia, Emeritus Professor and Founding Director, International Centre for Theoretical Sciences (ICTS-TIFR), Tata Institute of Fundamental Research, Bangalore, India. e-mail: spenta.wadia@gmail.com tel: +91 80 6730 6010
Signature Spenta Wadia Date 30 March 2017

Nomination form for the 2017 Nishina Asia Award

Candidate (name, affiliation, curriculum vitae including the date of the degree of Ph.D., nationality, address, email and telephone)
Bumjoon Kim Department of Physics Pohang University of Science and Technology 77 Cheongam-Ro Nam-Gu Pohang Gyeongbuk Korea 37673 Tel: +82 (0)54 279 9882 Fax: +82 (0)52 279 9889 Mobile: +82 (0)10 5128 5122 Nationality: Korean Career history: December 2016 - present Associate Professor Pohang University of Science and Technology Department of Physics July 2013 - November 2016 Group Leader Max Planck Institute for Solid State Research Neutron Scattering Group, Solid State Spectroscopy Department September 2010 - June 2013 Assistant Physicist Argonne National Laboratory Materials Science Division February 2010 - September 2010 Postdoctoral Research Fellow Argonne National Laboratory Materials Science Division April 2008 - January 2010 Postdoctoral Research Fellow University of Michigan, Ann Arbor Prof. James W. Allen

October 2006 - March 2008 Visiting scientist University of Tokyo Prof. Hidenori Takagi 08.2005 Ph. D. in physics New approach to angle-resolved photoemission spectroscopy using high photon energy Prof. Se-Jung Oh Seoul National University 02.2001 M. S. in physics Seoul National University 02.1999 B. A. in physics Korea Advanced Institute of Science and Technology Award: Brian R. Coles Prize 2013 30 Young Scientists of Korea (2016)
Citation for the Award (within 30 words)
The discovery and experimental study of an unconventional Mott insulating state induced by relativistic spin-orbit coupling in iridates.
Description of the work

B. J. Kim discovered a new phase of quantum matter in the 5d transition-metal oxide Sr_2IrO_4 now widely known as "spin-orbit Mott insulator". Using angle-resolved photoemission, x-ray absorption, and resonant x-ray diffraction, he established that the electronic ground state in this material has a highly nontrivial spin-orbit entangled structure with effective total angular momentum one-half (J_{eff}=1/2). These results were published in Physical Review Letters (2008) and Science (2009), which have a combined citation exceeding 1600 (as of 3/30/2017). The study of spin-orbit Mott insulator has now become one of the mainstreams in condensed matter physics.

The discovery of the J_{eff}=1/2 ground state is significant because it is parent to a plethora of unconventional electronic orders. One of the most exciting possibilities is the realization of the cuprate physics in a non-cuprate material; namely, spin-1/2 Mott insulator on a square lattice with J_{eff}=1/2 moments playing the role of spin-1/2 moments. Following the initial work, B. J. Kim showed that Sr_2IrO_4 exhibits spin dynamics in remarkable similarity with that in high temperature superconducting cuprates, heightening the prospect of finding a new high temperature superconductor. This work is also a major breakthrough in x-ray science because it is the first demonstration of using hard x-ray to probe momentum-resolved dynamic spin structure over the full Brillouin zone, which has previously been only accessible by inelastic neutron scattering.

B. J. Kim has further shown that the J_{eff}=1/2 state develops a high temperature pseudogap and a low-temperature d-wave gap upon carrier doping, reproducing the complete phenomenology of the cuprates. This work used surface sensitive techniques to dope the surface layer of Sr_2IrO_4 and at present whether the d-wave gap represents unconventional superconductivity remains an open question, but at the least it established a new material platform to study the elusive relationship between the pseudogap and the d-wave gap. Contributions from other groups have further strengthened the analogy to cuprates by showing the existence of competing symmetry broken phases in the pseudogap region of the phase diagram that are also very much reminiscent of the cuprate phase diagram. All the evidence collectively point to a high probability of finding high temperature superconductivity in iridate in the near future.

In another related material Na_2IrO_3, B. J. Kim showed that the J_{eff}=1/2 state leads to a strong magnetic frustration and a magnetic phase in close proximity to the Kitaev spin liquid.
This is first direct evidence that the Kitaev magnetic interaction can be realized in a condensed matter setting. This shows that J_{eff}=1/2 states can lead to very different types of magnetic interactions depending on the bonding and lattice geometry and thus can have wide applications beyond reproducing cuprate physics. Other interesting directions include topological phases of matter combining magnetism, for which pyrochlore iridates (also based on J_{eff}=1/2 states) are now under active discussions.

In summary, the discovery of the J_{eff}=1/2 ground state by B. J. Kim has opened a new field and had a broad impact in condensed matter physics in the last decade. Given the fact that the conventional Mott insulator since its discovery in 1930's has been a central paradigm of correlated electron physics for nearly a century, it is extremely interesting to see a new spin on the Mott insulators and the future it will bring.

Key references (up to 3 key publications*)

B. J. Kim et al., Novel J_{eff}=1/2 Mott insulator induced by relativistic spin-orbit coupling in Sr2IrO4, Physical Review Letters **101**, 076402 (2008).

B. J .Kim et al., Phase-sensitive observation of a spin-orbital Mott state in Sr2IrO4, Science **323**, 1329 (2009).

Y. K. Kim et al., Fermi arcs in a doped pseudospin-1/2 Heisenberg antiferromagnet, Science **345**, 187 (2014).

*) Copy of one most significant publication should be attached.

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Signature Park, Jaehoon Date March 31, 2017